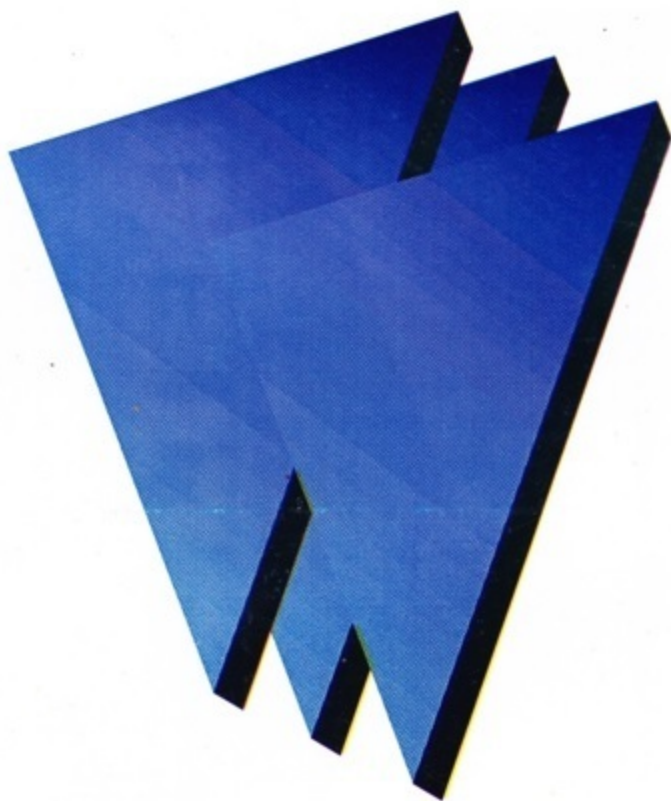# JURNAL ILMU KESEHATAN

POLTEKITA

Original Article

Effect of the Cooperative Learning Model through E-Module regarding Third Stage of Labor Care on the Increase in Knowledge, Skills and Learning Motivation among Midwifery D-III Students

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ABSTRACT

The era of the industrial revolution 4.0 has led to technological developments, especially in the world of education. This era emphasizes the pattern of digital economy, artificial intelligence, big data, robotics, and so on or commonly known as the phenomenon of disruptive innovation, for example the use of Android as a mobile learning medium. This study aims to determine the effect of the cooperative learning model thorugh e-module regarding third stage of labor care on the increase in knowledge, skills, and learning motivation among midwifery D-III students. This was a quantitative study with a pre-experimental approach using a two-group pre-test- post-test design. The results showed that the majority of respndents in the two groups of variables before being given treatment had poor knowledge as many as 33 respondents (73.3%) and 34 respondents (75.6%), all respondents had poor skills, and the majority had low motivation as many as 39 respondents (86.7%) and 45 respondents (100%). The statistical test for knowledge, skills and motivations variables obtained the same p value of 0.000 <0.05. Thus, the research hypothesis was accepted. There was an effect of the cooperative learning model with e-module regarding third stage of labor care on the increase in knowledge, skills and learning motivation among midwifery DIII students.

Keywords : Third Stage of Labor Care, E-Module, Cooperative Learning Model, Skill, Learning Motivation.

INTRODUCTION

The era of the industrial revolution 4.0 has led to technological developments, especially in the world of education. This era emphasizes the pattern of digital economy, artificial intelligence, big data, robotics, and so on or commonly known as the phenomenon of disruptive innovation, for example the use of Android as a mobile learning medium. Online-based mobile learning provides opportunities for students to study anytime and anywhere. The development of cooperative learning-based modules for teaching can make a very large contribution, especially to student reading comprehension[2].

Media and learning resources are factors that can influence learning. The function of cooperative learning system is to create information media so as to deliver information more interactively and also informative. The media must be interesting, not boring but still have a significant effect in improving psychomotor, cognitive and affective aspects[14].

E-modules are electronic and practical teaching materials designed by lecturers which will later be used by students to learn the

subjects. The application of the cooperative learning model through learning media (E-Module) is expected to be able to optimize mastery of the material and increase learning motivation both in terms of knowledge and skills of students [1]. The reason for using android is because it's easy to bring anywhere and currently, almost everyone has an android. Android also has complete, open, free and easy to access application system wherever students are. Lecturers can also organize lectures without having to bring personal computers or laptops. Interaction between lecturers and students will occur easily. Students can access learning materials from lecturers anytime and anywhere by using the Android application [10].

The existence of E-modules is also expected to assist in understanding concepts in subject matter which can make it easier for students to carry out practicums and increase collaboration between students in completing assignments. Learning method using E-modules basically aims to help students or university students to achieve their learning goals independently. In turn, students will be able to develop their thinking processes and also directly increase their knowledge according to the learning topic during the lecture process [3]. The current study aims to determine the effect of the cooperative learning model through e-module regarding third stage of labor care on the increase in knowledge, skills, and learning

METHOD

This was a quantitative study with a pre-experimental approach using a two-group pre-test- post-test design. The study was conducted at STIKES Nani Hasanuddin of Makassar. The samples were selected using total sampling. The study samples were assigned into 2 groups consisted of 45 respondents respectively. Group 1 was the treatment group using the cooperative learning model through android-based e-module, and group 2 was the control group without any treatment as the comparison group.

RESULTS

Results of analysis on the effect of the cooperative learning model through e-module regarding third stage of labor care on the increase in knowledge, skills, and learning motivation among midwifery D-III students showed that most of respondents in the intervention group were 19-20 years in age as many as 25 respondents (55.6%), and had the last GPA of >3.00-<4.00 as many as 42 respondents (93.4%). Furthermore, most of respondents in the control group the majority were 21-25 years in age as many as 31 respondents (68.9%) and all respondents had the latest GPA of >3.00-<4.00 (100%)(Table 1).

Table 1. Characteristics of Respondents in the Intervention Group and Control Group.

Characteristic	Intervention		Control	
	N	%	n	%
Age				
19 – 20 years	25	55.6	14	31.1
21 – 25 years	20	44.4	31	68.9
Total	45	100	45	100
GPA				
≤ 3.00	3	6.6	0	0
> 3.00 - < 4.00	42	93.4	45	100
Total	45	100	45	100

Results regarding the level of knowledge, skills and learning motivation of students before and after treatment in the Intervention Group and Control Group showed that before being given treatment, the majority of respondents had less knowledge, namely as many as 33 respondents (73.3%) and 34 respondents (75.6%), respectively. Furthermore, all of respondents had poor skills, motivation among midwifery D-III students.

and the majority of respondents had low motivation, namely as many as 39 respondents (86.7%) and 45 respondents (100%), respectively. Table 2 also showed that after study population involved 90 4th semester students of Midwifery DIII study program at STIKES Nani Hasanuddin of Makassar. The being given intervention, the majority of respondent in both groups had good knowledge,

namely as many as 38 respondents (84.4%) and 36 respondents (80.0%), respectively. In addition, the majority of respondents had moderate motivation, namely as many as 42 respondents (93.3%) and 32 respondents

respectively. Regarding Skills, the majority of respondents in the intervention group had moderate skills, namely as many as 20 respondents (44.4%) and all respondents in the control group had poor skills.

Table 2. Level of Knowledge, Skills and Learning Motivation of Students Before and After Treatment in the Intervention Group and Control Group.

Variable	Before Treatment				After Treatment			
	Intervention		Control		Intervention		Control	
	n	%	n	%	n	%	n	%
Knowledge								
Good	3	6.7	1	2.2	38	84.4	36	80.0
Moderate	9	20.0	10	22.2	6	13.3	8	17.8
Poor	33	73.3	34	75.6	1	2.2	1	2.2
Total	45	100	45	100	45	100	45	100
Skills								
Good	0	0	0	0	13	28.9	0	0
Moderate	0	0	0	0	20	44.4	0	0
Poor	45	100	45	100	12	26.7	45	100
Total	45	100	45	100	45	100	45	100
Motivation								
High	1	2.2	0	0	2	4.4	8	17.8
Moderate	5	11.1	0	0	42	93.3	32	71.1
Low	39	86.7	45	100	1	2.2	5	11.1
Total	45	100	45	100	45	100	45	100

Study findings regarding the effect of the cooperative learning model thorough e-module regarding third stage of labor care on the increase in knowledge, skills, and learning motivation showed that the knowledge variable obtained a Zcount value = -8.133 and a p-value = 0.000 <0.05; the skill variable obtained a Zcount value = -5.190 and p value = 0.000 <0.05. Therefore, the study hypothesis was accepted. The cooperative learning model thorough Android-based E-module regarding third stage of labor care had a better effect and could increase students' knowledge, skills and learning motivation.

Table 3. Effect of the Cooperative Learning Model with E-Module regarding Third Stage of Labor Care on the Increase in Knowledge, Skills and Learning Motivation.

Variable	Effect of Cooperative Learning Model	
	Zhit	p value
Knowledge	-8.133	0.000
Skill	-5.190	0.000
Motivation	-8.258	0.000

DISCUSSION

Knowledge

The results showed that the Cooperative Learning Model through Android-Based E-Module (Magguru) regarsing Third Stage of Labor Care had a better effect and could increase student knowledge with a p value = 0.000 <0.05. Before the intervention using the e-module, the majority of students had poor knowledge, and after being given intervention, there was a positive change wherein the majority of students had good knowledge.

Android-based cooperative learning methods can train students to collaboratively share ideas to each other in groups so that students are trained to express their ideas during the teaching and learning process. Thus, the existence of an Android-based e-module can emphasize the participation and involvement of students, both individually and in group student which further affect the level of student knowledge. Such finding is in line with the

result of a study conducted by Kalsum[6] which found that the use of Android-based 3D science could increase students' knowledge by showing very responsive nature in learning. One of the advantages of android-based learning media is that it is able to stimulate students to think actively in learning so that it tends to increase students' knowledge.

The success of interactive e-modules in learning indicated that the use of interactive e-modules as learning media was categorized as very good with a mean score of 84.72%. The results regarding student responses also showed that all aspects of the questionnaire were categorized as very good. Thus, interactive e-modules were appropriate for use as learning media in the teaching and learning process.

According to Sidiq, R dan Najuah[14], it was explained that the Android-based cooperative learning learning system could encourage, trigger, strengthen students' interest in learning independently and the learning process would become more effective, efficient. Such condition would further increase the quality of learning and affect knowledge.

Skills

The result of the study showed that the cooperative learning model thorugh Android-based E-module regarding third stage of labor care had a better effect and could increase students' skills. Before the intervention using e-module, the majority of students had poor skills, and after being given intervention, there was a positive change wherein the majority of respondents had moderate skills.

This increase in skills is also due to the GPA of the respondents. Most of them had GPA of >3.00 - <4.00 by 93.4%. This data support the opinion that respondents are basically able to understand learning using e-modules, so that it is expected that students' skill may increase after the use of learning e-modules.

The result of this study is in line with a study conducted by Suarsanah and Mahayukti[15] which explained that Android-based E-modules could improve students' skills in critical thinking, problem-solving skills. Furthermore, according to Yang and Liu, learning using online-based e-modules provided a significant increase in student skills in carrying out work procedures for the second stage of labor.

Motivation

The results of statistical analysis revealed that age and GPA had a significant correlarion with skills (p value=0.02 <0.05). A study conducted by Rahman[12], which was conducted at the National University of Malaysia, found that there was a positive relationship between critical thinking skill and academic achievement.

The result of the study showed that the cooperative learning model thorugh Android-based E-module regarding third stage of labor care had a better effect and could increase students' learning motivation with a p value = 0.000 <0.05. Before the intervention using e-module, the majority of students had low learning motivation, and after being given intervention, there was a positive change wherein the majority of respondents had moderate learning motivation.

The cooperative learning model thorugh Android-based E-module regarding third stage of labor care had a better effect and could increase students' knowledge, skills and learning motivation. Before the intervention using the e-module, the majority of students had low learning motivation, and after being given intervention, there was a positive change wherein the majority of students had moderate learning motivation. the result of a study conducted by Vansteenkiste proved that good quality motivation could be increased by creating a teaching climate with high support characteristic for autonomy, structure, and student involvement which could be a contribution to the learning process. High learning motivation can improve student learning achievement.

According to Giantera[4], it was found that one of the external factors that influenced student learning motivation was environmental condition. The school's physical environment, facilities and infrastructure need to be organized and managed so as to create fun situation and make students feel comfortable to learn. In this case, the facilities and infrastructure used are regarding the use of e-modules based on problem-based learning method.

CONCLUSION

Cooperative Learning Model through Android-Based E-Module regarding the Third Stage of Labor Care had a better effect and

could increase students' knowledge, skills and learning motivation. Thus, E-module can be used as one of the learning materials for teachers to deliver subjects towards students so that they are motivated to take part in lectures regularly and their knowledge and skills may further increase. Future researchers should use the E-module in other subjects besides childbirth care, so as to increase students' knowledge, skills, and learning motivation in various subjects.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCE

1. Aulia, F. Pengaruh Penggunaan Modul Pada Model Pembelajaran Kooperatif Tipe Student Team Achievement Divisions Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Keterampilan Komputer Dan Pengelolaan Informasi Di Smk Negeri 2 Bukittinggi. *Skripsi.* Program Studi Pendidikan Teknik Informatika Universitas Negeri Padang. Padang. 2014.
2. Astalini, Darmaji, Kurniawan, W., Anwar, K., Kurniawan, D. A. Effectiveness of Using E-Module and E-Assessment. *International Journal of Interactive Mobile Technologies*. 2019; 13(9): 21-39. https://doi.org/10.3991/ijim.v13i09.11016
3. Fadieny, N., Fauzi, A. Usefulness of E-Module Based on Experiential Learning in Physics Learning. International Journal of Progressive and Technologies. 2021; 25(1): 410-414.
4. Giantera, D. R. Pengaruh Fasilitas Belajar Dan Motivasi Belajar Terhadap Hasil Belajar Siswa Mata Pelajaran Peralatan Kantor Pada Siswa Kelas X Program Keahlian Administrasi Perkantoran SMK Cokroaminoto 1 Banjarnegara. Semarang, Universitas Pendidikan Semarang. 2013.
5. Jaenudin, A., Baedhowi, Murwaningsih, T. The Effectiveness of the E-Module of Economics Learning on Problem-Based Learning used to Improve Students' Learning Outcomes. Advances in Social Science, Education and Humanities Research, 2017; 158:30-36.
6. Kalsum, M. Pengaruh Penggunaan Media 3D Sience Berbasis Android Dengan Model Pembelajaran Kooperatif terhadap Hasil Belajar Biologi Siswa Kelas VIII Di MTs Negeri Marod Baru. Jurnal Binomial, 2020; 3(1), 49-60
7. Priatna IK, Putrama IM, Divayana DG. Pengembangan E-Modul Berbasis Model Pembelajaran Project Based Learning Pada Mata Pelajaran Videografi Untuk Siswa kelas X Desain Komunikasi Visuak di SMK Negeri 1 Sukasada. Jurnal Nasional Pendidikan Teknik Informatika. 2017 Mar 14;6(1):70-8.
8. Kurnia, R. D., Ruskan, E. L., Ibrahim, A. Pengembangan Model Pembelajaran Berbasis Cooperative Learning dalam Meningkatkan Motivasi Belajar Mahasiswa dan Peningkatan Mutu Lulusan Alumni Fasilkom Unsri Berbasis E-Learning (studi kasus: matakuliah pemrograman web). Jurnal Sistem Informasi, 2014; 6(1): 645-654.
9. Laili, I., Ganefri, G., Umeldi, U. Efektivitas Pengembangan E- Modul Project Based Learning pada Mata Pelajaran Instalasi Motor Listrik. Jurnal Ilmiah Pendidikan dan Pembelajaran, 2019; 3(3): 306-315.
10. Lee, S., Han, T., Jeon, Y. Design of Small Sized Mobile Lecture Support System. Advanced Science and Technology Letters, 2014; 73: 7-10. http://dx.doi.org/10.14257/astl.2014.73.02
11. Novitri, S. Developing Cooperative Learning Based Module for Teaching Reading to The Second Semester Students at English Department Of Fkip – Uir. Journal of English Academic, 4(1):92-103
12. Rahman S, Philips JA. Hubungan

antara Kesedaran Metakognisi, Motivasi dan Pencapaian Akademik Pelajar Universiti. J Pendidikan Kebangsaan Malaysia. 2006;31(2):21-39.

13. Safaat, Nazrudin. Pemograman Aplikasi Mobile Smartphone dan Tablet PC Berbasis Android. Bandung: Informatika. 2012.

14. Satriawati, H. Pengembangan E-Modul Interaktif Sebagai Sumber Belajar Elektronika Dasar Kelas X SMKN 3 Yogyakarta. Tesis. Universitas Negeri Yogyakarta. 2015.

15. Sidiq, R., Najuah. Pengembangan E-Modul Interaktif Berbasis Android pada Mata Kuliah Strategi Belajar Mengajar. Jurnal Pendidikan Sejarah, 2020; 9(1):1-4. https://doi.org/10.21009/JPS.091.01

16. Suarsana, I. M., Mahayukti, G. A. Pengembangan E-Modul Berorientasi Pemecahan Masalah untuk Meningkatkan Keterampilan Berpikir Kritis Mahasiswa. Jurnal Pendidikan Indonesia, 2013; 2 (2), 264 – 275.

17. Riyanti, I., Almafie, M. R., Marlina, L., Jauhari, J. The Effect of Using Flipbook-Based on Student Learning Outcomes. Kasuari: Physics Education Journal, 2020; 3 (2): 69-75.

Original Article

Analysis of Determinants of Preventive Behavior towards the Spread of Covid-19 among Ships that Docked at Boombaru Port, Palembang

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ABSTRACT

Boombaru Port in Palembang is a meeting point for the activities of ships, goods and people with the potential to become a means of the spread of Covid-19. Current efforts to prevent the spread of Covid-19 have not been fully implemented optimally. This study aims to analyse the determinants of preventive behavior towards the spread of Covid-19. This was a quantitative study using descriptive analytical method with a cross sectional approach. The study population was all crew members of ships that docked at Boombaru Port, Palembang with a total sample of 114 respondents who were selected accidentally. Data were analyzed using chi-square test and multiple logistic regression. The results showed several variables with a significant correlation, namely Captain support (P-value=0.0001) and availability of facilities (P-value=0.0001). Meanwhile, there were no significant correlations between age (P-value=1), education (P-value=0.612), type of ship (P-value=0.748), knowledge (P-value=1), attitude (P-value=0.279) with the preventive behavior towards the spread of Covid-19. In conclusion, the most dominant variable related to Covid-19 preventive behavior was captain support (PR=35.605). Poor Captain support had a 35.606 times greater risk to create bad preventive behavior towards the spread of Covid-19 compared to good Captain support.

Keywords : Covid-19, Ships, Behavior.

INTRODUCTION

According to the World Health Organization (WHO), the number of global Covid-19 cases as of April 21, 2022 was 504,079,039 confirmed cases of Covid-19 and 6,204,155 deaths (1.2%) worldwide, while in Southeast Asia there were 57,478. 119 confirmed cases of Covid-19 and 781.322deaths (1.4%) [1]. In Indonesia, data on the same date were 6,036,909 confirmed cases of Covid-19 and 155,746 deaths (2.6%) [2]. In South Sumatra, there were 80,403 confirmed cases of Covid-19 and 3,336 deaths(4.2%), while in Palembang there were 43,863 confirmed cases of Covid-19 and 1,315 deaths (3%) [3]. Additional cases of Covid-19 were obtained from various sectors including from sea and air ports which are the gateways for the movement of goods, people and means of transportation. Disease transmission can be caused by vectors or disease-carrying animals carried by means of transportation or by vectors already present at sea or air ports [4].

Based on data from Class II Ministry of Marine Affairs and Fisheries in Palembang, From 2019 to 2021, there was a relative increase in the number of ship arrivals from areas infected with quarantine diseases in the Palembang Boombaru Work Area. In 2019, there were 783 arrivals of ships and it increased in 2020 to 5994 ships, then in 2021 there were 7268 arrivals of ships. It was also found that 5 ships were quarantined with 39 crew members who were positive for Covid-19 and were isolated and 56 others were in quarantine [5].

Such condition is due to community compliance with the preventive behavior towards the spread of Covid-19.

Community compliance in efforts to prevent the spread of Covid-19 is influenced by various factors. According to Herawati, et al., (2021), it was influenced by community behavior factor whether efforts to prevent and control Covid-19 were implemented or not [6]. Such finding was also conveyed by Sangadji and Aningsih, (2021) that efforts to deal with the Covid-19 pandemic should be implemented by increasing people's understanding and behavior to carry out government recommendations regarding the prevention of Covid-19 [7]. Meanwhile according to Notoatmodjo, (2014), human behavior is influenced by several factors, namely predisposing factors (knowledge, attitudes, perceptions, motivation, values, beliefs, age, education), supporting factors (availability of facilities) and driving factors (laws, regulations, SOP, family/community figure/leader support)[8]. This is in line with the study conducted by Nuriati et. al. (2021) which revealed that there was a correlation between the availability of facilities and infrastructure and employee compliance in implementing health protocols [9]. Likewise a study conducted by Sangadji and Aningsih, (2021) which found that leadership support in preventing the spread of Covid-19 had a significant effect on employee compliance in implementing the Covid-19 preventive protocols in the workplace in accordance with established regulations and policies[7].

Based on observations made at Boombaru port in Palembang, efforts to prevent the spread of Covid-19 have been carried out based on established regulations. However, several activities had not been carried out optimally including the implementation of physical distancing on ships, there was no instructions for keeping a distance in several rooms, sterilization by spraying disinfectants had been carried out but not routinely with no specific schedule, and there were no specific health check facilities for crew members, only thermogans were available on several ships so that the health checks were carried out independently by crew members. This study aims to analyse the determinants of preventive behavior towards the spread of Covid-19 among ships that docked at Boombaru Port.

METHOD

This was a quantitative study using descriptive analytical method with a cross sectional approach. This study was carried out at Boombaru Port, Palembang from June to July 2022. The study population was all crew members of ships that docked at Boombaru Port, Palembang. Data were collected using a questionnaire that had been tested for validity among 30 respondents of crew members whose ships docked at Sungai Baung Port.

The study population was all crew members of ships that docked in the Boombaru Port area. The number of sample was determined using the Lemeshow formula for a two-proportion hypothesis test sample which obtained 114 respondents. Data were collected through a questionnaire consisting of 15 questions regarding Covid-19 and its prevention, 15 questions regarding attitude, 14 questions regarding preventive behavior towards the spread of Covid-19, 14 questions reagrding captain support, and 8 questions regarding availability of facilities.

Univariate analysis applied descriptive analysis to describe the characteristics of the respondents in the form of percentage tables. Furthermore, bivariate analysis applied the chi-square and Pearson Correlation statistical tests to determine the correlation between the two related or unrelated variables, while the multivariate analysis was performed through a multiple logistic regression modeling procedure to find out which independent variable had a more dominant correlation with the dependent variable.

RESULTS

Table 1. Distribution of Characteristics

Characteristic	f	(%)
Age		
< 35	97	85.1
≥ 35	17	14.9
Education		
≤ SMA	98	86
> SMA	16	14
Type of Ship		
> 350	101	88.6
≤ 350	13	11.4
Behavior		
Poor	53	46.5
Good	61	53.5

Education		
Poor	44	38.6
Good	70	61.4
Attitude		
Poor	86	75.4
Good	28	24.6
Captain Support		
Poor	58	50.9
Good	56	49.1
Availability of Facilities		
Poor	22	19.3
Good	92	80.7
Total	**114**	**100**

Table 1 revealed that most of respondents were involved in the <35 years of age group by 85.1%, had a level of education of high school and below by 86%, came from the type of ship with a ship weight of >350 by 88.6%, had good behavior by 53.5%, had good knowledge by 61.4%, had bad attitude by 75.4%, had poor captain support by 50.9%, and had good facilities by 80.7%.

Table 2. Analysis of the Correlation between Age, Education, Type of Ship, Knowledge, Attitude, Captain Support, and Availability of Facilities with Preventive Behavior towards the Spread of Covid-19

Variable	Preventive Behavior				P-value	PR
	Poor		Good			(95% CI)
	n	%	n	%		
Age						
< 35	45	46.4	52	51.9	1.000	0.974
≥ 35	8	47.1	9	52.9		(0.347-2.734)
Education						
≤ SMA	47	48	51	52	0.612	1.536
> SMA	6	37.5	10	62.5		(0.518 – 4.554)
Type of Ship (GT)						
> 350	48	47.5	53	52.5	0.748	1.449
≤ 350	5	38.5	8	61.5		(0.444-4.733)
Knowledge						
Poor	20	45.5	24	54.5	1.000	0,934
Good	33	47.1	37	52.9		(0.438-1.991)
Attitude						
Poor	37	43	49	57	0.279	0,566
Good	16	57.1	12	42.9		(0.239 -1.341)
Captain Support						
Poor	47	81	11	19	0.0001	35.606
Good	6	10.7	50	89.3		12.195 -103.957)
Availability of Facilities						
Poor	20	90.9	2	9.1	0.0001	17.879
Good	33	35.9	59	64.1		(3.931–81.314)

Table 2 presented the results of statistical test using chi square for age which obtained a P-value of 1 >α (0.05), for education which obtained a P-value of 0.612 > α (0.05), for type of ship which obtained a P-value of 0.748, for knowledge which obtained a P-value of 1, and for attitude which obtained a P-value of 0.279. It can be concluded that there was no correlation between age, education, type of ship, knowledge and attitude with preventive behavior towards the spread of Covid-19.

Furthermore, based on the result of chi square statistical test on captain support, it was obtained a P-value of 0.0001, similarly with the availability of facilities which obtained a P-value of 0.0001. Thus, it can be concluded that there was a significant correlation between captain support and availability of facilities with preventive behavior towards the spread of Covid-19.

Table 3. Analysis of the Correlation of the Dominant Variables

Variable	B	P-value	Exp (B)	95 % CI
Initial Model of Multivariate Analysis				
Captain Support	3.214	0.0001	24.89	8.255-75.043
Availability of Facilities	1.621	0.064	5.06	0.910-28.136
The model by excluding the Availability of Facilities variable				
Captain Support	3.573	0.0001	35.606	12.195-103.957
Availability of Facilities	1.621	0.064	5.06	0.910-28.136
Confounding calculation by excluding the Onset Time variable				
Captain Support	24.89	35.606	43.05	Confounding
Final Model				
Captain Support	3.573	0.0001	35.606	12.195-103.957
Availability of Facilities	1.621	0.064	5.06	0.910-28.136

Based on the results of the multivariate analysis in table 3, it was shown that there was a variable with a p value of >0.05, namely the availability of facilities. Therefore, the availability of facilities variable must be excluded. Based on the result of the analysis of OR change after the availability of facilities variable was excluded, there was a change in the OR value by >10%. Therefore, the availability of facilities variable was re-introduced into the model, so that it was found that the most dominant influential variable for the preventive behavior towards the spread of Covid-19 was Captain Support with Exp (B) of 35.606. The study finding revealed that availability of facilities was a confounding variable in the preventive behavior towards the spread of Covid-19.

DISCUSSION
Correlation between Age and Preventive behavior towards the Spread of Covid-19. This study revealed that there was no correlation between age and preventive behavior towards the spread of Covid-19. Prevention must be carried out by all parties and all ages, both young and old, because they are at risk of contracting Covid-19 and have different ways of doing preventive measures towards the spread of Covid-19. The study finding is in line with the study conducted by Rohmah and Simanjuntak (2020) which found that there was no correlation between age and Covid-19 prevention and age was not a determinant of one's knowledge. However, activeness in seeking knowledge was required

in efforts to prevent Covid-19[10]. A study conducted by Sari, et al. (2020) further revealed that there was no correlation between age and preventive behavior towards Covid-19 and that there were almost equal proportions between the age groups of adolescents, adults and the elderly with good preventive behavior towards Covid-19[11].

This study offers an implication that crew members at all age levels must remain active in efforts to prevent the spread of Covid-19 because they have the opportunity to spread Covid-19.

Correlation between Education and Preventive behavior towards the Spread of Covid-19. This study revealed that there was no correlation between education and preventive behavior towards the spread of Covid-19. Not only formal education is needed to prevent the spread of Covid-19, but also the experience of crew members, social environment and different views of crew members regarding disease susceptibility, preventive efforts, benefits, as well as efforts to prevent Covid-19. The study findings are consistent with a study conducted by Wulandari et.al., (2020) that there was no correlation between education and preventive behavior towards Covid-19 [12]. This is because the knowledge gained by people with low education regarding the transmission of Covid-19 is not only from formal education but from their own experiences and the social environment. The study finding is in line with the study conducted by Pratiwi, et.al. (2020) which found that there was an insignificant correlation between education level and behavior to prevent transmission of Covid-19 which was influenced by differences in

perceptions regarding disease susceptibility, preventive efforts, benefits as well as efforts to prevent Covid-19[13].

This study offers an implication that crew members at all education levels must remain active in efforts to prevent the spread of Covid-19 since higher education does not guarantee that efforts to prevent the spread of Covid-19 can be carried out properly.

Correlation between Type of Ship and Preventive Behavior towards the Spread of Covid-19. This study revealed that there was no correlation between type of ship and preventive behavior towards the spread of Covid-19. Weight of the ship in gross tons (GT) unit will affect the number of crew members on board. The larger the GT, the larger the ship, the more crew members working on the ship and the more likely it is for the spread of Covid-19. The government through the Ministry of Transportation stipulates that every company operating Indonesian-flagged ships must make several adjustments to procedures to prevent the spread of Covid-19 within ship activities[14]. There was no correlation between type of ship and preventive behavior towards the spread of Covid-19 in this study because the spread of Covid-19 depends on the immune system of the crew and the extent to which compliance with the health protocols that apply at ports and ships is implemented by crew members and port managers. It is expected that crew members with types of ships of <350 GT and >350 GT will always consider efforts to prevent the spread of Covid-19.

Correlation between Knowledge and Preventive behavior towards the Spread of Covid-19. This study revealed that there was no correlation between knowledge and preventive behavior towards the spread of Covid-19. There are other factors that can influence it, namely the comprehension and mind-set that are increasingly developing and accompanied by increasing age of a crew member. Besides, the quality of information which is a source of knowledge for a crew member also an important factor since along with the correctness of the information obtained, prevention of the spread of Covid-19 can also be performed properly. The study finding is in line with a study conducted by Patimah, (2021) which found that there was no correlation between knowledge and preventive behavior towards the spread of Covid-19 because a person's behavior is

influenced by internal factors such as motivation, goals, will and as well as by external factors, namely the environment [15].

This research offers an implication that it is necessary to increase the knowledge of crew members to provide correct information about preventive effort towards the spread of Covid-19 and the latest regulations.

Correlation between Attitude and Preventive behavior towards the Spread of Covid-19. This study revealed that there was no correlation between attitude and preventive behavior towards the spread of Covid-19. Attitudes available in the form of closed responses and are still influenced by one's experience regarding the prevention of Covid-19. Attitudes are influenced by subjective norms, namely trust in the opinions of others regarding the actions to be taken. The study finding is in line with the study conducted by Alfikrie, et al (2021) which found that there was no correlation between attitude and preventive behavior towards Covid-19, despite the rules that require a person to behave as expected[16]. A study conducted by Sari et al. (2020) also found that the positive attitude of respondents did not guarantee positive preventive behavior towards Covid-19, and was also it was influenced by the personal experiences of respondents regarding Covid-19 prevention as well as information obtained from the mass media and news from other communication media [11].

Correlation between Captain Support and Preventive Behavior towards the Spread of Covid-19. This study revealed that there was a correlation between Captain Support and preventive behavior towards the spread of Covid-19. The behavior of crew members is much influenced by a person considered important, namely the captain. Information conveyed by the Captain tends to be obeyed and is able to exert influence or encouragement to crew members to implement preventive behavior towards Covid-19. In addition, the policies and rules made by the captain to implement the Covid-19 prevention protocol on the ship can be carried out by crew members along with direct supervision from the captain. The study finding is in line with a study conducted by Sangadji and Aningsih, (2021) which found that there was a correlation between company management support and employee compliance with Covid-19 preventive measures since management support

could motivate and ensure the proper implementation of the Covid-19 prevention protocols [9]. Furthemore, a study conducted by Agustina and Budiono (2021) also found that leadership support was related to the preventive behavior towards the transmission of Covid-19 since a person's behavior was more influenced by people considered important so that what they do or say will tend to be obeyed [17].

The study finding implied that the Captain had a good understanding and behavior regarding Covid-19 prevention so that he could implement the rules to prevent the spread of Covid-19 on ships that docked at Boombaru Port, Palembang.

Correlation between the availability of Facilities and Preventive Behavior towards the Spread of Covid-19. There was a correlation between the availability of facilities and preventive behavior towards the spread of Covid-19. It can be due to the preventive behavior performed by crew members on ship requires supporting factors in the form of the availability of adequate facilities on board. A person's behavior is strongly influenced by the availability of resources including facilities and infrastructure. Such finding is in line with a study conducted by Sari and Budiono (2021) which found that there was a correlation between the availability of facilities and preventive behavior towards the spread of Covid-19[18]. The availability of infrastructure can enable a person to carry out preventive behavior towards the spread of Covid-19. Furthermore, according to Lawrence Green's theory, a person's behavior is influenced by enabling factors and facilities and infrastructure are part of the enabling/supporting factors [18]. Another study conducted by Herawati, et al (2021) revealed that there was a significant correlation between infrastructure and efforts to prevent and deal with Covid-19 because a person's health behavior was influenced by supporting factors such as the availability of facilities and health infrastructure [8]. It is expected a specific person in charge for the availability of facilities so that there is no shortage of facilities when needed.

Variables with Dominant Effect on Preventive behavior towards Covid-19 at Boombaru Port. Based on the results of multivariate analysis regarding Captain support variable, it was obtained a P-value; 0.0001; p < 0.05; Exp(B); 35.606 95% CI; 12.195-103.957. It can be concluded that there was a significant

correlation Captain support and preventive behavior towards the spread of Covid-19.

Poor Captain support had a 35.606 times greater risk to create bad preventive behavior towards the spread of Covid-19 compared to good Captain support. Such finding is in line with a study conducted by Sangadji and Aningsih (2021) which found an effect of leadership support on employee compliance with Covid-19 preventive measures with a P-value= 0.000, p < 0.005; Exp(B)= 2.43; 95% CI= 1.24 - 4.76 [9].

CONCLUSION

The most dominant influential factor for the prevention of the spread of Covid-19 among ships that docked at Boombaru Port, Palembang was the Captain support, while the availability of facilities acted as a confounding variable. In contrast, age, education, type of ship, knowledge, and attitude variables showed no correlation with preventive behavior towards the spread of Covid-19.

Captain and crew members should be able to optimally implement the rules related to preventive behavior towards the spread of Covid-19 among ships that docked at Boombaru Port, Palembang according to good governance in every technical implementation of the predetermined policies. The crew members are expected to be able to adapt to changes in behavior to continue performing normal activities by still implementing health protocols.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. World Health Organization. WHO Coronavirus (Covid-19) Global Situation, Dashboard [Internet]. who.int. 2022 [cited 2022 Apr 24]. Available from: https://covid19.who.int/

2. Kementerian Kesehatan R. Covid-19 #Update 24 April 2022 Indonesia [Internet]. infeksiemerging.kemkes.go.id. 2022 [cited 2022 Apr 24]. Available from: https://infeksiemerging.kemkes.go.id/dashboard/covid-19

3. Dinas Kesehatan S. Situasi Terkini Perkembangan Corona Virus Disease-19 (Covid-19) Provinsi Sumatera Selatan.

4. Dwicahya B, Datu Adam F. Gambaran Higiene Sanitasi Pada Kapal Di Pelabuhan Rakyat Luwuk (Sanitation Hygiene Overview On Boat In Rakyat Luwuk Port, Banggai Regency). Public Heal J [Internet]. 2019;10(1):1. Available from: https://journal.fkm-untika.ac.id/index.php/phj

5. KKP Palembang. Layanan Kekarantinaan Kesehatan, Sertifikat Izin Karantina Kapal [Internet]. sinkarkes.kemkes.go.id. 2022 [cited 2022 Apr 24]. Available from: https://sinkarkes.kemkes.go.id/sert_kekarantinaan_kesehatan/izin_karantina

6. Herawati C, Yasinta, Indragiri S. Faktor Determinan Perilaku dalam Upaya Pencegahan dan Penanggulangan Covid-19. J Kesehat Masy Indones. 2021;4(1):52–9.

7. Sangadji NW. Hubungan Antara Dukungan Manajemen, Pengetahuan Dan Sikap Terhadap Kepatuhan Karyawan Pada Protokol Pencegahan Covid 19 Di Pt. Asuransi Sinarmas Jakarta. Ikesma. 2021;17(November).

8. Notoatmodjo S. Ilmu Perilaku Kesehatan. 2nd ed. Jakarta: PT. Rineka Cipta; 2014.

9. Nuriati Y, Heryana A, Mustikawati IS, Sangadji NW, Studi P, Masyarakat K, et al. Persepsi Karyawan terhadap Ketersediaan Fasilitas dan Sarana Penanganan COVID-19 di Tempat Kerja Berhubungan dengan Kepatuhan. J Kesehat Masy. 2021;9(4):566–75. Available from: http://ejournal3.undip.ac.id/index.php/jkm

10. Rohmah HNF, Simanjuntak H. Correlation Between Age and Education With Knowledge of Health Protocol Covid-19 Prevention Among Midwifes In Bekasi Regency 2020. Atl Press. 2020;30(Ichd):78–80.

11. Ayu Riana Sari FR, Wulandari A, Pujianti N, Laily N, Vina, Anhar Y, et al. Perilaku Pencegahan Covid-19 Ditinjau dari Karakteristik Individu dan Sikap Masyarakat. J Penelit dan Pengemb Kesehat Masy Indones. 2020;1(128):32–7.

12. Wulandari A, Rahman F, Pujianti N, Sari AR, Laily N, Anggraini L, et al. Hubungan Karakteristik Individu dengan Pengetahuan tentang Pencegahan Coronavirus Disease 2019 pada Masyarakat di Kalimantan Selatan. J Kesehat Masy Indones. 2020;15:42–6.

13. Pratiwi MSA, Yani MVW, Putra AIYD, Mardiana IWG, Adnyana IKA, Putri NMMG, et al. Hubungan Karakteristik Individu Terhadap Perilaku Mengenai Covid-19 Di Desa Gulingan, Mengwi, Bali. J Kesehat. 2020;13(2):112.

14. Direktorat Jenderal PL. SE 14 2020 ditjen hubla .pdf. 2020.

15. Patimah I, Yekti W S, Alfiansyah R, Taobah H, Ratnasari D, Nugraha A. Hubungan Tingkat Pengetahuan dengan Perilaku Pencegahan Penularan Covid-19 pada Masyarakat. J Kesehat. 2021;12(1):52.

16. Alfikrie F, Akbar A, Anggreini YD. Pengetahuan dan Sikap dalam Pencegahan COVID-19. Borneo Nurs J [Internet]. 2021;3(1):1–6. Available from: https://akperyarsismd.e-journal.id/BNJ

17. Agustina & Budiono. Perilaku Pencegahan Covid-19 pada Santri di Pondok Pesantren Al-Asy'ariyyah Kalibeber Kabupaten Wonosobo. Indones J Public Heal Nutr [Internet]. 2021;1(3):282–90. Available from: http://journal.unnes.ac.id/sju/index.php/IJPHN

18. Sari A, & Budiono I. Faktor yang Berhubungan dengan Perilaku Pencegahan Covid-19. Indones J Public Heal Nutr. 2021;1(1):101–13.

Original Article

Factors Related to Work Fatigue Among Traffic Police

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ABSTRACT

Work fatigue is a significant problem related to occupational health and safety since fatigue is a cause of work accidents which are very dangerous for workers. Data reported by the ILO stated that up to two million workers died every year due to accidents caused by work fatigue. This study aims to determine the factors related to work fatigue among Traffic police. This was a quantitative study with an analytical survey method and a cross-sectional research design. The population in this study involved all Traffic Police in Jambi Police Resort. The study samples were selected using total sampling technique involving 40 people. The results of the study revealed that 80% of respondents experienced moderate level of fatigue and 20% of respondents experienced mild level of fatigue. The results of statistical test showed that there was a relationship between age (p=0.003) and years of service (p=0.014) with the level of work fatigue. Furthermore, there was no relationship between nutritional status, history of disease, and workload with work fatigue. It can be concluded that there was a relationship between age and years of service with the level of work fatigue among traffic police. It is expected that respondents perform muscle stretching within rest hours.

Keywords : Work Fatigue, Traffic Police.

INTRODUCTION

Based on Law no. 1 of 1970 concerning Occupational Safety, Occupational Health and Safety (K3) policy aims to prevent accidents and illness due to work. In addition, K3 also functions to protect all production sources so as to be used effectively[1]. Occupational Health and Safety (K3) refers to all activities to guarantee and protect the safety and health of workers through preventive efforts towards work accidents and work-related diseases[2]. According to OHSAS 18001: 2007 Occupational Health and Safety (K3) refers to all conditions and factors that can have an impact on the health and safety of workers as well as other people (contractors, suppliers, visitors and guests) in the workplace[3].

The growth in the number of workers in Indonesia continues to increase every year, and this is not matched by efforts to protect the health and safety of workers. This lead to a high number of work accidents in Indonesia[4]. The International Labor Organization (2018) noted that an average of 6,000 people died every day due to work-related diseases and work accidents or equivalent to 2.2 million people per year[5]. The ILO further reported that up to two million workers died every year due to accidents caused by work fatigue[6]. Meanwhile, in Indonesia, based on data derived from the Directorate General of Labor Inspection (2012), it was stated that there were 847 work accidents and 36% of the total were caused by fatigue[7]. In a study conducted by Verawati, 2017, it was explained that out of 58,115 samples, 32.8% of them experienced fatigue, and work accident due to fatigue had a direct impact on the level of labor productivity[8]. Therefore, the level of labor productivity is strongly influenced by human factors, such as sleep problems and biological needs[6].

Work fatigue is a problem often faced by workers. Work fatigue greatly affects health

and can decrease productivity if it is not cared for properly[9]. The level of fatigue due to work experienced by workers may cause discomfort, reduce performance and increase errors in work duties [10]. Work fatigue are caused by various aspects, including individual factors (age, gender, nutritional status and history of disease), work factors (workload, work shifts, work attitude, length of work, and years of service) and environmental factors (heat, noise, and lighting pressure) [11].

The result of a study conducted by Utami et al (2018) among aluminum smelting household industry workers showed that 7 workers (23.3%) had a mild level of fatigue and 23 workers (76.7%) had a high level of fatigue. This study also found that there was a significant relationship between age and years of service with work fatigue[12]. Age will affect the condition of the body. Someone who is still young will be able to do heavy work and vice versa, an old age may decrease the ability to do heavy work. An old worker will feel tired quickly and not move agile when carrying out his works, and this will further affect performance. In addition, years of service will have a positive effect. Longer years of service will create more experience in doing jobs. On the other hand, it can also have a negative effect since the longer the years of service, the more tired, bored and exposed to the hazards posed by the work environment a person will be[13].

One of the occupations with the potential to experience work burnout is traffic police. The traffic police is a unit tasked with maintaining security, providing protection and creating traffic order in accordance with statutory regulations. Since there is a need to prevent work accidents caused by work fatigue among traffic police, this study aims to find out the factors related to work fatigue among traffic police.

METHOD

This was a quantitative study with an analytical survey method and a cross-sectional research design. The study samples were selected using total sampling technique. The study samples involved 40 traffic police officers. Primary data were collected with characteristic interview techniques to respondents. Work fatigue was assessed using the Industrial Fatigue Research Committee (IFRC) questionnaire regarding symptoms of subjective fatigue with a total of 30 items which consisted of 10 questions regarding the weakening of activities, 10 questions regarding the weakening of motivation, 10 questions regarding physical fatigue. In addition, weight and height measurements were performed to find out the Body Mass Index, the year the respondent started working, and whether the respondents had certain disease or not. The researchers also checked the workers' pulse using a pulse oximeter to determine workload. This study was conducted in June-November 2022. Data analysis in this study used two methods, namely, Univariate analysis to determine the frequency and distribution of the variables under study and Bivariate analysis to analyze the relationship between the independent variables and the dependent variable.

RESULTS

Table 1. Distribution of Work Fatigue Frequency, Age, Nutritional Status, History of Disease, Workload and Years of Service.

Variable		n	%
Work Fatigue	Mild	32	80.0
	Moderate	8	20.0
Age	≥ 35 years	29	72.5
	<35 years	11	27.5
Nutritional Status	Not Normal	25	62.5
	Normal	15	37.5
History of Disease	Had	6	15.0
	Didn't Have	34	85.0
Workload	High	33	82.5
	Low	7	17.5
Years of Service	> 10 years	22	55.0
	≤ 10 years	18	45.0
Total		40	100.0

Based on data presented in Table 1 regarding frequency distribution of respondents, it was shown that 80% of respondents experienced moderate level of fatigue and 20% respondents experienced mild level of fatigue. The results of the study on the assessment of work fatigue risk factor variables showed that the highest age frequency distribution was in the ≥35 years category by 72.5%. Furthermore, most of respondents had an abnormal nutritional status by 62.5% and most of respondents did not have a history of disease by 85.0%. Furthermore, most of respondents had moderate level of workload by 82.5% and 55.0% of respondents had working period of >10 years.

Table 2. Relationship between Age and Work Fatigue.

Variable	Work Fatigue				Total	PR	(95% CI)	p-value
	Moderate		Mild					
	n	%	n	%				
Age								
≥35 years	27	93.1	2	6.9	29	2.04	1.06-3.94	0.003
<35 years	5	45.5	6	54.5	11			
Total	32		8		40			

Based on data presented in Table 2 regarding relationship between age and work fatigue, it was shown that among respondents aged ≥35 years, 27 respondents (93.1%) experienced moderate level of fatigue, and 2 respondents (6.9%) experienced mild level of fatigue. It is also known that among respondents aged <35 years, 5 respondents (45.5%) experienced moderate level fatigue involved and 6 respondents (54.5%) experienced mild level of fatigue. The result of bivariate analysis using chi-square showed that there was a significant relationship between age and work fatigue with a p-value of 0.003. Such finding indicated that Traffic Police aged ≥ 35 years had a 2.04 times risk (PR=2.04, 95% CI, 1.06-3.94) of experiencing moderate level of work fatigue compared to those aged <35 years.

Table 3. Relationship between Nutritional Status and Work Fatigue.

Variable	Work Fatigue				Total	PR	(95% CI)	p-value
	Moderate		Mild					
	n	%	n	%				
Nutritional Status								
Abnormal	19	76.0	6	24.0	25	0.87	0.65-1.18	0.686
Normal	13	86.7	2	13.3	15			
Total	32		8		40			

Based on data presented in Table 3 regarding relationship between nutritional status and work fatigue, it was shown that among traffic police who had an abnormal nutritional status, 19 respondents (76.0%) experienced a moderate level of fatigue and 6 respondents (24.0%) experienced mild level of fatigue. On the other hand, among respondents who had a normal nutritional status, 13 respondents (86.7%) experienced moderate level of fatigue and 2 respondents (13.3%) experienced mild level of fatigue. The result of the chi-square analysis obtained a p value=0.686 with a PR value=0.87 (0.65 – 1.18) which indicated that there was no significant relationship between nutritional status and the level of work fatigue among Traffic Police.

Table 4. Relationship between History of Disease and Work Fatigue.

Variable	Work Fatigue				Total	PR	(95% CI)	p-value
	Moderate		Mild					
	n	%	n	%				
History of Disease								
Had	5	83.3	1	16.7	6	1.04	0.70-1.56	1.000
Didn't Have	27	79.4	7	20.6	34			
Total	32		8		40			

Based on data presented in Table 4 regarding relationship between history of disease and work fatigue, it was shown that among traffic police who had a history of mild fatigue, and 1 respondent (16.7%) experienced level of fatigue. On the other hand, among respondents who did not have a history of disease, 27 respondents (79.4%) experienced moderate level of fatigue, while 7 respondents

(20.6%) experienced mild level of fatigue. Based on the result of chi-square analysis, it was obtained a p value=1.000 (p >0.05) with a PR value=1.04 (0.70-1.56) which indicated that

there was no significant relationship between history of disease and the level of work fatigue among Traffic police.

Table 5. Relationship between Workload and Work Fatigue.

Variable	Work Fatigue				Total	PR	(95% CI)	p-value
	Moderate		Mild					
	n	%	n	%				
Workload								
Moderate	28	84.8	5	15.2	33	1.48	0.76-2.86	0.128
Low	4	57.1	3	42.9	7			
Total	32		8		40			

Based on data presented in Table 5 regarding relationship between workload and work fatigue, it was shown that among respondents who had moderate level of workload, 28 respondents (84.4%) experienced moderate level of fatigue and 5 respondents (15.2%) experienced mild level of fatigue. On the other hand, among respondents who had low

level of workload, 4 respondents (57.1%) experienced moderate level of fatigue and 3 respondents (42.9%) experienced mild level of fatigue. Statistical test result showed that there was no significant relationship between workload and the level of work fatigue (p-value=0.128, PR=.48 (0.76-2.86)).

Table 6. Relationship between Years of Service and Work Fatigue.

Variable	Work Fatigue				Total	PR	(95% CI)	p-value
	Moderate		Mild					
	n	%	n	%				
Years of Service								
>10 years	21	95.5	1	4.5	22	1.56	1.06-2.28	0..014
≤10 years	11	61.1	7	38.9	18			
Total	32		8		40			

Based on data presented in Table 6 regarding relationship between years of service and work fatigue, it was shown that among respondents with >10 years of service, 21 respondents (95.5%) experienced moderate level of fatigue and 1 respondent (4.5%) experienced mild level of fatigue. On the other hand, among respondents with ≤10 years of service, 11 respondents (61.1%) experienced moderate level of fatigue and 7 respondents (38.9%) experienced mild level of fatigue. Based on the result of chi-square analysis, it was obtained a p value=0.014 (p <0.05) which indicated that there was a relationship between years of service and work fatigue among Traffic Police. In addition, it was obtained a PR value=1.56 (1.06-2.28) which indicated that respondents who have worked >10 years were 1.56 times more at risk of experiencing high level of fatigue compared to those who have worked ≤ 10 years.

DISCUSSION

Age and Work Fatigue among Traffic police. Based on the results of the study, it was shown that 27 of 29 traffic police aged ≥35 years experienced moderate level of fatigue. Meanwhile, there were 11 traffic police aged <35 years who experienced low level of fatigue. It was obtained a p-value of 0.003, which indicated there was a relationship between age and the level of work fatigue among Traffic Police in Jambi Police Resort.

Several studies showed evidence that age was related to work fatigue. A study conducted by Andrianus Evander Kondi and Herlina among nurses at Awal Bross Hospital, Bekasi obtained a p-value of 0.001 (<0.05), which indicated that there was a significant relationship between age and work fatigue among nurses[8].

To avoid age-related burnout, management should balance the workload

based on the age of the workers. This aims to ensure that workers do not complain about excessive activities at work. Older workers should not get too many hard works due to a decline in their physical condition. This should become a concern to avoid more strenuous physical activity because older workers are not too agile in carrying out certain activities compared to young workers[14].

Nutritional Status and Work Fatigue among Traffic police. Based on a study conducted among Traffic Police in Jambi Police Resort, it was found that 25 of 40 respondents (62.5%) had an abnormal Body Mass Index (BMI), and 19 respondents experienced moderate level of fatigue. Meanwhile, 13 of 15 respondents with normal nutritional status experienced moderate level of fatigue. It was obtained a p-value of 0.686, which indicated that there was no relationship between nutritional status and work fatigue among Traffic Police in Jambi Police Resort.

Such finding is in line with a study conducted by Apriliani et al, 2019 entitled factors related to work fatigue among fire-fighters in the South Jakarta fire and rescue department with a p-value of 0.921 (> 0.05)[15]. Good nutritional status by consuming the right amount of calories at the right time and having good nutrition can have a positive effect on work performance. If an employee has insufficient calorie intake, of course he will tire more quickly than other employee with sufficient calorie intake[16].

Relationship between History of Disease and Work Fatigue among Traffic police. Based on the study findings, it can be seen that 6 of 40 respondents had a history of disease, and 5 of them experienced moderate level of fatigue. In the category of having no history of disease, 27 of 34 people experienced moderate level of fatigue. It was found a p-value of 1.000, which indicated that there was no relationship between history of disease and the level of work fatigue among Traffic Police.

The study finding is in line with the result of a study conducted by Dewi Gurusinga, Anita Camelia, and Imelda G Purba entitled analysis of factors related to work fatigue among sugar factory operators of PT. pN VII Cinta Manis in 2013 with a p-value = 0.195, which indicated that there was no relationship between history of disease and work fatigue among sugar factory operators at PT. PN VII

Cinta Manis[17].

Suma'mur (2014) states that a person's health can certainly lead to work fatigue based on the history of the disease experienced. Diseases that can affect fatigue include heart disease, hypertension, asthma, kidney disease, low blood pressure, lung disease, and diabetes mellitus.

Relationship between Workload and Work Fatigue among Traffic police. Based on the study findings, it was found that 33 of 40 respondents (82.5%) had a pulse of >100 beats/minute in the moderate category, and 28 of them experienced moderate level of fatigue. Furthermore, 7 respondents (17.5%) had a pulse of <100 beats/minute in the mild category, and 4 of them experienced moderate level of fatigue.

Based on the results of a study conducted by Safira et al (2020) entitled work fatigue among workers at PT. Indonesia Power Unit Generation and Generation Services (UPJP) of Priok, it was found that there was no relationship between workload and work fatigue with a p value=0.100 (p>0.05)[18].

There are many factors that determine the workload of a worker, such as the physical and psychological environment that may affect individual performance. Too much workload can lead to mental and physical fatigue as well as emotional reactions such as irritability[18].

Relationship between Years of Service and Work Fatigue among Traffic police. Based on the study findings, there were 22 out of 40 Traffic Police who 10 years of service which involved in old category and 18 respondents were involved in the new category with ≤10 years of service. The p-value was 0.014<0.05 which indicated that there was a relationship between years of service and work fatigue among Traffic Police.

Several theories state that years of service can affect the incidence of work fatigue, which can have both positive and negative impacts. However, the study finding regarding years of service is in line with the theory which states that years of service has a negative effect due to a limit to one's body's resistance to work processes which results in fatigue and boredom among workers[19]. Another study conducted among engineering service workers at PT. PLN (PERSERO) ULP Batulicin, Tanah Bambu District in 2021 also found that there was a relationship between years of service and work

fatigue. The results of statistical test using chi-square obtained a p-value = 0.006 (p <0.05)[20].

CONCLUSION

Based on the study conducted among the Traffic Police, it was found that 80% of the traffic police experienced moderate level of fatigue. Furthermore, there was a relationship between age and years of service with work fatigue among Traffic Police. Future research may assess the risk factors for work fatigue and work stress among the police officers in different divisions. It is expected that respondents perform muscle stretching within rest hours and when they start to feel excessive fatigue, They may be able to take a short break at the weekend to recover their physical and mental health due to the high workload and create a positive work environment that allows respondents to avoid the boredom of monotonous work and to be passionate about the work to be done.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Presiden Republik Indonesia. Undang-Undang Republik Indonesia Nomor 1 Tahun 1970 Tentang Keselamatan Kerja. Pres Republik Indones [Internet]. 1970;(14):1–20. Available from: https://jdih.esdm.go.id/storage/document/uu-01-1970.pdf
2. Saraswati Y, Ridwan A, Iwan Candra A. Analisis Penerapan Keselamatan Dan Kesehatan Kerja (K3) Pembangunan Gedung Kuliah Bersama Kampus C Unair Surabaya. J Manaj Teknol Tek Sipil. 2020;3(2):247.
3. ISO 45001. Occupational health and safety management systems Requirements with guidance for use. Occup Heal Saf Manag Syst Requir with Guid use. 2018;1:1–52.
4. Budiman A, Husaini, Arifin S. Relationship Between Age and Workload Index with Fatigue in Workers at PT Karias Tabing Kencana.

J Berk Kesehat. 2016;1(2):121–9.
5. Faiz N. Faktor-faktor yang Berhubungan dengan Kelelahan Kerja pada Pekerja Bagian Operator Spbu di Kecamatan Ciputat Tahun 2014. Universitas Islam Negeri Syarif Hidayatullah; 2014.
6. Susanti S, AP ARA. Faktor yang Berhubungan dengan Kelelahan Kerja pada Pekerja PT. Maruki International Indonesia Makassar. Sinergitas Multidisiplin Ilmu Pengetah dan Teknol. 2019;2:231–7.
7. Narpati JR, Ekawati, Ida W. Hubungan Beban Kerja Fisik, Frekuensi Olahraga, Lama Tidur, Waktu Istirahat Dan Waktu Kerja Dengan Kelelahan Kerja (Studi Kasus Pada Pekerja Laundry Bagian Produksi Di Cv.X Tembalang, Semarang). J Kesehat Masy. 2019;7(1):337–44.
8. Verawati L. Hubungan Tingkat Kelelahan Subjektif Dengan Produktivitas Pada Tenaga Kerja Bagian Pengemasan Di Cv Sumber Barokah. Indones J Occup Saf Heal. 2017;5(1):51.
9. Politon FVM, Christine C. Faktor Risiko Kelelahan Kerja pada Operator SPBE PT Putra Arba Mandiri. Poltekita J Ilmu Kesehat. 2020;14(2):123–7.
10. Zetli S. Pengukuran Kelelahan Kerja Pada Sopir Angkutan Umum Dalam Upaya Mengetahui Faktor Kecelakaan Transportasi Umum Di Kota Batam. J Rekayasa Sist Ind. 2018;4(1):11–7.
11. Innah M, Alwi MK, Gobel FA, Abbas HH. Faktor yang Berhubungan dengan Kelelahan Kerja pada Penjahit Pasar Sentral Bulukumba. Window of Public Health Journal. 2021 Feb 28:471-81.
12. Utami NN, Riyanto H, Evendi HA. Hubungan Antara Usia dan Masa Kerja dengan Kelelahan Kerja pada Pekerja Industri Rumah Tangga Peleburan Alumunium di Desa Eretan Kulon Kabupaten Indramayu The Relationship Between Age and Employment With Work Fatigue in Domestic Industri Alumunium Smeltin. J Kesehat Masy. 2018;3(2):1–6.
13. Lady L, Wiyanto AS. Tingkat Kelelahan Kerja Pada Pekerja Luar Ruangan Dan Pengaruh Lingkungan Fisik Terhadap Peningkatan Kelelahan.

J Ind Serv. 2019;5(1):58–64.

14. Tarwaka. Ergonomi Industri Dasar-Dasar Pengetahuan Ergonomi Dan Aplikasi di Tempat Kerja. II. Surakarta: Harapan Press; 2020.

15. Apriliani, Linda O, Astuti NH. Faktor-Faktor yang Berhubungan dengan Kelelahan Kerja pada Petugas Pemadam Kebakaran di Suku Dinas Pemadam Kebakaran dan Penyelamatan Jakarta Selatan Factors Associated with Fatique Factors of Firefighters in Rescue Services Offices South Jakarta. Arkesmas. 2019;4(1):162–7.

16. Masyarakat JK. Analisis Faktor-Faktor Yang Berhubungan Dengan Kelelahan Kerja Pada Pekerja Pembuat Kerupuk Opak Di Desa Ngadikerso, Kabupaten Semarang. J Kesehat Masy. 2018;6(4):278–85.

17. Dewi BM. Hubungan Antara Motivasi, Beban Kerja, Dan Lingkungan Kerja Dengan Kelelahan Kerja. Indones J Occup Saf Heal. 2018;7(1):20.

18. Safira ED, Pulungan RM, Arbitera C. Work Fatigue of Workers at PT. Indonesia Power Unit Pembangkitan dan Jasa Pembangkitan (UPJP) Priok. J Kesehat [Internet]. 2020;11(2):265–71. Available from: http://ejurnal.poltekkes-tjk.ac.id/index.php/JK

19. Politon FVM, Christine C. Gambaran Kelelahan Kerja Karyawan PT Paving Meriba Jaya Kelurahan Tavanjuka Kota Palu. Banua J Kesehat Lingkung. 2021;1(1):19–25.

20. Muammar, Norfai & Abdullah. faktor-faktor yang berhubungan denga kelelahan kerja pada pekerja layanan teknik di PT PLN (persero) ULP Batulicin kabupaten tanah bumbu tahun 2021. 2021;1–10. Available from: http://eprints.uniska-bjm.ac.id/9906/

Original Article

Correlation between Socio-economic Factors and Stress with Hypertension Cases during the Covid-19 Pandemic

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ABSTRACT

Hypertension is often referred to as The Silent Killer because it is the second leading cause of death after hear disease. Hypertension cannot be due to single cause but multifactorial causes, wherein many factors can be a risk for hypertension. This study aims to analyze the correlation between socio-economic factors and stress with hypertension cases during the Covid-19 pandemic at Sikumana Community Health Center. This was an analytical observational study with a case control design. The study samples involved 84 respondents who were assigned in the case and control groups consisting 42 respondents, respectively, or with a ratio of 1:1. Data were analyzed using the chi square test by calculating the OR value. The results of this study indicated that there was a correlation between income (p= 0.016; OR= 3.21; 95% CI 1.33-8.05), employment status (p= 0.029; OR= 2.91; 95% CI 1.20 -7.15), education level (p= 0.004; OR= 4.06; 95% CI 1.62-10.13) and stress (p= 0.000; OR= 8.17; 95% CI 3.05-21.91) with hypertension. It can be concluded that there was a correlation between socio-economic factors (income, employment status, and education) and stress with hypertension cases in the work area of Sikumana CHC, Kupang City. Provision of education related to diverse food consumption pattern and stress management must be increased.

Keywords : Socio-economic Factors, Stress, Hypertension.

INTRODUCTION

Non-Communicable Diseases are diseases that are not caused by infection of microorganisms such as protozoa, bacteria, fungi, or viruses. This type of disease is responsible for 70% of deaths in the world[1]. Hypertension is defined as a condition in which blood pressure rises steadily. A person can be said to have hypertension if he has systolic blood pressure of ≥140 mmHg and diastolic blood pressure of ≥90mmHg which are measured twice with an interval of five minutes[2].

Based on the 2019 World Health Organization (WHO) report, around 1.28 billion people in the world in the last thirty years from 1990-2019, had hypertension. The number of people with hypertension continues to increase every year, and it is estimated that by 2025 there will be 1.5 billion people with

hypertension and 10.44 million people will die from hypertension and its complications[3]. Institute for Health Metrics and Evaluation (IHME) also stated that out of a total of 1.7 deaths in Indonesia was caused by many factors including high blood pressure or hypertension by 23.7%, hyperglycemia by 18.4%, smoking by 12.7% and obesity by 7.7%[4]. Based on the results of Baaic Health Research data for the Province of East Nusa Tenggara in 2018, the prevalence of hypertension by diagnosis, medication and the results of measurements in the population aged >18 years were 7.2%, and 4%, and 27.7%, respectively[5].

Kupang is a city that cannot be separated from hypertension. Hypertension is included in the top five Non-Communicable Diseases in CHCs in 2021 with the highest number of sufferers in January to June 2021 by 919 people, followed by diabetes mellitus by 260 people, obesity by 316 people, stroke by 33

people, and osteoporosis by 24 people. Such findings indicated that hypertension was the most dominant health problem in every CHC in Kupang City. Sikumana CHC occupies the first position out of 10 existing CHCs in Kupang City in 2021 with a total of 1,995 cases.

The increase in hypertension is driven by the main risk factors of lifestyle and stress condition. Non-communicable diseases have health consequences towarda individuals, families as well as communities. Another factor that influences the incidence of hypertension is the state of socioeconomic status. Low socio-economic status is associated with poor health status. This is related to lifestyle, unhealthy diet, type of work and the level of education.

The theory put forward by Mac Mohan and Pugh (1970) regarding the concept of the occurrence of a disease is referred to as the causal network theory in Notoatmodjo 2011. Such theory emphasizes that a disease occurs due to the interaction of various factors. For example, environmental interactions consisting of biological, chemical and social environments play a very important role in the occurrence of a disease[6].

Based on interviews with healthcare workers at Sikumana CHC, it was revealed that in controlling hypertension, many people had not yet implemented a healthy lifestyle, namely in choosing types of food to consume every day, as well as the economic status of families who were considered unable to buy highly nutritious foods to control hypertension. The Covid-19 pandemic situation that has taken place in the last few years certainly had an impact. There were changes within oneself as well as the social environment which further increased stress level in these circumstances. The pandemic has even caused psychological crises and health crises such as fear, anxiety, depression or insecurity, which surely have a negative impact on a person's health condition. Various efforts have been made to prevent the incidence of hypertension, but have not been significantly successful because there were still many factors that triggerred each other to develop hypertension (multifactorial). This study aims to analyze the correlation between socio-economic factors and stress with hypertension cases during the Covid-19 pandemic at Sikumana CHC.

METHOD

This was an analytical observational study with a case-control approach[7]. This study was conducted in the work area of Sikumana CHC, Kupang City, Maulafa Sub-District. This study was conducted from July to August 2022. The study population involved patients with hypertension recorded in the register book of Sikumana CHC in 2021 to May 2022, aged 30 years and over as many as 185 people. The samples in two study groups had a ratio of 1:1 consisting of 42 respondents, respectively. This study applied a probability sampling technique, namely simple random sampling, which was performed by recording the identity of patients with hypertension from 2021 to May 2022 who were then determined through the assistance of the Ms.excel program using the formula of =RANDBETWEEN. The independent variable in this study was socio-economic factors which consisted of income level. In terms of socio-economic status, income in a certain community group is determined based on the Regional Minimum Wage (UMR) and whether there is social assistance from the government/private sector. In this study, high category income referred to income of >UMR in 2022 (Rp. 2,039,500) and did not receive pre-prosperous family social assistance from the government/private sector. On the other hand, low category of income referred to income of ≤ UMR in 2022 (Rp. 2,039,500) and/or had a pre-prosperous family card (recipient of social assistance). Employment status was determined based on the activities carried out by respondents to earn regular income, both permanent and non-permanent work with the category of employed (had regular income from permanent or non-permanent work), and the category of unemployed (did not have a permanent and not permanent work and had no regular income).

The level of education was determined based on the last formal education taken by respondents that was supported by a graduation certificate, with the category of high education (SHS/VHS,Diploma/Bachelor/Masters/Special ist/Doctorate), and low education category (no formal education, dropped out of school, Elementary/JHS). The stress condition was assessed based on the categories of mild, moderate, severe and very severe conditions. Normal and mild stress conditions were included in no stress category, and moderate,

severe and very severe stress conditions were included in stress category. The dependent variable in this study was hypertension, which was assessed based on level of blood pressure of $\geq$ 120/80 mmHg, as diagnosed by a healthcare worker in the medical record. Respondents with hypertension were involved in the case group, and vice versa, respondents without hypertension were involved in the control group. Data were collected using Depression Anxiety Stress Scales (DASS 42)

questionnaire as an instrument to assess the level of stress experienced by respondents[8]. Data were processed using software and analyzed using the Chi Square test with a 95% confidence level (alpha=0.05). Furthermore the OR value was calculated based on the Confidence Intervals=95% [9]. This study has obtained ethical approval issued by the Health Research Ethics Commission, Faculty of Public Health, Nusa Cendana University Number: 2022198-KEPK.

Table 1. Frequency Distribution of Characteristics of Respondents.

Characteristic of Respondent	Category	Group				Total	
		Case		Control			
		n	%	n	%	n	%
Age	30-34 years	2	4.8	8	19.0	10	11.9
	35-39 years	3	7.1	10	238	13	15.5
	40-44 years	3	7.1	10	23.8	13	15.5
	45-49 years	9	21.4	5	11.9	14	16.7
	50-54 years	8	19.0	2	4.8	10	11.9
	55-58 years	17	40.5	7	16.7	24	28.6
Residence	Oepura Village	9	21.4	8	19.0	17	20.2
	Sikumana Village	10	23.8	8	19.0	18	21.4
	Naikolan Village	4	9.5	10	23.8	14	16.7
	Kolhua Village	4	9.5	1	2.4	5	6.0
	Bello Village	8	19.0	8	19.0	16	19.0
	Fatukoa Village	7	16.7	7	16.7	14	16.7
Number of Family Members	> 4 people	28	66.7	29	69.0	57	67.9
	$\leq$ 4 people	14	33.3	13	31.0	27	32.1
Gender	Male	16	38.1	13	31.0	29	34.5
	Female	26	61.9	29	69.0	55	65.5

Regarding the age group, most of respondents in the case group were at the age group of 55-58 years as many as 17 people (40.5%). On the other hand, most of respondents in the control group were at the age groups of 35-39 and 40-44 years 55-58 years, as many as 10 people (23.8%), respectively. Regarding residence, most of respondents in the case group lived in Sikumana Village, as many as 10 people (23.8%) and most of respondents in the control group lived in Naikolan Village,

as many as 10 people (23.8%). Furthermore regarding the number of family members, most of respondents in the case group had >4 family members, as many as 28 people (66.7%) and most of respondents in the control group had >4 family members, as many as 29 people (69.0%). Regarding gender, most of respondents in the case group were female, as many as 26 people (61.9%) and most of respondents in the control group were female, as many as 29 people (69.0%).

Table 2. Correlation between Income, Occupation, Education and Stress with Hypertension Cases at Sikumana CHC.

Variable	Hypertension				p-value	OR	CI (95%)
	Case		Control				
	n	%	n	%			
Income							
Low	29	69.0	17	40.5	0.016	3.21	1.33-8.05
High	13	31.0	25	59.5			
Employment Status							
Employed	28	66.7	17	40.5	0.029	2.94	1.20-7.15
Unemployed	14	33.3	25	59.5			

Variable	Hypertension				p-value	OR	CI (95%)
	Case		Control				
	n	%	n	%			
Level of Education							
Low	30	71.4	16	38.1	0.004	4.06	1.62-10.13
High	12	28.6	26	61.9			
Stress Condition							
Stress	33	78.6	13	31.0	0.000	8.17	3.05-21.91
No Stres	9	21.4	29	69.0			

Based on the results of bivariate analysis, there was a correlation between income and hypertension (p-value=0.016). Respondents who had low income were at risk of 3.21 times greater for experiencing high blood pressure (95% CI 1.33-8.05) compared to respondents who had high income. Furthermore, there was a correlation between employment status and hypertension (p-value=0.029). Respondents who were unemployed had a 2.94 times greater risk of experiencing high blood pressure (95% CI 1.20-7.15) compared to respondents who were employed. There was a correlation between level of education and hypertension (p-value=0.004). Respondents with low education had a 4.06 times greater risk of experiencing high blood pressure (95% CI 1.62-10.13) compared to respondents who had higher education. In addition, there was a correlation between stress and hypertension (p-value=0.000). Respondents who experienced stressful conditions were 8.17 times more likely to experience high blood pressure (95% CI 3.05-21.91) compared to respondents who did not experience stressful conditions.

DISCUSSION

The number of people with hypertension continues to increase every year, and it is predicted that many people will die from hypertension and its complications[3]. There are many influential factors for hypertension which consist of changeable factors and unchangeable factors[10].

Income is a risk factor for the incidence of hypertension[11]. Income level is related to the amount of income a person earns[11]. The low income earned by a person can affect his or her consumption patterns and lifestyle towards disease. The low income earned by respondents showed an impact on poor diversity of food consumed, both in terms of protein, carbohydrates, fat, fiber, minerals and vitamins. Respondents' income was only sufficient to

meet basic needs such as children's school fees, electricity, water and rental cost which were considered more important than consuming good food which was able to control blood pressure as well as performing health checks at health facilities[12]. This finding is supported by a study conducted in Yogyakarta City which showed that there was a correlation between low income and hypertension[13].

A person's work or livelihood determines the amount of the income earned. Furthermore, type of work or livelihood is determined by one's education, the better one's work or livelihood, the greater the community appreciation, meaning that one's social and economic status in society can be directly defined based on his work or livelihood[14] The study findings indicated that work was a risk factor for hypertension. Most of respondents in the study were unemployed because most of the respondents experienced the impact of the Covid-19 pandemic and lost their jobs temporarily. Most of the jobs held by the respondents were temporary, such as self-employed, drivers, fishermen, laborers and entrepreneurs. Work is very closely related to the level of income, which will affect family welfare related to fulfillment of household needs, both primary and secondary needs. The better fulfillment of primary and secondary needs in the family will affect the respondents' health status. In other words, respondents might have good purchasing power in meeting good and varied food intake and could access various good health services as well. On the other hand, unfulfilled primary and secondary needs will lead to poor purchasing power which will lead to a decline in health status, since the needs of good and varied food intake could not been pfulfilled and there is a lack of access to various health services[15].

Previous study showed that there was a correlation between employment status and hypertension at Makrayu Ilir Barat II CHC, Palembang. In addition, employment status also

had a strong correlation with socio-economic status. Diseases that occurred in the family were often associated with the type of work which affected family income[16].

Low level of education tends to inhibit attitudes in receiving various information which will be proven by the presence or absence of changes in behavior[17]. On the other hand, the higher a person's education, the better the level of knowledge, information and quality of human resources. The level of education is an influential factor for hypertension. A person with a high level of education is considered able to obtain information and manage it before it becomes a good or bad behavior that affects his or her health status[11]. The study findings indicated that most uneducated people had high blood pressure. A low level of education will affect the perception of antihypertensive behavior. In other words, the more someone knows about factors, signs and symptoms, as well as normal and abnormal blood pressure, the more likely he is to avoid behaviors that can cause hypertension, such as: smoking, drinking coffee, lack of physical activity and consumption of fatty foods. The study finding is in line with a study conducted in Yogyakarta City which showed a correlation between education and hypertension[13].

Stress occurs because of the gap between expectations and reality[18]. Stress condition experienced by each person can be different in terms of how to respond and overcome it. Such difference may exist since stress is subjective and personal matter[19]. The results of interviews with respondents revealed that stress experienced by respondents occurred due to daily activities in the family, work environment, social environment, socio-economic conditions, and health status. Those factors are coupled with the Covid-19 pandemic situation which has made changes in lifestyle and routines such as a decrease in the quality of food consumed, utilization of health facilities and difficulty in concentrating which resulted on a decrease in body immunity of respondents As a result, there were psychological responses from the respondent in the form of easily irritated and angry, difficult to rest every night, easily agitated, anxious, and difficulty in getting time to relax. In addition there was a physiological response of an increase in blood pressure[20].

The physiological response experienced by the respondents will affect their health condition. If this is experienced by the respondents in a prolonged period of time it will make blood pressure to be constant and get higher[21]. Stress can cause activation of the sympathetic nerves, which further increases the release of norepinephrine from the sympathetic nerves in the heart and blood vessels, resulting in increased cardiac output and increased systemic vascular resistance. Excretion by the adrenal medulla causes excess hormones to be released into the bloodstream, which produce a response to physical and emotional stress. The presence of sympathetic nerve activity can increase circulating angiotensin II, aldosterone, and vasopressin, which can increase systemic vascular resistance. Prolonged increases in angiotensin II and catecholamine may lead to enlargement of the heart and blood vessels, both of which can contribute to persistent increase in blood pressure as the cause of hypertension[22].

Previous study conducted at Medan City Regional General Hospital showed that there was a correlation between stress and hypertension. Stress affects a person's health since it can increase blood pressure intermittently (not permanently). The presence of sympathetic nerve activity will cause a gradual increase in blood pressure. Prolonged stress can cause stabilization or increase in blood pressure[21].

CONCLUSION

Income, Employment Status, and Stress were risk factors for someone to experience hypertension. Respondents need to respond actively to every direction given by healthcare workers to maintain health status properly by adopting various food consumption pattern, and maintaining their psychological condition during the Covid-19 pandemic. The CHC should increase health promotion and add various media by utilizing electronic media as an effort to educate the public regarding various food consumption pattern, as well as paying attention to types of work and stress management during the Covid-19 pandemic.

CONFLICT OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Kemenkes RI. Profil Kesehatan Indonesia 2019 [Internet]. Kementrian Kesehatan Republik Indonesia. Kementerian Kesehatan Republik Indonesia; 2020. 487 p. Available from: https://www.kemkes.go.id/downloads/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-Indonesia-2019.pdf

2. Anggia V, Wiyati T, Wulandari N. Pembuatan Nutrisi dan Penyuluhan Penyakit Hipertensi pada Anggota PKK Delima Jakarta Timur. J SOLMA [Internet]. 2019;8(1):1. Available from: journal.uhamka.ac.id/index.php/solma/article/view/3059/954

3. World Health Organization. More than 700 million people with untreated hypertension. In: Hypertension [Internet]. 2019. Available from: https://www.who.int/news/item/25-08-2021-more-than-700-million-people-with-untreated-hypertension

4. Kemenkes RI. Hari Hipertensi Dunia 2019 : "Know Your Number, Kendalikan Tekanan Darahmu dengan CERDIK.". [Internet]. P2PTM Kemenkes RI. 2019. Available from: http://p2ptm.kemkes.go.id/subdit-penyakit-kanker-dan-kelainan-darah/hari-hipertensi-dunia-2019-know-your-number-kendalikan-tekanan-darahmu-dengan-cerdik

5. Riskesdas. Hasil Utama Riset Kesehatan Dasar. Kementrian Kesehat Republik Indones [Internet]. 2018;1–100. Available from: https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-riskesdas-2018_1274.pdf

6. Notoatmodjo S. Kesehatan Masyarakat Ilmu dan Seni. Revisi 201. Jakarta: Rineka Cipta; 2011. 413 p.

7. Masturoh I, Nauri A. Metodologi Penelitian Kesehatan [Internet]. Kementerian Kesahatan RI. 2018. p. 307. Available from: http://bppsdmk.kemkes.go.id/pusdiksdmk/wp-content/uploads/2018/09/Metodologi-Penelitian-Kesehatan_SC.pdf

8. Marsidi SR. Identification of Stress, Anxiety, and Depression Levels of Students in Preparation for the Exit Exam Competency Test. J Vocat Heal Stud. 2021;5(2):87.

9. Kleinbaum G.David KM. Logistic Regression: A Self Learning Text (3rd ed). New York: Springer; 2010.

10. Kemenkes RI. Faktor Risiko Hipertensi. 2018; Available from: https://p2ptm.kemkes.go.id/infographic-p2ptm/hipertensi-penyakit-jantung-dan-pembuluh-darah/faktor-risiko-hipertensi

11. Rismadi K. Pengaruh faktor sosial dan gaya hidup terhadap kejadian hipertensi pada nelayan di kota medan tesis [Internet]. Unviversitas Sumatera Utara; 2021. Available from: https://repositori.usu.ac.id/handle/123456789/32776

12. Lestari YI, Nugroho PS. Hubungan Tingkat Ekonomi dan Jenis Pekerjaan dengan Kejadian Hipertensi di Wilayah Kerja Puskesmas. Borneo Student Researh. 2019;269–73.

13. Ningsih D. Faktor-Faktor Yang Berhubungan Dengan Kejadian Hipertensi Pada Pekerja Sektor Informal Di Pasar Beringharjo Kota Yogyakarta. Naskah Publ [Internet]. 2017;1–20. Available from: http://digilib.unisayogya.ac.id/2689/1/1610104364_Dwi Lestari_Naspub.pdf

14. Pinem M. Pengaruh pendidikan dan status sosial ekonomi kepala keluarga bagi kesehatan lingkungan masyarakat. JPPUMA J Ilmu Pemerintah dan Sos Polit UMA (Journal Gov Polit Soc UMA) [Internet]. 2016;4(1):97–106. Available from: http://ojs.uma.ac.id/index.php/jppuma

15. Hanum N, Safuridar S. Analisis Kondisi Sosial Ekonomi Keluarga terhadap Kesejahteraan Keluarga di Gampong Karang Anyar Kota Langsa. J Samudra Ekon dan Bisnis. 2018;9(1):42–9.

16. Azhari MH. Faktor-Faktor yang Berhubungan dengan Kejadian Hipertensi di Puskesmas Makrayu Kecamatan Ilir Barat II Palembang. J Aisyah J Ilmu Kesehat [Internet]. 2017;2(1):23–30. Available from: https://aisyah.journalpress.id/index.php/jika/article/view/MHA

17.   Maulidina F, Harmani N, Suraya I, Studi P, Masyarakat K, Bekasi PJ, et al. Faktor-Faktor yang Berhubungan dengan Kejadian Hipertensi di Wilayah Kerja Puskesmas Jati Luhur Bekasi Tahun 2018 Factors Associated with Hypertension in The Working Area Health Center of Jati Luhur Bekasi 2018. Arkesmas [Internet]. 2019;4(July):149–55. Available from: https://journal.uhamka.ac.id/index.php/arkesmas/article/view/3141

18.   Gunawan SP, Adriani M. Obesitas Dan Tingkat Stres Berhubungan Dengan Hipertensi Pada Orang Dewasa Di Kelurahan Klampis Ngasem, Surabaya. Media Gizi Indones [Internet]. 2020;15(2):p123. Available from: https://e-journal.unair.ac.id/MGI/article/view/14026

19.   Muslim M. Moh . Muslim : Manajemen Stress pada Masa Pandemi Covid-19 " 193. J Manaj Bisnis [Internet]. 2020;23(2):192–201. Available from: https://ibn.e-journal.id/index.php/ESENSI/article/view/205

20.   Loa WW, Nabuasa E, Sir AB. Hubungan Antara Berat Badan, Diet, Aktivitas Fisik Dan Tingkat Stres Dengan Gangguan Siklus Menstruasi (Studi Pada Mahasiswi Fakultas Kedokteran, Universitas Nusa Cendana). Media Kesehat Masy [Internet]. 2022;4(1):34–43. Available from: https://doi.org/10.35508/mkmhttps://ejurnal.undana.ac.id/MKM

21.   Rita S. Faktor yang Mempengaruhi Hipertensi di RSUD DR.RM. Djoelham Kota Binjai. J Publ Kesehat Masy Indones [Internet]. 2017;4(3):108–14. Available from: https://ppjp.ulm.ac.id/journal/index.php/JPKMI/article/view/4323#:~:text=Berdasarkan hasil penelitian dapat disimpulkan,RM. Djoelham Kota Binjai.

22.   Awaliyah R. Hubungan Antara Tingkat Stres Dengan Kejadian Hipertensi Pada Usia Produktif Di Klinik Gracia Ungaran Kabupaten Semarang. Univ Ngudi Waluyo Semarang [Internet]. Journal Information, 2020:1–133. Available from: http://repository2.unw.ac.id/636/

Original Article

Multivariate Analysis of Factors Associated with Hemoglobin Levels among CKD Patients undergoing Hemodialysis

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ABSTRACT

Chronic Kidney Disease (CKD) is one of the silent killer diseases that often experience an increase in incidence every year. Common problem that often arises in someone with CKD is a decrease in hemoglobin levels. This study aims to identify and analyze factors related to hemoglobin levels among CKD patients undergoing hemodialysis. This was a correlational study with cross sectional approach. The study was conducted on March 21 – 31, 2022. The study population consisted of 90 CKD patients undergoing hemodialysis at Doctor Soedarso Regional General Hospital (as of January 2022). The samples involved 73 people who were selected using purposive sampling technique. The independent variables included age, gender, ethnicity, education, employment status, smoking history, creatinine and urea levels, while the dependent variable in this study was hemoglobin levels. Bivariate analysis in this study applied chi-square, Kendall's, and independent sample t tests, while the multivariate test applied logistic regression. The analysis results obtained p values for age, employment status, smoking history, creatinine levels, and urea levels of 0.069 (OR=8.4), 0.418 (OR=2.4), 0.286 (OR=4.3), 0.000, and 0.323, respectively. It can be concluded that there was an effect of creatinine levels on changes in hemoglobin levels among CKD patients undergoing hemodialysis. Patients undergoing hemodialysis are recommended to control the amount and source of protein intake, adjust physical activity according to age and ability, and pay attention to the regular dialysis schedule.

Keywords : Risk Factors, Hemoglobin, Kidney Failure, Hemodialysis.

INTRODUCTION

The Global Burden of Disease (2017) explained that there were 9.1% or 697.5 million people who had CKD, even this study showed that the prevalence of women who had CKD was 9.5%, higher than men that was only 7,3%. It is estimated that people with CKD in the world come from the People's Republic of China which ranked the first country with the number of cases of 132.3 million[1]. Such findings are even in line with the condition in Indonesia's neighboring country (Malaysia) which showed an increase in the number CKD cases in 2018 (15.48%) at the age of over 18 year[2]. This secondary clinical syndrome disease is one of the contributors to increased mortality as a silent killer due to persistent and irreversible changes in structure and function[3,4]. This disease is often found with a specific sign of an increase in blood urea levels[5].

Decreased hemoglobin is often found in patients with CKD with hemoglobin level of <13 g/dL for men and <12 g/dL for non-pregnant women[6]. Anemia complications are frequently found in ESRD status or earlier in grades 4 and 5 chronic kidney disease[7]. The result of previous case control study showed that there were more cases of anemia found in cases of death in patients with CKD[8]. Increased mortality in CKD patients was also found in other studies with marked increase in diastolic

volume and anemia[9]. Another impact also found was a decrease in lofe quality among patients with anemia[10].

There were limited studies regarding analysis of influential factors of hemoglobin changes among chronic kidney failure patients undergoing hemodialysis. A study conducted by Ani & Asni (2016) and Siti (2018) described factors that influenced anemia among patients with kidney failure including period of HD, age, gender, frequency of HD, nutritional status as well as economic status[11,12].

Results of a preliminary study towards 2019-2021 data at DR. Soedarso Regional General Hospital showed that 61% of patients who had a primary diagnosis of stage 5 chronic kidney failure (N18.5) had a secondary diagnosis of anemia. Through some of the facts that have been described, the researchers are interested to analyze the correlation between demographic characteristics and plasma creatinine and urea levels with hemoglobin levels among CKD patients undergoing hemodialysis.

METHOD

This was a correlational study with cross sectional approach. The study population consisted of 90 CKD patients undergoing hemodialysis at Doctor Soedarso Regional General Hospital (as of January 2022). The sample calculation applied the Lameshow formula which obtained 73 respondents who were selected using purposive sampling technique that was quota sampling. The inclusion criteria for this study were CKD patients undergoing hemodialysis, were able to communicate and had complete medical records. Exclusion criteria in this study included having a history of Systemic Lupus Erythematosis (SLE) and psychiatric disorder. The independent variables included age, gender, ethnicity, education, employment status, smoking history, creatinine and urea levels, while the dependent variable in this study was hemoglobin levels. Hemoglobin levels in this study were grouped based on empirical cut-off point. Kuzma (1984) explains that the cut-off point with the mean can be used for normally distributed data, while the cut-off point with the median is used for data that were not normally distributed [13].

This study used a list of questions that contained demographic data and laboratory results derived from the medical records of respondents. This study was approved by the Health Research Ethics Committee Board of DR. Soedarso Regional General Hospital through Ethics Approval Registration Number No. 28/RSUD/KEPK/II/2022 which was stipulated on February 26, 2022. Data collection was carried out on March 21 – 31, 2022.

The analysis technique in this study was divided into 2 types of data on the dependent variables. Categorical independent variable, namely demographic data were tested using Chi-Square test. On the other hand, Kendall's test was applied on categorical variables that had more than 2 degrees. If the expected count value was not met, then the Fisher test was applied. Numerical independent variables such as creatinine and urea levels were tested using the independent sample t test. If the data were not normally distributed, Mann Whitney was applied as an alternative test. Multivariate analysis in this study applied a binary logistic regression test by including all independent variables that had a bivariate p value of <0.250.

RESULTS

The results of this study were taken through direct interviews related to demographic data and direct observation of medical record data related to laboratory examination results. The calculation results (See Table 2) revealed that the characteristics of respondents with hemoglobin (Hb) levels of <8.48 g/dL were found among respondents aged ≥55 years (57%), male respondents (55%), Malay respondents (33%), had higher education (43%), and had no smoking history (71%). The group with Hb levels of <8.48 g/dL had a mean creatinine and urea levels of 8.73 and 178.29, respectively. Such mean levels were higher than the creatinine and urea values in the group with Hb levels of >8.48 g/dL.

The results of the Kolmogrov-Smirnov test obtained p values for the numerical data in this study included creatinine levels (0.200), urea levels (0.200) and haemoglobin levels (0.098), which indicated that the data were normally distributed.

Table 1. Laboratory Results of Respondents

Result	Mean	SD
Creatinine	6.44	3.855
Urea	149.0	65.141
Hemoglobin	8.48	1.593

Source: Secondary data, 2022

Table 1 showed that the mean creatinine, urea and hemoglobin levels of CKD patients undergoing hemodialysis were 6.44 mg/dL, 149 mg/dL and 8.48 g/dL, respectively. Such findings also indicated that the hemoglobin levels of 8.48 as the mean could be used as a reference for the cut-off value.

Table 2. Bivariate Test Results for Demographic Characteristics with Hemoglobin Levels.

Variable	Hemoglobin Levels			p-Value	Unadjusted	
	< 8.48 g/dL (n=42)	≥ 8.48 g/dL (n=51)			OR	Statistical Test
	n (%)	n (%)	N (%)			
Age				0.187	0.474	Chi-square
< 55 years	18 (49%)	19 (51%)	37 (100)			
≥ 55 years	24 (67%)	12 (33%)	36 (100)			
Gender				0.977	1.135	Chi-square
Man	23 (59%)	16 (41%)	39 (100)			
Woman	19 (56%)	15 (44%)	34 (100)			
Ethnicity				0.558		Kendall's
Malay	14 (50%)	14 (50%)	28 (100)			
Dayak	9 (75%)	3 (25%)	12 (100)			
Tionghoa	6 (60%)	4 (40%)	10 (100)			
Javanese	8 (50%)	8 (50%)	16 (100)			
Other	5 (71%)	2 (29%)	7 (100)			
Education				0.990		Kendall's
Elementary School	9 (60%)	6 (40%)	15 (100)			
JHS-SHS	15 (58%)	11 (42%)	26 (100)			
Higher Education	18 (56%)	14 (44%)	32 (100)			
Employment Status				0.038[*]	3.089	Chi-square
Unemployed	29 (69%)	13 (31%)	42 (100)			
Employed	13 (42%)	18 (58%)	31 (100)			
Smoking History				0.214	0.481	Chi-square
No	30 (54%)	26 (46%)	56 (100)			
Yes	12 (70%)	5 (30%)	17 (100)			

*p-value of < 0.05

Table 2 presents the results of the bivariate test with the chi square test, as well as Kendall's Test for Demographic characteristics and Hemoglobin Levels.

Table 3. Correlation between Creatinine and Urea Levels with Hemoglobin Levels.

	Hemoglobin	n (%)	Mean ± SD	p-Value	Statistical Test
Creatinine	≥ 8.48 g/dL	31 (42%)	3.33 ± 1.77	0.000[*]	Independent sample t Test
	< 8.48 g/dL	42 (58%)	8.73 ± 3.34		
Urea	≥ 8.48 g/dL	31 (42%)	109.34 ± 39.09	0.000[*]	
	< 8.48 g/dL	42 (58%)	178.29 ± 65.30		

Table 3 revealed that there was a correlation between employment status, creatinine and urea levels on hemoglobin levels among CKD patients undergoing hemodialysis.

Table 4. Multivariate Test Results.

Predictor	Sig.	B	Adjusted OR	95% CI
Constant	0.001	3.894		
Age (x1)				
< 55 Years	0.069	-2.128	8.4	0.8 – 83.3
≥ 55 Years (Ref)				
Employment Status (x2)				
Unemployed (Ref)	0.418	0.850	2.4	0.3 – 18.3
Employed				
Smoking History (x3)				
Yes	0.286	1.454	4.3	0.3 – 61.8
No (Ref)				
Creatinine (mg/dL) (x4)	0.000	-1.116		
Urea (mg/dL) (x5)	0.323	-0.009		

Table 4 revealed that age and smoking history had p-values of <0.250, so that these two variables could be candidates in logistic regression modelling. The final accumulation confirmed that there were 5 predictors to be applied in follow-up test.

Table 5. Logistic Regression Basic Test Results.

Test	Sig.
Hosmer & Lameshow test	0.377
Omnibus test of model	0.000

The results of the modelling obtained the Hosmer & Lameshow test scores of >0.05. Thus, it can be concluded that the model involving 5 predictors of the dependent variable met the fitness criteria (fit) for regression modelling. The omnimbus test obtained a sig value of < 0.05 which indicated that the addition of predictors would affect the dependent variable.

Table 6. Model Summary Results.

-2 LR	Cox & Snell R	Nagelkerke R Square
33.813	0.594	0.798

The model summary results showed a Nagelkerke R square value of 0.798 which indicated that the model involving age, employment status, smoking history, creatinine and urea levels had an impact of 79.8%, while 23.3% could be due to other factors that had not been studied.

DISCUSSION

In general, anemia occurs due to decreased EPO and impaired iron metabolism associated with increased hepcidin, circulating urea in the blood can also induce EPO inhibitors which are thought to also play a role in CKD cases[39]. Several triggers for biomarker instability in the elderly (>55 years) can be affected by decreased body function. This phenomenon can be found in cases of decreased hemoglobin in old age which can occur with a 25-hydroxyvitamin D deficiency mechanism which results in erythropoietin resistance in the hematopoietic stem cell pathway[14]. Psychological problem can also be another indirect cause of changes in hemoglobin levels in the elderly, for example the presence of additional stressors resulting in depression[15]. Previous studies have demonstrated poor sleep quality and insomnia in nearly half the population with advanced CKD[16]. This is indirectly related to the increase in cases of anemia due to disturbed sleep duration[17]. The results of this study indicated a difference in finding from previous study which showed that the prevalence of CKD among women was 9.5%, higher than men, that was only 7.3%[3].

Such difference could be due to differences in study site and data collection period. The results of previous study showed higher hemoglobin levels among postmenopausal men and women compared to premenopausal women[18]. Basically, there is similar physiological basis mechanism of anemia for both men and women, including in CKD cases. In fact, hemoglobin level of healthy women will be lower than that of men, and this phenomenon also occurs in populations with CKD[19]. Previous study identified that women started dialysis when their estimated kidney function was lower than men, and the mean age of women undergoing hemodialysis was older than men [20]. According to dialysis guidelines, the targeted Hb level of men and women is the same, namely 10 g/dL. Other study also showed that gender affected response to anemia, CKD and mineral disorders [21].

The result of this study indicated that there was no correlation between ethnicity and hemoglobin levels among CKD patients undergoing hemodialysis. Such finding is in line with previous study which found there was no significant difference in hemoglobin concentration among third trimester pregnant women between the Batak and Javanese ethnic groups[22]. Other previous study also showed a difference in hemoglobin levels related to Caucasoid, Hispanic, Asian, Oriental and African Races[23]. Such difference can be due to ethnicities recorded were still of the same race, namely Asian Race. Besides that, several respondents in this study were children born from mixed ethnicity. Other study further explained ethnicity which was generally classified based on a phenotype called race, e.g. Asian, Hispanic, Black, and White (Caucasoid) Races[24].

A person's level of education has not been able to describe a knowledge possessed and the use of such knowledge to improve the quality of life. This is in line with previous study which found that there was no correlation between education level and IDU's knowledge on HIV[25]. The right action of a nurse to ensure is by directly examining how basic knowledge is related to diseases and other conditions that are often encountered, one of which is anemia, as well as the level of knowledge of the patient's coping mechanisms. Providing self-management information is an effort to improve individual quality. Orem's theory explains that each individual has the ability to take care of

himself. The nurse's main role is to identify individual abilities in carrying out such self-management. Knowledge considered important to be delivered are regarding activity modification and food patterns[26].

It is interesting to note that there was a correlation between employment status of CKD patients undergoing hemodialysis and their hemoglobin levels (p value=0.038), although this was a basic correlation value which required path analysis that showed how employment status can affect hemoglobin levels. The results of the researchers' assumptions indicated that employment status could affect hemoglobin levels indirectly through several mechanisms such as the income earned, coping mechanisms with the process of working as a daily activity, or socialization resulting from an occupation on patient psychology. Such opinion is supported by previous study which showed that there was a correlation between socioeconomic status and the incidence of anemia[27]. The result of other assumption was stated in a previous study regarding the correlation between physical activity and haemoglobin levels among workers with non-dialysis dependent CKD status. The study assessed the haemoglobin levels of CKD patients with Hb levels of >12 g/dL who had a high activity ratio, lower CKD progression and better survival[28]. Employment status contributes to quality improvement, either through nutritional intake, as well as mental health due to socialization during work. According to Camilia, et al (2015), individuals with CKD with an income of 5.1 times the Regional minimum wage had a better quality of life in terms of physical, pain, social, mental health aspects than unemployed individuals or those whose income was below the Regional minimum wage[29]. Current study further explained how poverty and the burden of disease had an impact on all aspects. Few resources for individuals with co-morbidities will result in "catastrophic spending" or costs beyond food needs exceeding 40%. This will further deplete remaining resources and even change the structure of the whole family which eventually affects medical treatment[30].

The result of the regression modelling test showed that patients with chronic kidney failure wit history no history of smoking had the potential to have a hemoglobin level of ≥8.48 g/dL 4 times, although there was no significant correlation in the regression test between the

two variables. Such finding is in line with a study conducted by Devina, et al. (2017), which found that there was no significant correlation between smoking status and hemoglobin levels. Conversely, the result of this study is not in accordance with previous study which showed that smoking women had higher hemoglobin levels compared to non-smoking women[31]. Another study also showed an increase in the Hb levels of smokers and non-smokers which even caused polycythemia[32]. The result of another study showed that the Kaplan-Meier test obtained a finding that smoking behavior among CKD patients reduced survival rates compared to non-smokers. The impact of smoking WAs more sensitive in someone with renal dysfunction due to the progress of immunoglobulin from IgA which causeD nephrotic. Further analysis also showed that there was a correlation between smoking and interstitial atrophy or fibrolysis due to oxidative stress from cigarette content[33].

The result of this study indicated that there was a negative correlation between creatinine levels and haemoglobin levels. Such finding is in line with the finding of a case control study conducted by Ismatul, et al (2012) which showed that renal failure patients who died had high creatinine levels and low hemoglobin levels compared to living renal failure patients[34]. In addition, previous study also showed that there was a negative effect of creatinine levels on haemoglobin levels. Increased plasma creatinine levels indicated the process of hemodialysis to remove certain toxic substances[35]. Increased creatinine levels may indicate that the process of renal damage. Kidneys are the main producer of EPO which can decrease along with the degree of insufficiency of kidney function. Plasma EPO levels can be missed (detection), but elevated EPO levels can also be found due to the presence of reactive excrements of EPO which are biologically inactive[35].

The mean urea level among patients undergoing hemodialysis at Dr. Soedarso Regional General Hospital was 149 mg/dL. The result of this study indicated that there was a negative correlation between the urea (BUN) levels and hemoglobin levels among patients undergoing hemodialysis. Such finding is in line with a study conducted by Makiko, et al (2019) which showed that there was a decrease in hemoglobin levels along with an increase in BUN levels[36]. Furthermore, another study

showed that increased protein consumption also had an impact on an increase in urea levels among patients with chronic kidney disease[37]. Urea concentration was closely related to chronic kidney failure among patients who reported an increase in reactive oxygen species (ROS) and oxidative stress in adipocytes, pancreatic beta cells which can reduce insulin sensitivity and aortic endothelium[36]. Consuming plant-based protein has the disadvantage of increasing potassium levels. However, other advantages are lowering blood pressure, increasing prevention of diabetes, delaying CKD progression and death[38]. Certain theory suggests that high circulating BUN levels may increase protein carbamylation and generate reactive oxygen species (ROS), increase oxidative stress, inflammation, endothelial dysfunction, and cardiovascular disease[40]. High consumption of protein can also have an impact on metabolic disorders which further become metabolic complications.

While there is currently no full elucidation of the underlying mechanism by which high protein intake may affect kidney function, especially in the context of CKD, the available data suggest that glomerular hyperfiltration induced by a high protein diet may lead to increased albuminuria or decreased GFR. Additionally, increasing evidence suggests that high-protein diets may be associated with a number of metabolic complications that can impair kidney health. Given the increasing popularity of high-protein diets and the high prevalence of CKD within the United States population, many individuals may be unaware of their CKD status[40].

The final step in the nursing process is assessing and evaluating the effectiveness of an intervention in chronic disease[41]. This action aims to observe comorbidities that have the potential to arise and can worsen the patient's condition[42]. Some nursing problems that can result from changes in hemoglobin among patients with CKD are the risk of gastrointestinal perfusion, myocardial perfusion, or ineffective renal function[43]. An important role of a nurse to decrease morbidity and mortality rates is definitely required, both for among patients with acute and chronic conditions. Nurses are responsible for nursing care and are present during treatment. Nurses are also required to observe and further assess the general condition of the patient by integrating multidisciplinary aspects such as the

physical, emotional or social condition of the patient[44].

CONCLUSION

The results of this study indicated significant correlations between employment status, creatinine and urea levels on the mean hemoglobin levels among CKD patients undergoing hemodialysis at RSUD DR. Soedarso, while there were no significant correlations between age, gender, ethnicity, education and smoking history on haemoglobin levels. In general, the regression test revealed age was the dominant predictor of changes in hemoglobin levels among CKD patients undergoing hemodialysis.

Some of the recommended activities to be implemented by CKD patients include controlling the amount and source of protein intake, adjusting physical activity according to age and ability, paying attention to the regular dialysis schedule.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Carney EF. The impact of chronic kidney disease on global health. Nat Rev Nephrol [Internet]. 2020 May 6;16(5):251–251. Available from: http://www.nature.com/articles/s41581-020-0268-7

2. Saminathan TA, Hooi LS, Mohd Yusoff MF, Ong LM, Bavanandan S, Rodzlan Hasani WS, et al. Prevalence of chronic kidney disease and its associated factors in Malaysia; findings from a nationwide population-based cross-sectional study. BMC Nephrol [Internet]. 2020 Dec 14;21(1):344. Available from: https://bmcnephrol.biomedcentral.com/articles/10.1186/s12882-020-01966-8

3. Bikbov B, Purcell CA, Levey AS, Smith M, Abdoli A, Abebe M, et al. Global, Regional, and National Burden of Chronic Kidney Disease, 1990–2017: a Systematic Analysis for the Global Burden of Disease Study 2017. Lancet [Internet]. 2020 Feb;395(10225):709–33. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673620300453

4. Ammirati AL. Chronic Kidney Disease. Rev Assoc Med Bras [Internet]. 2020;66(suppl 1):s03–9. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-42302020001300003&tlng=en

5. Kumar V, Abbas AK, Aster JC. Ginjal dan Sistem Pengumpul. In: Robbins Basic Pathology. Edisi 9. Philadelphia, USA: Elsevier; 2015. p. 517.

6. Hanna RM, Streja E, Kalantar-Zadeh K. Burden of Anemia in Chronic Kidney Disease: Beyond Erythropoietin. Adv Ther [Internet]. 2021 Jan 29;38(1):52–75. Available from: http://link.springer.com/10.1007/s12325-020-01524-6

7. Barinda AJ, Arozal W, Wahyuni UT. Statin Mencegah Penurunan Kadar Hemoglobin dan Parameter Hematologi Lainnya pada Model Tikus Gagal Ginjal Eksperimental. J Med Heal [Internet]. 2021 Aug 17;3(2). Available from: https://journal.maranatha.edu/index.php/jmh/article/view/3332

8. Rajagukguk M. Hubungan antara Lama Hemodialisa dan Faktor Komorbiditas dengan Kematian Pasien gagal Ginjal Kronik di RSUD DR. Pringadi Medan. J Ilm Maksitek [Internet]. 2019;4(2):5. Available from: https://makarioz.sciencemakarioz.org/index.php/JIM/article/view/83/80

9. Bhagat N, Dawman L, Naganur S, Tiewsoh K, Kumar B, Pratyusha K, et al. Impact of anemia on the cardiovascular status in children with chronic kidney disease: A pilot study. Clin Nutr ESPEN [Internet]. 2021 Dec; Available from: https://linkinghub.elsevier.com/retrieve/pii/S2405457721011438

10. Lisnawati E, Sintowati R, Lestari N, Nursanto D. Hubungan Antara Kadar

Hemoglobin, Indeks Massa Tubuh, Dan Tekanan Darah Terhadap Kualitas Hidup Pasien Gagal Ginjal Kronik. In: Proceeding Book National Symposium and Workshop Continuing Medical Education XIV [Internet]. Surakarta: UMS; 2021. p. 776–87. Available from: https://publikasiilmiah.ums.ac.id/xmlui /bitstream/handle/11617/12788/66.pdf ?sequence=1&isAllowed=y

11. Kurniawati S, Wibrata DA, Anugrahini HN. Faktor-Faktor yang Mempengaruhi Anemia Pada Klien Gagal Ginjal Kronik yang Menjalani Hemodialisa di Rumah Sakit Islam Jemursari Surabaya. J Keperawatan [Internet]. 2018;11(3):133–41. Available from: http://journal.poltekkesdepkes-sby.ac.id/index.php/KEP/article/view/1 471/835

12. Retni A, Ayuba A. Faktor – Faktor Yang Berhubungan Dengan Kejadian Anemia Pada Pasien Penyakit Gagal Ginjal Kronik Di Ruang Hemodialisa Rsud Prof. Dr. H. Aloei Saboe Kota Gorontalo. J Zaitun [Internet]. 2016;4(1). Available from: https://journal.umgo.ac.id/index.php/Z aitun/article/view/1230

13. Hamidah L. Gambaran Faktor-Faktor Perilaku Ibu terhdap Pemberian ASI dengan Pendekatan Helath Belief Model di Wilayah Kerja Puskesmas Setu Tanggerang Selatan [Internet]. Cetakan Pe. UIN Syarif Hidayatullah Jakarta; 2017. Available from: https://www.google.com/url?sa=t&rct =j&q=&esrc=s&source=web&cd=&ca d=rja&uact=8&ved=2ahUKEwj5svDI nY39AhV0_XMBHQMxAcQQFnoEC A4QAQ&url=https%3A%2F%2Frepo sitory.uinjkt.ac.id%2Fdspace%2Fbitstr eam%2F123456789%2F36736%2F1% 2FLisnani%2520Hamidah-FKIK.pdf&usg=AOvVaw1

14. Indriani V, Purwanto, Kusmiyati, Juniarto AZ, Indranila. The Differences Of 25-Hydroxyvitamin D Levels, Leucocyte Count, Neutrophil Limfocyte Ratio Dan C-Reactive Protein In Elderly With Anemia And Non-Anemia. Prosiding [Internet]. 2021;10(1). Available from: http://eprints.undip.ac.id/71107/8/cove r_Tesis_S2_vitasari_indriani.pdf

15. Ladaninejad S, Ilali E, Mousavinasab N, Taraghi Z. The Relationship between Depressive Symptoms and Demographic-Medical Characteristics among Elder People with Cancer. Asia-Pacific J Oncol Nurs [Internet]. 2019 Oct;6(4):424–30. Available from: https://linkinghub.elsevier.com/retriev e/pii/S2347562521002006

16. Tan LH, Chen PS, Chiang HY, King E, Yeh HC, Hsiao YL, et al. Insomnia and Poor Sleep in CKD: A Systematic Review and Meta-analysis. Kidney Med [Internet]. 2022 May;4(5):100458. Available from: https://linkinghub.elsevier.com/retriev e/pii/S2590059522000711

17. Jackowska M, Kumari M, Steptoe A. Sleep and Biomarkers in the English Longitudinal Study of Ageing: Associations with C-reactive Protein, Fibrinogen, Dehydroepiandrosterone sulfate and Hemoglobin. Psychoneuroendocrinology [Internet]. 2013 Sep;38(9):1484–93. Available from: https://linkinghub.elsevier.com/retriev e/pii/S0306453012004283

18. Shin JY, Shim JY. Low vitamin D levels increase anemia risk in Korean women. Clin Chim Acta [Internet]. 2013 Jun;421:177–80. Available from: https://linkinghub.elsevier.com/retriev e/pii/S0009898113000806

19. Duncan JA, Levin A. Sex, haemoglobin and kidney disease: new perspectives. Eur J Clin Invest [Internet]. 2005 Dec;35(s3):52–7. Available from: https://onlinelibrary.wiley.com/doi/10. 1111/j.1365-2362.2005.01531.x

20. Saran R, Robinson B, Abbott KC, Agodoa LYC, Albertus P, Ayanian J, et al. US Renal Data System 2016 Annual Data Report: Epidemiology of Kidney Disease in the United States. Am J Kidney Dis [Internet]. 2017 Mar;69(3):A7–8. Available from: https://linkinghub.elsevier.com/retriev e/pii/S027263861630703X

21. Ho LT, Sprague SM. Women and CKD-Mineral and Bone Disorder. Adv Chronic Kidney Dis [Internet]. 2013 Sep;20(5):423–6. Available from: https://linkinghub.elsevier.com/retriev

e/pii/S1548559513000840

22. Surya A fauza, Pane AH, Lubis EH. Perbedaan Konsentrasi Hemoglobin Wanita Hamil Trimester III antara Suku Jawa dan Suku Batak. J Kedokt Ibnu Nafis [Internet]. 2020;9(1):27–31. Available from: https://jurnal.fk.uisu.ac.id/index.php/ibnunafis/article/view/53

23. Chu CD, Powe NR, McCulloch CE, Crews DC, Han Y, Bragg-Gresham JL, et al. Trends in Chronic Kidney Disease Care in the US by Race and Ethnicity, 2012-2019. JAMA Netw Open [Internet]. 2021 Sep 27;4(9):e2127014. Available from: https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2784527

24. Atkinson MA, Pierce CB, Zack RM, Barletta GM, Yadin O, Mentser M, et al. Hemoglobin Differences by Race in Children With CKD. Am J Kidney Dis [Internet]. 2010 Jun;55(6):1009–17. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0272638610001198

25. Negara IC, Prabowo A. Penggunaan Uji Chi–Square untuk Mengetahui Pengaruh Tingkat Pendidikan dan Umur terhadap Pengetahuan Penasun Mengenai HIV–AIDS di Provinsi DKI Jakarta. Pros Semin Nas Mat dan Ter 2018 [Internet]. 2018;1–8. Available from: http://matematika.fmipa.unsoed.ac.id/wp-content/uploads/3.-igo-dkk.pdf

26. Solihatin Y, Mu'Min MF. Pengaruh Pendidikan Kesehatan Terhadap Tingkat Pengetahuan Self Management Pasien Chronic Kidney Disease (CKD) Di Ruang Hemodialisa RSUD SMC Tasikmalaya. J Mitra Kencana Keperawatan Dan Kebidanan [Internet]. 2021 Apr 9;4(2). Available from: http://www.jurnal.ubktasikmalaya.ac.id/index.php/jmk_kb/article/view/106

27. Liow FM, Kapantow NH, Malonda N. Hubungan antara status sosial ekonomi dengan anemia pada ibu hamil di desa sapa kecamatan tenga kabupaten Minahasa selatan [Internet]. Universitas Sam Ratulangi; 2012. Available from: https://fkm.unsrat.ac.id/wp-content/uploads/2013/08/M.-Liow.pdf

28. Hoshino J, Muenz D, Zee J, Sukul N, Speyer E, Guedes M, et al. Associations of Hemoglobin Levels With Health-Related Quality of Life, Physical Activity, and Clinical Outcomes in Persons With Stage 3-5 Nondialysis CKD. J Ren Nutr [Internet]. 2020 Sep;30(5):404–14. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1051227619304145

29. Gregg LP, Bossola M, Ostrosky-Frid M, Hedayati SS. Fatigue in CKD. Clin J Am Soc Nephrol [Internet]. 2021 Sep;16(9):1445–55. Available from: https://cjasn.asnjournals.org/lookup/doi/10.2215/CJN.19891220

30. Morton RL, Schlackow I, Gray A, Emberson J, Herrington W, Staplin N, et al. Impact of CKD on Household Income. Kidney Int Reports [Internet]. 2018 May;3(3):610–8. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2468024917304795

31. Handayani NS, Astuti NFW. Analisis Kadar Hemoglobin pada Wanita Perokok dan Wanita Bukan Perokok di Indonesia (Analisis Matching Sampel menggunakan Data IFLS 5). Med Respati J Ilm Kesehat [Internet]. 2022;17(1):1–12. Available from: http://repository.unej.ac.id/xmlui/handle/123456789/107161

32. AlQahtany FS, Algahtani FH, Alshebly MM, Madkhaly FM, Ghandour MK, Almalki JH, et al. Association Between Cigarette & Shisha Smoking and the Severity of Polycythemia: A cross Sectional Study. Saudi J Biol Sci [Internet]. 2020 Jan;27(1):460–4. Available from: https://linkinghub.elsevier.com/retrieve/pii/S1319562X19302438

33. Wang S, Qin A, Pei G, Jiang Z, Dong L, Tan J, et al. Cigarette Smoking may Accelerate the Progression of IgA Nephropathy. BMC Nephrol [Internet]. 2021 Dec 29;22(1):239. Available from: https://bmcnephrol.biomedcentral.com/articles/10.1186/s12882-021-02453-4

34. Latifah I, Suswardany DL, Kusumawati Y. Hubungan Antara Kadar Hemoglobin, Kadar Albumin, Kadar Kreatinin dan Status Pembayaran

dengan Kematian Pasien Gagal Ginjal Kronik di RSUD Dr. Moewardi Surakarta. J Kesehat [Internet]. 2012;5(1):83–92. Available from: http://hdl.handle.net/11617/3070

35. Rosnety M, Arif H. Hubungan Antara Kadar Hemoglobin Dengan Kadar Kreatinin Serum Penderita Penyakit Ginjal Menahun (Kronis). Indones J Clin Pathol Med Lab [Internet]. 2018 Mar 15;13(3):97. Available from: https://indonesianjournalofclinicalpathology.org/index.php/patologi/article/view/908

36. Seki M, Nakayama M, Sakoh T, Yoshitomi R, Fukui A, Katafuchi E, et al. Blood Urea Nitrogen Is Independently Associated With Renal Outcomes In Japanese Patients With Stage 3–5 Chronic Kidney Disease: A Prospective Observational Study. BMC Nephrol [Internet]. 2019 Dec 2;20(1):115. Available from: https://bmcnephrol.biomedcentral.com/articles/10.1186/s12882-019-1306-1

37. Ma 'shumah N, Bintanah S, Handarsari E. Hubungan Asupan Protein dengan Kadar Ureum, Kreatinin, dan Kadar Hemoglobin Darah Pada penderita Gagal Ginjal Kronik Hemodialisa Rawat Jalan di RS Tugurejo Semarang. J Gizi Univ Muhammadiyah Semarang [Internet]. 2014;3(1):22–32. Available from: https://doi.org/10.26714/jg.3.1.2014.%25p

38. Cases A, Cigarrán-Guldrís S, Mas S, Gonzalez-Parra E. Vegetable-Based Diets for Chronic Kidney Disease? It Is Time to Reconsider. Nutrients [Internet]. 2019 Jun 4;11(6):1263. Available from: https://www.mdpi.com/2072-6643/11/6/1263

39. Kim HJ, Kim TE, Han M, Yi Y, Jeong JC, Chin HJ, et al. Effects of Blood Urea Nitrogen Independent of the Estimated Glomerular Filtration Rate on the Development of Anemia in Non-dialysis Chronic Kidney Disease: The Results of the KNOW-CKD Study. Wu PH, editor. PLoS One [Internet]. 2021 Sep 10;16(9). Available from: https://dx.plos.org/10.1371/journal.pone.0257305

40. Ko GJ, Rhee CM, Kalantar-Zadeh K, Joshi S. The Effects of High-Protein Diets on Kidney Health and Longevity. J Am Soc Nephrol [Internet]. 2020 Aug;31(8):1667–79. Available from: https://jasn.asnjournals.org/lookup/doi/10.1681/ASN.2020010028

41. Hinkle JL, Cheever KH. Chronic Iilness. In: Brunner & Suddarth's textbook of medical-surgical nursing [Internet]. Edisi 13. New York: Lippincott Williams & Wilkins; 2014. p. 146–57. Available from: https://rspmanguharjo.jatimprov.go.id/wp-content/uploads/2020/02/11.-Handbook-for-Brunner-and-Suddarths-Textbook-of-Medical-Surgical-Nursing-12th-Edition-Suzann.pdf

42. Sudoyo AW. Buku Ajar Ilmu Penyakit Dalam. Edisi 6. Jakarta Pusat: InternaPublishing; 2014.

43. PPNI. Standar Diagnosis Keperawatan Indonesia. 1st ed. Jakarta: DPP PPNI RI; 2017.

44. Kallenbach J. Review of Hemodialysis for Nurses and Dialysis Personnel. 9th ed. Missouri: Mosby Elsevier; 2015. 431.

Original Article

Factors Related to the Incidence of Congenital Rubella Syndrome (CRS) in Indonesia

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ABSTRACT

Congenital Rubella Syndrome (CRS) is a serious consequence in infants due to Rubella virus infection during early pregnancy which can cause several congenital abnormalities. In 2021, Indonesia became the country that reported the highest cases of CRS in the WHO Southeast Asia region with 229 cases out of a total of 402 cases (57%). There are various factors related to the incidence of CRS including vaccination, health facilities and mother and baby factors. Knowledge on these factors can be applied to improve efforts to prevent and control CRS cases. This study aims to determine the factors related to the incidence of CRS in Indonesia. This was a case-control study using secondary data derived from the 2020-2021 CRS sentinel surveillance reports of the Ministry of Health of the Republic of Indonesia. Based on the results of multivariate analysis using multiple logistic regression, it was revealed that there was one factor related to the incidence of CRS, namely the area of residence with an OR of 2.3 (95% CI: 1.49-3.42). The area of residence outside Java-Bali had a higher risk for the incidence of CRS by 2.3 times compared to the area of residence in Java-Bali. In contrast, other variables such as history of maternal vaccination, history of maternal Rubella infection, maternal age and the child gender were not found to be statistically related to the incidence of CRS. It can be concluded that the area of residence outside Java-Bali was a factor related to the incidence of CRS. Therefore, it is necessary to have an even distribution of Rubella vaccination coverage, strengthen the surveillance system and prepare equal distribution of health facilities to prevent the spread of Rubella cases.

Keywords : Rubella, Congenital Abnormalities, Congenital Defects, Sentinel Surveillance.

INTRODUCTION

Congenital Rubella Syndrome (CRS) is a condition of various congenital abnormalities that occur in infants due to Rubella virus infection during pregnancy. Congenital abnormalities that usually occur include cataracts, congenital heart disease, hearing loss and developmental delays[1]. Congenital abnormalities due to the Rubella virus are most at risk in the first 12 weeks of pregnancy.

Congenital abnormalities that occur in infants may cause serious consequences in the form of permanent disability, medical burden and financial burden since the treatment of infants with CRS is limited to treating symptoms that can last for years[3].

CRS cases still occur in countries with low vaccination coverage or with no implementation of Rubella vaccination. Indonesia is one of the countries that still reports CRS cases every year. In 2019

,Indonesia reported 211 cases of CRS, which decreased in 2020 by 122 cases and increased again in 2021 by 229 cases[4]. In 2021, Indonesia became the country that reported the highest cases of CRS in the WHO Southeast Asia region with 229 cases out of a total of 402 cases (57%). The increase in CRS cases in 2021 is in line with the decrease in Measles-Rubella vaccination coverage in 2020 - 2021 or since the COVID-19 pandemic took place. Decreased vaccination coverage during a pandemic could be due to delayed schedule of Community Health Care services and immunization logistics, parents were afraid of contracting COVID-19 when they came to health facilities, and COVID-195 virus exposure among healthcare workers, families and children[5].

Based on several studies, most cases of CRS occur in male children, with an age range of <1 – 5 months, and low birth weight babies. Most of clinical findings are heart defects, sight abnormalities and hearing loss that are permanent and occur in women who give birth with an age range between 14-30 years[6,7]. The results of a study on Rubella immunity seroprevalence in women showed that vaccination increases a person's antibodies thereby reducing the possibility of Rubella virus infection and giving birth to babies with CRS[8] [9]. Previous study on CRS in Indonesia observed CRS cases based on sentinel hospitals descriptively to determine the number of cases, clinical symptoms and the development of a surveillance system on CRS[10]. Another studies discussed the relationship between Rubella infection factors and the incidence of CRS through a spatiotemporal approach[11], and the relationship between vaccination factors and family awareness descriptively with the incidence of CRS[12,13]. Studies on CRS in Indonesia have mostly been conducted descriptively, but analytic studies and relationships between various factors have not been widely studied.

CRS is still a public health burden in several countries. Congenital abnormalities that occur in infants due to CRS can cause medical burdens as well as financial burdens for both the family and the country. Therefore, the main strategy that can be implemented to reduce the burden of CRS disease is through promotive and preventive efforts. In order to carry out effective prevention efforts in addressing the increase in CRS cases, it is necessary to have knowledge of the factors related to the incidence of CRS in Indonesia in order to determine the relationship and the size of effect of these factors on the incidence of CRS.

Based on the description above, the incidence of CRS still needs proper attention since it continues to occur every year and can cause various permanent congenital defects in infants. In addition, analytic studies regarding the factors of the incidence if CRS have not been widely conducted in Indonesia. This study aims to determine the factors related to the incidence of CRS in Indonesia.

METHOD

This was a case-control study which is defined as a study that traces back the causal factors that can lead to a health problem. The study was conducted in July – October 2022 using secondary data derived from the CRS Sentinel Surveillance Report of the Ministry of Health, Republic of Indonesia in 2020-2021. It was the result of investigation towards CRS cases from 18 sentinel hospitals in 15 provinces in Indonesia. The study population was all cases of suspected CRS recorded in the 2020-2021 CRS sentinel surveillance report, as many as 1,373 cases. Based on the two-proportion hypothesis test formula in a case-control study described, it was obtained a minimum sample size for each group of 180 samples. The sampling as conducted using cumulative sampling. The case group consisted of women with suspected CRS with the final classification of clinical CRS and laboratory confirmed CRS that met the inclusion and exclusion criteria, as many as 180 samples. Meanwhile, the control group consisted of women with suspected CRS with a final classification of non-CRS cases that met the inclusion and exclusion criteria, as many as 240 samples. The dependent variable of the current study was the incidence of CRS, while the independent variables included history of maternal rubella vaccination, history of maternal rubella infection, maternal age, child gender and area of residence.

Data were analyzed using the STATA application version 13.0 which consisted of bivariate analysis through the chi-square test for variables with 2 categories, the Fisher's exact test if there were cells with an expected frequency of <5, and the simple logistic regression test for variables with >2 categories. Meanwhile, multivariate analysis was conducted through multiple logistic regression

test to determine the relationship between independent variables and dependent variable as well as the most dominant variable in the relationship.

RESULTS

Bivariate analysis was conducted between two variables that were suspected to be related to each other, namely the independent variables and the dependent variable. If the results of statistical calculation obtained a p value of $< \alpha$ (0.05), then there is a significant relationship between the two variables. Table 1 presented that most of respondents in the case and control groups had no history of rubella vaccination (99.4% vs 99.2%) and had no history of rubella infection (99.4% vs 99.6%). Furthermore, most of respondents in both groups were 20-34 years of age (73.9% vs 66.7%), had male children (54.4% vs 53.8%) and lived the area of residence of Java-Bali

Table 1. Bivariate analysis on the Relationship between the Independent Variable and the Incidence of CRS.

Variable	Case n (%)	Control n (%)	Total n (%)	OR	p-value
History of Maternal Rubella Vaccination					
No	179 (99,4%)	238 (99.2%)	417 (99.3%)	1.00	0.607
Yes	1 (0.6%)	2 (0.8%)	3 (0.7%)	Reff	
History of Maternal Rubella Infection					
Yes	1 (0.6%)	1 (0.4%)	2 (0.5%)	1.00	
No	179 (99.4%)	239 (99.6%)	418 (99.5%)	Reff	0.647
Maternal Age					
14-19	5 (2.8%)	11 (4.6%)	16 (3.8%)	Reff	
20-34	133 (73.9%)	160 (66.7%)	293 (69.7%)	1.83	0.274
35-49	42 (23.3%)	69 (28.8%)	111 (26.3%)	1.33	0.611
Child Gender					
Male	98 (54.4%)	129 (53.8%)	227 (54%)	0.92	0.483
Female	82 (45.6%)	111 (46.3%)	193 (46%)	Reff	
Residence					
Outside Java-Bali	82 (45.6%)	65 (27.1%)	147 (35%)	2.25	0.0001
Java-Bali	98 (54.4%)	175 (72.3%)	273 (65%)	Reff	

The results of the bivariate analysis showed that there was one variable that had a significant relationship with the incidence of CRS, namely the area of residence (0.0001). In contrast, history of maternal Rubella vaccination (0.607), history of maternal Rubella infection (0.647), maternal age group of 20-34 years (0.274), maternal age group of 35-49 years (0.611) and child gender (0.483) variables were not statistically related to incidence of CRS (Table 1).

Analysis was continued with multivariate analysis through multiple logistic regression, namely by entering all the independent variables simultaneously into the model. Such analysis aims to assess the size of relationship of each independent variable after considering other independent variables and to find out the most dominant independent variable towards the dependent variable.

Based on the results of multivariate analysis, there was one variable that was statistically related to the incidence of CRS, namely the area of residence with OR = 2.3, 95% CI (1.49-3.42). The area of residence outside Java-Bali had a higher risk for the incidence of CRS by 2.3 times compared to the area of residence in Java-Bali. Other variables of maternal history of maternal Rubella vaccination (OR=2.8, 95% CI (0.25-31.4), history of maternal Rubella infection (OR=1.6, 95% CI (0.99-26.4), maternal age of 20-34 years (OR=1.5, 95% CI (0.50-4.53), and maternal age of 35-49 years (OR=1.1, 95% CI (0.36-3, 57) also had a risk for the incidence of CRS, but statistically had no significant correlation (p-value >0.05). On the other hand, the child gender variable was a variable that had no risk for the incidence of CRS (OR=1.0, 95% CI (0.66-1.47) and statistically had no significant correlation (Table 2).

Tabel 2. Multivariate Analysis of the Relationship between Independent Variable and the Incidence of CRS in Indonesia.

Variable	OR	95% CI		p-value
		Lower	Upper	
History of Maternal Rubella Vaccination				
No	2.8	0.25	31.40	0.410
Yes	Reff			
History of Maternal Rubella Infection				
Yes	1.6	0.99	26.41	0.735
No	Reff			
Maternal Age				
14-19	Reff			
20-34	1.5	0.50	4.53	0.464
35-49	1.14	0.36	3.57	0.821
Child Gender				
Male	1.0	0.66	1.47	0.949
Female	Reff			
Residence				
Outside Java-Bali	2.3	1.49	3.42	0.000
Java-Bali	Reff			

DISCUSSION

Area of residence outside Java-Bali had a highet risk for the incidence of CRS than area of residence in Java-Bali. The difference in the incidence of CRS between regions was closely related to the difference in Rubella vaccination coverage, the quality of CRS/Rubella surveillance and the difference in the quality of health services provided in the region[13]. Based on national vaccination coverage data for 2021, the lowest vaccination coverage was reported from provinces outside the Java-Bali region such as Aceh (40.9%), West Papua (56.9%) and Papua (54.6%). CRS sentinel surveillance performance in 2021 also revealed that areas outside Java-Bali (89%) were less likely to reach the target when compared to areas in Java-Bali (100%)[4]. In addition, the uneven availability of health facilities in Indonesia can lead to disparities in access to health services for women who plan for pregnancy, including in terms of vaccination and early detection of Rubella infection. Based on a study conducted by Misnaniarti (2017), the ratio of specialists tended to be lower in areas outside Java-Bali and most hospitals in Indonesia are located in the Java-Bali region (51.4%), most of which are type A hospitals (67.3%)[14]. Such differences in health infrastructure reflect that women living outside the Java-Bali region had fewer choices to obtain ideal quality maternal and fetal care compared to those living in the Java-Bali region[14,15].

The incidence of CRS in an area is also related to the incidence of Rubella cases. A study conducted by Sriwahyuni (2020) found that there was a spatio-temporal relationship between Rubella cases and the incidence of CRS, wherein CRS was detected 6-8 months after an increase in Rubella cases[11]. In 2020, there were 67 cases of Rubella and in 2021 there were 106 cases in areas outside Java-Bali with the majority of cases were among children who had not received vaccinations (55%)[16]. Such finding indicated that those areas are still vulnerable to Rubella and CRS. So, it is necessary to strengthen the surveillance system to prevent a wider spread of the disease.

Based on the study results, it was known that history of maternal vaccination was not related to the incidence of CRS, this is not in line with several studies which stated that history of maternal vaccination was proven to be effective in reducing Rubella cases and the incidence of CRS. The results of a study conducted in Yogyakarta found that there was a decrease in the number of CRS cases by 60.9% after 1 year since the measles-Rubella vaccination campaign was implemented[13]. Similar finding was also reported in Australia, which is one of the countries that have achieved Rubella elimination. Such study compared CRS case data in 2010 to the pre-vaccination era

(1960-1970). It was found that selective Rubella vaccination for school students could reduce CRS cases by 90%, while universal vaccination given to all children could reduce CRS cases more significantly (99%)[17].

A history of rubella infection during pregnancy was also statistically not related to the incidence of CRS. Such finding is not in line with the literature which stated that the incidence of CRS occurred due to rubella infection during pregnancy, especially in the first trimester[18]. CRS can occur because the Rubella virus is capable of infecting the placenta, spreading to the fetus and changing the function of several fetal systems by interfering with organ formation and causing systemic inflammation and further lead to various congenital abnormalities[19]. Based on the data source, the history of rubella infection in question was a history of maternal Rubella diagnosis during pregnancy based on laboratory confirmation. Out of the total sample, only 2 people (0.5%) had a history of Rubella infection with laboratory confirmation during pregnancy was found. This indicated that only a few mothers checked for symptoms of rubella infection during pregnancy at a health facility, which could be due to a lack of maternal knowledge about the symptoms of Rubella infection. They thought that infection only caused mild clinical symptoms or no symptoms so they didn't go to the hospital or health facilities or there was a lack of access to health services.

More than 50% of Rubella cases were asymptomatic and the clinical diagnosis of Rubella was unreliable because a similar rash can also occur due to other viral infections. Therefore, the diagnosis of Rubella infection among pregnant women requires standard laboratory test[20]. Rubella clinical manifestations are non-specific and very diverse, causing the identification of suspected CRS cases to be quite challenging[21], so that pregnant women's awareness to have examination is required. On addition, there should be accuracy of medical personnel and improvement of the quality of health services supported with screening and diagnostic equipment for other related cases, for example congenital heart defects using echocardiography and hearing defects using otoacoustic emission (OAE).

Maternal age is a factor that is not statistically related to the incidence of CRS.

However, based on several studies, women of childbearing age are more susceptible to Rubella infection and are at risk of giving birth to babies with CRS compared to other age groups. A study conducted by Chandy (2011) found that women aged 24-34 years had a higher susceptibility to Rubella infection (14.5%) compared to the age group of 19-23 years (8%)[22], which could be due to a reduced immune response in such age group. Another study conducted by al Dossary (2022) revealed that susceptibility to Rubella increased in the age group of 29-34 years with an OR of 1.225 compared to other age groups. The higher the susceptibility of women of childbearing age to Rubella infection, the higher the risk for Rubella infection during pregnancy and giving birth to babies with CRS[23]. Therefore, it is important to ensure that women of childbearing age are aware of their Rubella immune status and if necessary they should get Rubella vaccination to increase immunity against Rubella infection[24].

The study results revealed that was no significant relationship between child gender and the incidence of CRS. This result is not in line with a study conducted by Tandililing (2016) and Singh (2013) which found that male babies had a higher risk for CRS than female babies. However, this study did not explain the reasons of it[25,26]. Previous study conducted by Mitchell revealed a different finding that women were more susceptible to Rubella and CRS since women have a slower onset of formation of E-specific IgG and IgM antibodies with a smaller proportion of total RV antibody responses indicating that there are hormonal and genetic influences on immune recognition of RV proteins. This is likely to be associated with an increase in the incidence of Rubella and CRS among women[27].

CONCLUSION

Area of residence outside Java-Bali was a factor related to the incidence of CRS in Indonesia. To support efforts to prevent and eliminate Rubella/CRS in 2026, it is necessary to increase and equalize the coverage of Rubella vaccination in all regions through cooperation with various related sectors. In addition, equal distribution of health facilities in Indonesia still needs to be considered so that mothers who have pregnancy plans in all regions can get quality health services to prevent CRS.

This study had several limitations, namely the samples who were selected from 18 CRS Sentinel Hospitals in 15 provinces. CRS Sentinel Hospital is a hospital owned by the central/regional government and private hospitals are not yet involved. So, it is possible that there were still many cases of CRS that had not been reported. Further study which involved more CRS case data from sentinel hospitals and more complete data is expected to provide more representative findings to describe the condition of CRS in Indonesia.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCE

1. Zimmerman LA, Knapp JK, Antoni S, Grant GB, Reef SE. Progress Toward Rubella and Congenital Rubella Syndrome Control and Elimination — Worldwide, 2012–2020. MMWR Morb Mortal Wkly Rep [Internet]. 2022 Feb 11;71(6):196–201. Available from: http://www.cdc.gov/mmwr/volumes/71/wr/mm7106a2.htm?s_cid=mm7106a2_w
2. WHO. Congenital Rubella Syndrome. Vaccine-Preventable Diseases Surveilans Standards [Internet]. 2018; Available from: https://www.who.int/publications/m/item/vaccine-preventable-diseases-surveillance-standards-crs
3. Motaze NV, Manamela J, Smit S, Rabie H, Harper K, DuPlessis N, et al. Congenital Rubella Syndrome Surveillance in South Africa Using a Sentinel Site Approach: A Cross-sectional Study. Clinical Infectious Diseases [Internet]. 2019 May 2;68(10):1658–64. Available from: https://academic.oup.com/cid/article/68/10/1658/5092747
4. Kemenkes RI. Buletin Laporan Surveilans Congenital Rubella Syndrom (CRS) Indonesia Bulan Desember Tahun 2021. 2021.
5. Permatasari R, Liliandriani A. The Implementasi Kegiatan Imunisasi Posyandu dengan Menggunakan Juknis Imunisasi pada masa Pandemi Covid - 19. Poltekita : Jurnal Ilmu Kesehatan [Internet]. 2021 Nov 27;15(3):274–82. Available from: http://jurnal.poltekkespalu.ac.id/index.php/JIK/article/view/526
6. Murhekar M, Verma S, Singh K, Bavdekar A, Benakappa N, Santhanam S, et al. Epidemiology of Congenital Rubella Syndrome (CRS) in India, 2016-18, based on data from sentinel surveillance. Harley D, editor. PLoS Negl Trop Dis [Internet]. 2020 Feb 3;14(2):e0007982. Available from: https://dx.plos.org/10.1371/journal.pntd.0007982
7. Sugishita Y, Shimatani N, Katow S, Takahashi T, Hori N. Epidemiological Characteristics of Rubella and Congenital Rubella Syndrome in the 2012&ndash;2013 Epidemics in Tokyo, Japan. Jpn J Infect Dis [Internet]. 2015;68(2):159–65. Available from: https://www.jstage.jst.go.jp/article/yoken/68/2/68_JJID.2014.195/_article
8. Miyakawa M, Yoshino H, Yoshida LM, Vynnycky E, Motomura H, Tho LH, et al. Seroprevalence of rubella in the cord blood of pregnant women and congenital rubella incidence in Nha Trang, Vietnam. Elsevier [Internet]. 2014;32(10):1192–8. Available from: http://dx.doi.org/10.1016/j.vaccine.2013.08.076
9. Sreepian PM, Sreepian A. Seroprevalence of rubella immunity among women of childbearing age in bangkok, thailand. Southeast Asian Journal of Tropical Medicine and Public Health [Internet]. 2018;49(1):76–81. Available from: https://www.researchgate.net/publication/328572696_Seroprevalence_of_rubella_immunity_among_women_of_childbearing_age_in_bangkok_thailand
10. Herini ES, Gunadi, Triono A, Mulyadi AWE, Mardin N, Rusipah, et al. Hospital-based surveillance of congenital rubella syndrome in Indonesia. Eur J Pediatr [Internet]. 2017 Mar 13;176(3):387–93. Available from: https://link.springer.com/10.1007/s00431-017-2853-8
11. Sriwahyuni E, Fuad A, Riris Andono Ahmad, Rustamaji, Gunadi, Herini ES. Spatiotemporal proximity of rubella

cases to the occurrence of congenital rubella syndrome in yogyakarta, Indonesia. Medical Journal of Malaysia [Internet]. 2020;75(May):41–7. Available from: https://www.researchgate.net/publication/341879585

12. Rosyada A, Putri DA, Mutahar R. Family Awareness of Congenital Rubella Syndrome in Palembang, Indonesia. In: Proceedings of the 2nd Sriwijaya International Conference of Public Health (SICPH 2019) [Internet]. Paris, France: Atlantis Press; 2020. p. 18–22. Available from: https://www.atlantis-press.com/article/125941300

13. Herini ES, Triono A, Iskandar K, Prasetyo A, Nugrahanto AP, Gunadi. Congenital Rubella Syndrome Surveillance After Measles Rubella Vaccination Introduction in Yogyakarta, Indonesia. Pediatric Infectious Disease Journal [Internet]. 2021 Dec 7;40(12):1144–50. Available from: https://journals.lww.com/10.1097/INF.0000000000003290

14. Misnaniarti M, Hidayat B, Pujiyanto P, Nadjib M, Thabrany H, Junadi P, et al. Availability of facilities and health workers to support universal coverage of national health insurance. Jurnal Penelitian dan Pengembangan Pelayanan Kesehatan [Internet]. 2017;1(1):6–16. Available from: https://doi.org/10.22435/jpppk.v1i1.425

15. Dharmayanti I, Azhar K, Tjandrarini DH, Hidayangsih PS. Pelayanan Pemeriksaan Kehamilan Berkualitas Yang Dimanfaatkan Ibu Hamil Untuk Persiapan Persalinan Di Indonesia. Jurnal Ekologi Kesehatan [Internet]. 2019 Aug 9;18(1):60–9. Available from: https://ejournal2.litbang.kemkes.go.id/index.php/jek/article/view/1777

16. Kemenkes RI. Buletin Laporan Surveilans PD3I (Vaccine Preventable Disease Surveillance) Bulan Agustus Tahun 2022. 2022;(Agustus).

17. Gao Z, Wood JG, Burgess MA, Menzies RI, McIntyre PB, MacIntyre CR. Models of strategies for control of rubella and congenital rubella syndrome-A 40 year experience from Australia. Vaccine [Internet]. 2013;31(4):691–7. Available from: http://dx.doi.org/10.1016/j.vaccine.2012.11.043

18. Alter SJ, Bennett JS, Koranyi K, Kreppel A, Simon R. Common childhood viral infections. Curr Probl Pediatr Adolesc Health Care [Internet]. 2015;45(2):21–53. Available from: http://dx.doi.org/10.1016/j.cppeds.2014.12.001

19. Lambert N, Strebel P, Orenstein W, Icenogle J, Poland GA. Rubella. The Lancet [Internet]. 2015 Jun;385(9984):2297–307. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0140673614605390

20. Bouthry E, Picone O, Hamdi G, Grangeot-Keros L, Ayoubi JM, Vauloup-Fellous C. Rubella and pregnancy: diagnosis, management and outcomes. Prenat Diagn [Internet]. 2014 Dec;34(13):1246–53. Available from: https://onlinelibrary.wiley.com/doi/10.1002/pd.4467

21. Toda K, Reef S, Tsuruoka M, Iijima M, Dang TH, Duong TH, et al. Congenital rubella syndrome (CRS) in Vietnam 2011-2012-CRS epidemic after rubella epidemic in 2010-2011. Vaccine [Internet]. 2015;33(31):3673–7. Available from: http://dx.doi.org/10.1016/j.vaccine.2015.06.035

22. Chandy S, Abraham Am, Jana Ak, Agarwal I, Kekre A, Korula G, et al. Congenital rubella syndrome and rubella in Vellore, South India. Epidemiol Infect [Internet]. 2011 Jun 20;139(6):962–6. Available from: https://www.cambridge.org/core/product/identifier/S0950268810001755/type/journal_article

23. al Dossary RA, Althuwaiqeb S, Alkharsah KR, Wanni NHO, Hunasemaranda BC, Obeid OE, et al. Susceptibility to Rubella Infection and Incidence of Congenital Rubella Infection: 6 Years Retrospective Study. Int J Gen Med [Internet]. 2022 Apr;Volume 15(March):3605–11.

Available from: https://www.dovepress.com/susceptibility-to-rubella-infection-and-incidence-of-congenital-rubell-peer-reviewed-fulltext-article-IJGM

24. Palminha P, Vinagre E, Riberio C, Lourenco T, Roque C. Congenital rubella syndrome in a country with high vaccination coverage – Portugal. Journal of Clinical Virology [Internet]. 2016;82 Supplem(September):252–3. Available from: https://www.sciencedirect.com/science/article/pii/S138665321630467X

25. Tandililing LC, Setiabudi D, Risan NA. Hubungan Jenis Kelamin, Usia Gestasi, dan Berat Badan Lahir dengan Sindrom Rubela Kongenital. Sari Pediatri [Internet]. 2016 Oct 26;17(4):302. Available from: https://saripediatri.org/index.php/sari-pediatri/article/view/297

26. Singh S, Bingwor F, Tayler-Smith K, Manzi M, Marks GB. Congenital Rubella Syndrome in Fiji, 1995–2010. J Trop Med [Internet]. 2013;2013:1–5. Available from: http://www.hindawi.com/journals/jtm/2013/956234/

27. Mitchell LA, Zhang T, Tingle AJ. Differential Antibody Responses to Rubella Virus Infection in Males and Females. Journal of Infectious Diseases [Internet]. 1992 Dec 1;166(6):1258–65. Available from: https://academic.oup.com/jid/article-lookup/doi/10.1093/infdis/166.6.1258

Original Article

Nutritional Status and Number of Comorbid in Adult Patients With COVID-19

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ABSTRACT

During the last two years, the death rate due to the COVID-19 pandemic in Indonesia has reached 157,000 people, with comorbid diseases being the most significant factor in the incidence of mortality in COVID-19 patients. Examining the nutritional status and number of comorbidities in COVID-19 patients was the study's main goal. This study is an analytic observational, quantitative study that uses survey research design and cross-sectional approach design. The research samples were taken by a purposive sampling approach, so that all samples that met the inclusion criteria were taken (N= 136) According to the study's findings, there was no linkage among nutritional status and the amount of comorbidities among adults and the elderly. (p value = 0.910 and p = 0.220) and based on gender (p value = 0.937 and p = 0.795). For these reasons, In order to obtain more precise results, there is a need for further research on additional variables that can affect the frequency of comorbidities in COVID-19 patients.

Keywords : Comorbidites, COVID-19, Nutritional Status.

INTRODUCTION

Coronavirus Disease 2019 is a health epidemic that has hit the whole world starting at the end of 2019 (COVID-19)[1]. and spreading significantly so that since 2020, the World Health Organization (WHO) declared that COVID-19 was a pandemic and Indonesia had reached three peaks of the COVID-19 wave[2].

This virus spreads through droplet which can be transmitted to other individuals, then attach themselves to the ACE2 receptor. These damaged cells will produce newer virus copies that will spread to other cells[3]. Following this virus's infiltration of the body's cells, there will be a body response in the form of inflammation that attacks the infected body cells. If inflammation occurs in the lung mucosal cells, this will cause plasma leakage and inhibition of the process of diffusion of oxygen and carbon dioxide by the alveoli [4].

Positive symptoms of COVID-19 include a dry cough, fever, anosmia (loss of taste and smell), myalgia (pain in the muscles and joints), sore throat, headache, vomiting, and diarrhea. Breathlessness and thrombotic symptoms like angina and others are major indications that this condition is present [3]. Several variables, including immunity, concurrent disorders, dietary state, and environmental factors, affect COVID-19 disease[5]. Different age groups can be affected by COVID-19 disease, and the severity of the condition varies. However, those who are elderly and who have co-morbid conditions (comorbids) are more likely to get a severe infection. Up to 88% of SARS-CoV-2 patient deaths have a history of coexisting conditions [6], Patients with COVID-19 are most frequently co-morbid with hypertension and diabetes mellitus, with obesity (BMI > 25) being among the most comorbid conditions. Numerous research have demonstrated a link between obesity and other comorbid disorders. Obese individuals are more likely to develop type II DM, CVD, and renal failure[7].

According to numerous studies in the US, where approximately to 48.3% of inpatients with COVID-19 had an obese nutritional status when they initially entered, as many as 48% of inpatients in the ICU of a Spanish hospital with COVID-19 had an obese nutritional status. According to the results of the nutrition risk screening tool (NRS-2002), that COVID-19 patients are at risk for malnutrition is between 77 and 88%, people with the disease have a high chance of developing it[8]. Based on research employing anthropometric criteria to assess nutritional status between 40 and 50 percent of hospitalized individuals with COVID-19 experience malnutrition [9].

In COVID-19 patients, Comorbid conditions are the leading killers in Indonesia, according to the COVID-19 death rate has reached 157 thousand people during the past two years. Based on this, the researcher aims to further examine the nutritional status and the number of comorbidities in adult patients with Covid-19 along with the factors that influence it.

METHOD

This quantitative study uses a cross-sectional methodology and an analytical observational research design. This research sample was taken using the purposive sampling technique, using samples that meet the criteria. All inpatients at RST Dompet Dhuafa Bogor Hospital diagnosed positive for COVID-19 from March 2020 through December 2021, were above 26 years old, and body mass index was used to determine their nutritional condition. The exclusion criteria for this study were incomplete patient data and patients who died while being given treatment.

Research data collection used secondary data originating from the medical records of RST Dompet Dhuafa Hospital, Bogor, with two variables. The independent variable, namely the number of patient comorbidities ($\leq$ 2Comorbids and >2 Comorbids)[10], and the dependent variable, namely nutritional status based on anthropometric body mass index of patients which is divided into two categories based on the 2018 Ministry of Health, namely normal nutritional status (BMI = 18.4 - 25) and abnormal nutritional status (BMI <18.5 and >25) with sex and age divided into two categories, namely adults (> 26 years) and the

elderly (> 60 years)[11], as control variables. 136 samples from 188 confirmed COVID-19 patients at Dompet Dhuafa Hospital in Bogor, West Java, were used in this research. Univariate analysis was done to assess the frequency distribution of gender, nutritional status, and the number of comorbidities. SPSS 26 was used to analyze the data. At the same time, bivariate analysis with who squares is used to see the relationship involving the dependent and independent variables with a significance level of 5%.The UPN Veteran Jakarta Research Ethics Committee approved this study under the number 480/XII/2022/KEPK.

RESULTS

Table 1. Characteristics of Research Subjects

Characteristic	N = 136
Sex	
Man, n (%)	64 (47,1)
Woman, n (%)	72 (52,9)
Age (Year), mean (min-max)	52 (26 – 82)
Adult (26 – 60) n (%)	98 (72,1)
Elderly(> 60) n (%)	38 (27,9)
Number of Comorbids	
$\leq$ 2Comorbids n (%)	113 (83,1)
>2 Comorbids n (%)	23 (16,9)
n (min-max)	24 (13 – 41)
Normal n (%)	81(59,6)
Abnormal n (%)	55 (40,4)

Source: *Medical Record RST Dompet Dhuafa Bogor Hospital, 2021*

According to table 1 above, of the 136 samples used in this investigation, 72 subjects (52.9) were predominately female patients, and 64 subjects were male (47.1). The sample for the study included a median age of 52 years, with participants as young as 26 and as old as 82. Participants were divided into adults aged 26 to 60 years old and elderly participants above 60 years old. Patients were separated into two groups based on the number of comorbidities they had: those less than equal to 2 and those with more than 2. There were 113 individuals (83.1) less than equal to 2, and up to 23 (16.9) of those had two or more. This classification based on This classification is based on research that has been conducted in China which shows that COVID-19 patients with a number of

comorbiditie s>2 show severe outcomes[10]. According to the Ministry of Health's classification of nutritional status, there are two categories of nutritional status. Patients with normal nutritional status (BMI = 18.5 to 25) and patients with abnormal nutritional status (BMI 18.5 and > 25) are the two groups to be discussed. There were as many as 81 participants in this study who had a normal nutritional state (59.6).

Table 2. Type of Comorbid Disease

Type of Comorbid Disease	n
Chronic Kidney Disease	18
Hypertension	18
Coronary Heart Disease	38
Diabetes Mellitus	44
Respiratory Disease Infection	111

Source: *Medical Record RST Dompet Dhuafa Bogor Hospital, 2021*

Based on research completed in 2020, the types of comorbid disorders utilized as a reference in this study were separated into five disease groups, as shown in table 2 above, which reported that the prevalence of comorbidities that dominated COVID-19 patients were hypertension, diabetes mellitus, Chronic Kidney Disease (CKD) , Chronic Heart Diseae (CHD), and systemic diseases respiratory. In 111 of the study subjects, the most common comorbid disease was respiratory tract infection [12].

Tabel 3. Relationship Based on Sex between COVID-19 Patients' Comorbidities and Nutritional Status.

Sex	Nutritional Status	Number of comorbids		p-value
		≤2 n (%)	>2 n (%)	
Woman	Normal	37 (82,2)	8 (17,8)	0,937
	Abnormal	22 (81,5)	5 (18,5)	
Total		59 (81,9)	13 (18,1)	
Man	Normal	30 (83,3)	6 (16,7)	0,795
	Abnormal	24 (85,7)	4 (14,3)	
Total		54 (84,4)	10 (15,6)	

Source: *Medical Record RST Dompet Dhuafa Bogor Hospital, 2021*

According on table 3 above, it can be seen that 72 female patients with normal nutritional status were dominated by patients with comorbidities ≤ 2, 37 patients (82.2%) and male patients with abnormal nutritional status. also dominated by patients who had a number of comorbidities > 2 as many as 22 (81.5). The results obtained were p = 0.937, indicating that there was no significant difference in the number of comorbidities among Covid-19 patients based on female gender for nutritional status.

In male patients, 64 patients were dominated by patients who had comorbid diseases with a total of ≤ 2 and had normal nutritional status in 30 patients (83.3) and abnormal nutritional status in 24 patients (85.7) with p = 0.795 This shows that there is no meaningful association between nutritional status and the number of total comorbidities among COVID-19 patients, regardless of male patient .

Table 4. Relationship between Nutritional Status and Number of Comorbidities in COVID-19 Patients Based on Age.

Age	Nutritional Status	Number of Comorbidities		p-value
		≤2 n (%)	>2 n (%)	
Adult	Normal	44 (80)	11 (20)	0,910
	Abnormal	34 (82)	9 (20,9)	
Total		78 (79,6)	20 (20,4)	
Elderly	Normal	23 (88,5)	3 (11,5)	0,220
	Abnormal	12 (100)	0 (0)	
Total		35 (92,1)	3 (7,9)	

Source: *Medical Record RST Dompet Dhuafa Bogor Hospital, 2021*

Relationship Based on Sex between COVID-19 Patients' Comorbidities and Nutritional Status is shown in table 4. Although concomitant disorders were present in the majority of COVID-19 patients in the adult age range (26–60 years), as many as 44 patients (80) with normal nutritional status and 34 patients (82) with abnormal nutritional status reported statistically (p value = 0.910). Based on the adult age group, there was no meaningful association between nutritional health and the

number of comorbidities.

While the number of patients with normal and abnormal nutritional status was 23 (88.5) and 12 respectively, the elderly age group (> 60 years) was also dominated by patients who had a number of comorbidity conditions (100). According to this statistical analysis, the number of comorbidities in the geriatric age group did not significantly correlate with nutritional status (p value = 0.220).

DISCUSSION

The majority of COVID-19 patients, according to the study's findings, were female. This is connected to the study done by Wu et al.[13]. The majority of COVID-19 patients were men, according to different results from studies in China utilizing the meta-analysis methodology[12]. Because of differences in sex hormones associated to the immune system, women have a lower chance than men of developing bacterial or viral illnesses. This is because women have higher innate and adaptive immune defenses than males.[14]

Additionally, it was discovered in this study that adults made up the majority of COVID-19 patients by age group (26-60 years). This outcome is consistent with the study of Al Omari, et al[15] which discovered that COVID-19 patients tend to be younger than 50. This is because this age group is productive and still has high mobility compared to older age groups, making them more susceptible to COVID-19 infection, remarkably. if they don't follow health procedures[16].

In this study, the normal BMI range of 18.5 to 25 dominated the nutritional condition of COVID-19 individuals. These findings contradict with data from the United Kingdom which found that inpatients with COVID-19 would have a risk of 2.37 times higher for abnormal nutritional status (BMI < 18.5 and > 25)[17]. Because of this, chronic inflammation with higher levels of IL-6 can happen in patients with abnormal nutritional status, particularly obesity, which can limit immune response, generate an imbalance in the gut flora, and have low cytokine profiles[18]. Obese people's nutritional status can affect their immune systems, both innate and adaptive, as well as lower lung volume and consequently lung function[19].

This study found that the comorbidities that dominated COVID-19 patients were respiratory tract diseases, such as pneumonia, tuberculosis, and others, which were in accordance with studies in China[12]. Symptomatic respiratory disorders will have a 2.17 higher level of severity compared to patients who do not have these symptoms. This occurs due to the body's response to a viral infection that causes cell damage. This happens as a result of virus replication, which stimulates the immune system, the occurrence of an inflammatory process, and the emergence of various symptoms in patients, indicating that the process of viral infection has been ongoing and the virus has spread to other cells[20]. Type II diabetes and coronary heart disease (CHD) are also included in the top three comorbid diseases in COVID-19 patients. This is consistent with studies done by 19. that type II diabetes mellitus and coronary heart disease are associated in COVID-19 patients. Oxidative stress and a weakened immune system are connected with CHD patients. Angiotensin converting enzyme-2 (ACE2) receptor expression is higher and the immune system is compromised in COVID-19 patients with a history of CHD. Coronavirus can bind to target cells through ACE2 receptors, which are expressed in several tissues; this process can result in changes in endothelium dysfunction, pro-inflammatory reactions, and post-receptor signaling pathways that cause vasoconstriction which can lead to myocardial injury and prothrombotic strategies[21]. The relationship between type II DM and COVID-19 occurs because diabetes can cause disruption of lymphocyte and macrophage function and interfere with individual immunological responses[22].

Based on the research, it was determined that in positive inpatients at Dompet Dhuafa Hospital in Bogor who had COVID-19, there was no correlation between nutritional status and the number of comorbidities (≤ 2Comorbids and >2 Comorbids. Meanwhile, based on research conducted at the Tripura Regional Hospital, India, it was found that as many as 66% of tuberculosis patients experienced malnutrition[5]. Malnutrition is a general occurrence that refers to a state of excess and deficiency of nutrition or both. The body is negatively affected by under nutrition or over nutrition. Infectious infections typically have a malnutrition state, one of which is tuberculosis. Poor dietary status combined with tuberculosis disease is a vicious cycle that, if not broken, will result in a high risk of death[5]. Due

to a weakened immune system, malnourished patients are more prone to TB. After TB disease, patients would be more susceptible to malnutrition due to a variety of circumstances, such as decreased food intake due to lack of appetite., loss of nutrition due to vomiting (nausea triggered by drugs) and changes in metabolism caused by viral infections [23]. Malnutrition is one of the risk factors that will exacerbate the incidence of COVID-19 [19].

Obesity increases a person's risk for many serious conditions, such as high blood pressure, low HDL, dyslipidemia, CHD, stroke, type II diabetes, and numerous malignancies [24]. Patients who are obese will experience changes in lung volume, function, and expansion, which will raise respiratory tract resistance, impede gas exchange, and decrease lung volume, all of which will have an effect on the patient's severity [6].

In this study, the results were not significant because the nutritional status data used secondary data so that the accuracy of the measurements could not be guaranteed by the authors. In addition to using BMI, it is recommended to use anthropometric measurements of abdominal circumference and ensure the accuracy of the measurements [25].

CONCLUSION

Based on the results of data analysis and discussion, adult COVID-19 patients at Dompet Dhuafa Bogor Hospital were shown to not have a significant association between their nutritional state and the number of comorbidities, so further research is needed using other factors that are thought to have an influence on the number of comorbidities in COVID-19 patients and using other measurement parameters to make nutritional status measurements more accurate..

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCE

1. Susilo A, Rumende CM, Pitoyo CW, Santoso WD, Yulianti M, Herikurniawan H, et al. Coronavirus Disease 2019: Tinjauan Literatur Terkini. Jurnal Penyakit Dalam Indonesia. 2020 Apr 1;7(1):45.
2. Susilo A, Martin Rumende C, Pitoyo CW, Djoko Santoso W, Yulianti M, Sinto R, et al. Coronavirus Disease 2019: Review of Current Literatures. Jurnal Penyakit Dalam Indonesia | [Internet]. 2020;7(1). Available from: https://www.ncbi.nlm.nih.gov/nuccore/
3. Drew C, Adisasmita AC. Gejala dan komorbid yang memengaruhi mortalitas pasien positif COVID-19 di Jakarta Timur , Maret-September 2020. medical journal. 2021;3(3):274–83.
4. Ikawaty R. Dinamika Interaksi Reseptor ACE2 dan SARS-CoV-2 Terhadap Manifestasi Klinis COVID-19. KELUWIH: Jurnal Kesehatan dan Kedokteran. 2020;1(2):70–6.
5. Das S, Sen S, Debnath A, Basuthakur S, Saha PK, Biswas C. A study of nutritional assessment of newly diagnosed tuberculosis patients in a tertiary care hospital of Tripura, India. Int J Res Med Sci. 2018;6(4):1382.
6. Rahayu LA, Admiyanti JC, Khalda YI, Adha FR, Agistany NFF. Hipertensi, Diabetes Melitus Dan Obesitas Sebagai Faktor Komorbiditas Utama Terhadap Mortalitas Pasien Covid-19 : Sebuah Studi Literatur Tijauan Pustaka Hypertension , Diabetes Mellitus , and Obesity As the Main Comorbidity Factors of Mortality in Covid-1. Jurnal Ilmiah Mahasiswa Kedokteran Indonesia. 2021;9:90–7.
7. Yuki K, Fujiogi M, Koutsogiannaki S. COVID-19 pathophysiology: A review. Clin Immunol. 2020 Jun 1;215:108427.
8. Bączek M, Zagańczyk-Bączek M, Szpringer M, Jaroszyński A, Wożakowska-Kapłon B. Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. Medicine [Internet]. 2021 Feb 19 [cited 2022 Dec 23];100(7). Available from: https://www.researchgate.net/publication/349483593_Students'_perception_of_online_learning_during_the_COVID-19_pandemic_A_survey_study_of_Polish_medical_students
9. Cederholm T, Jensen GL, Correia

MITD, Gonzalez MC, Fukushima R, Higashiguchi T, et al. GLIM criteria for the diagnosis of malnutrition - A consensus report from the global clinical nutrition community. Clin Nutr [Internet]. 2019 Feb 1 [cited 2022 Dec 23];38(1):1–9. Available from: https://pubmed.ncbi.nlm.nih.gov/30181091/

10. Barbu MG, Thompson RJ, Thompson DC, Cretoiu D, Suciu N. The Impact of SARS-CoV-2 on the Most Common Comorbidities–A Retrospective Study on 814 COVID-19 Deaths in Romania. Front Med (Lausanne). 2020 Sep 9;7.

11. Kemenkes. Peraturan Menteri Kesehatan Republik Indonesia. Jakarta;

12. Yang J, Zheng Y, Gou X, Pu K, Chen Z, Guo Q, et al. Prevalence of comorbidities and its effects in coronavirus disease 2019 patients: A systematic review and meta-analysis. International Journal of Infectious Diseases. 2020;94:91–5.

13. Wu S, Xue L, Legido-Quigley H, Khan M, Wu H, Peng X, et al. Understanding factors influencing the length of hospital stay among non-severe COVID-19 patients: A retrospective cohort study in a Fangcang shelter hospital. PLoS One. 2020;15(10 October):1–14.

14. Shepherd R, Cheung AS, Pang K, Saffery R, Novakovic B. Sexual Dimorphism in Innate Immunity : The Role of Sex Hormones and Epigenetics. Front Immunol. 2021;11(January):1–16.

15. Al-omari A, Alhuqbani WN, Rehman A, Zaidi Z, Al-subaie MF. Clinical characteristics of non-intensive care unit COVID-19 patients in Saudi Arabia:A descriptive cross-sectional study information. J Infect Public Health. 2020;13(January):3.

16. Kraemer MUG, Yang CH, Gutierrez B, Wu CH, Klein B, Pigott DM, et al. The effect of human mobility and control measures on the COVID-19 epidemic in China. Science (1979). 2020;368(6490):493–7.

17. Hamer M, Gale CR, Kivimäki M, Batty GD. Overweight , obesity , and risk of hospitalization for COVID-19 : A community-based cohort study of adults in the United Kingdom. Journal Immunology and Inflamationournal Immunology And Inflamation. 2020;117(35):25–7.

18. Nurfaiza AR, Studi P, Dokter P, Kedokteran F, Lampung U. Obesity in patients with COVID-19. Jurnal Kesehatan dan Agromedicine. 2021;8(1).

19. Muharramah DH, Prihartono N. Obesity and Severity COVID-19 : Literature Review Study. Jurnal Epidemiologi Kesehatan Komunitas. 2021;6(2):323–32.

20. Du RH, Liang LR, Yang CQ, Wang W, Cao TZ, Li M, et al. Predictors of mortality for patients with COVID-19 pneumonia caused by SARSCoV- 2: A prospective cohort study. European Respiratory Journal. 2020;55(5).

21. Kai H, Kai M. Interactions of coronaviruses with ACE2, angiotensin II, and RAS inhibitors—lessons from available evidence and insights into COVID-19. Hypertension Research. 2020;43(7):648–54.

22. Dawei Wang M, Bo Hu M, Chang Hu M, Fangfang Zhu M, Xing Liu M, Jing Zhang M, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. Journal of American medical association. 2020;323(11):1061–9.

23. WHO. Tuberculosis [Internet]. World Health Organization. 2021 [cited 2022 Sep 28]. Available from: https://www.who.int/en/news-room/fact-sheets/detail/tuberculosis/

24. Division of Nutrition, Physical Activity, and Obesity NC for CDP and HP. Overweight and obesity [Internet]. centers for disease clinical and prevention. 2022 [cited 2022 Sep 28]. Available from: https://www.cdc.gov/obesity/index.html

25. Herinasari NNV, Wibawa A, Nugraha MHS, Pramana Putra IPY. Persentase Lemak Total Tubuh Dan Lingkar Perut Terhadap Tekanan Darah Pada Wanita Usia 35-54 Tahun Di Desa Dauh Puri Klod. Majalah Ilmiah Fisioterapi Indonesia. 2022 May 5;10(2):68.

Original Article

Relationship between Waste Management and the Level of Fly Density at Kadompe Restaurants in Luwuk City

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ABSTRACT

The existence of waste can have an impact on public health because it becomes a means and source of transmission of various disease agents. The indirect effect of waste on health can be due to vector-borne disease agents that multiply in the waste. Buried waste can be used by flies as a breeding ground. This study aims to analyze the relationship between waste management and the level of fly density at Kadompe Restaurants in Luwuk City. This was an analytic survey with a cross-sectional design, namely by analyzing the relationship between waste management and the level of fly density at Kadompe Restaurants. The study population was all Kadompe Restaurants located on Maahas Coast in Luwuk City, Central Sulawesi Province as many as 33 restaurants. The study samples involved 26 restaurants which were selected using purposive sampling based on certain consideration, namely restaurants that were still active. The instrument for measuring Fly Density was a fly grill by referring to the Regulation of the Minister of Health of the Republic of Indonesia No. 50 of 2017. Data on waste management included sorting, container, transportation that were collected by direct observation at the Food Stall based on the observation sheet provided in accordance with Law no. 18 of 2008 concerning Waste Management. Data were analyzed using chi-square test with $\alpha \leq 0.05$. The results of the study statistically showed the values regarding waste sorting (p=0.382; RP= 1.071; 95% CI=0.936-1.227), waste container (p=0.713; RP=1.045; 95% CI=0.958-1.141), and waste transportation (p=0.234; RP=0.909; 95% CI=0.754-1.096). Based on the results of the study, it can be concluded that there was no relationship between waste sorting, container and transportation with the level of fly density at Kadompe Restaurants in Luwuk City. The Agency for the Environment (DLH) should be able to transport waste every day from Kadompe Restaurants located on Maahas coast in Luwuk City.

Keywords : Waste Management, Fly Density, Restaurant.

INTRODUCTION

Kadompe Restaurants which arep located on the coast of Maahas Beach are a favorite sites for the people of Luwuk City and tourists visiting Luwuk City because of their affordable price. Based on the results of initial observations made at 26 Kadompe Restaurants, there is still a lot of waste piled up due to the activities carried out at the restaurants. Piles of waste with unpleasant smell is a good place for vectors of disease agents to breed, such as flies.

Flies like places with high humidity condition and this will affect fly density. Waste is liked by flies and is a breeding ground for flies because the trash can is damp, smelly and dirty[1].

Flies are endophilic synanthropic insects that are closely related to humans and live in human dwellings [2]. Flies from the genus Musca, Chrysomya, and Sarchophaga, members of their species, live around humans[3]. House flies (Musca domestica L.) and green

flies (Chrysomya megachepala L.) are the two most common types of flies found around residential areas, trash cans, hospitals and other dirty areas in the tropics[4]. Flies play a role in decomposition, as predators, parasites, and some act as carriers of disease agents.

Flies are considered quite dangerous for humans and other animals because one fly can carry more than 100 pathogens[5]. Flies can transmit diarrheal disease agent of Escherichia coli[6,7]. In addition, flies can also transmit cholera, typhus, dysentery, and other disease agents[8,9]. Flies transmit disease agents by perching on food and contaminating food through feces, saliva, and vomit[10]. Foodstuffs that are sold are very susceptible to the presence of flies which can affect the quality of food ingredients.

The presence of flies in a certain place indicates its quality standard so that high fly density must be controlled immediately. It is impossible to completely eradicate flies, but to control them to a non-harmful population. Standards for Environmental Health Quality for vectors and disease-carrying animals consist of species, density and breeding habitat. Breeding habitat is the site where vectors and disease-carrying animals develop in their immature period. The quality standard value for fly vector is <2 flies to create a healthy environment[11]. A good measurement of fly density should be made by using a light yellow fly grill[12]. Measuring fly density using a fly grill is based on the nature of the flies which tend to land on edges or places with sharp angles[8].

Flies are often found around restaurants due to piles of waste. Restaurants are one source of waste, both food waste and non-food waste. In the food service sector, waste generation can originate from the consumption stage, which is food leftovers from consumers or other waste. Everyone involved in the management of household waste and household-like waste is obliged to reduce and manage waste in an environmentally sound manner. There are several poor waste management carried out by restaurant managers that are not in accordance with Law no. 18 of 2008 concerning Waste Management, namely regarding waste sorting, waste container and waste transportation[13].

A study conducted by Kasiono, et.al. (2016) at a restaurant located in the Tuminting Market, Manado City, showed that there was a relationship between waste management and the level of fly density. Fly density is closely related to poor environmental sanitation[14]. Based on the study conducted by Wardaningrum (2019), it was revealed that there was a relationship between the condition of the trash can and fly density at the canteen of State SHS with RP=9.5;CI95%=1.014-88.966)[15]. Meanwhile, the result of a study conducted at Kadompe Restaurant in Luwuk City showed no relationship between waste management and the level of fly density.

This study aims to analyze the relationship between waste management and the level of fly density at Kadompe Restaurants located on Maahas Coast.

METHOD

This was an analytical survey with a cross-sectional design to determine the relationship between waste management and the level of fly density at Kadompe Restaurants. The study sites were the Kadompe Restaurants located on Maahas coast in Luwuk City. The study was conducted in May-July 2022. The study population involved all Kadompe Restaurants located on Maahas coast in Luwuk City, totaling 33 restaurants. 26 restaurants as study samples were selected using purposive sampling technique according to certain consideration namely restaurants that were still active. The instrument used to assess fly density was a fly grill placed in a trash can, the number of flies that perched was counted for 30 seconds. Each trash can was assessed 10 times every 30 seconds. Out of 10 calculations, the 5 highest calculations were taken and averaged by referring to the Regulation of the Minister of Health of the Republic of Indonesia No. 50 of 2017 concerning vector control[11]. Fly density was considered to be high if the number of flies perched on the fly grill did not meet the quality standard of <2 flies. Waste management which included waste sorting, container, and transportation was conducted thorugh direct observation at Kadompe Food Stalls based on the observation sheet provided in accordance with Law no. 18 of 2008 concerning waste management[13]. Waste sorting was considered Eligible if organic waste and inorganic waste were separated. The waste container was considered eligible if the container was made of water-resistant material, did not corrode easily, had a lid and was tightly closed. Waste

transportation was considered eligible if it was carried out no more than 24 hours and all the waste was transported based direct observation by enumerators. Data were analyzed using univariate statistical test, which were further continued with bivariate test using chi-square test with the significance value of $p \leq 0.05$ [16].

RESULTS

Table 1. Relationship between Waste Sorting and Fly Density.

Sorting	Fly Density				N	%	p-value	RP (95%CI)
	High		Low					
	N	%	N	%				
NE	14	53.8	1	3.9	15	57.7	0.382	0.936-1.227
E	11	42.3	0	0	11	42.3		
Total	25	96.1	1	3.9	26	100		

Information: *NE: Non-eligible. E: Eligible*

Statistically, the chi square test showed no relationship between waste sorting and fly density with p=0.382. The result of the risk calculation obtained RP=1.071 (95% CI 0.936-1.227) which indicated that non-eligible waste sorting had a risk of 1.071 times resulting in a high fly density compared to eligible waste sorting. Although there was no statistical relationship, the bivariate analysis table (Table 1) revealed that non-eligible waste sorting had a higher number of fly density compared to eligible waste sorting.

Table 2. Relationship between Waste Containers and Fly Density.

Container	fly density				N	%	p-value	RP (95%CI)
	High		Low					
	N	%	N	%				
NE	22	84.6	1	3.9	23	88.5	0.713	0.958-1.141
E	3	22.5	0	0	3	11.5		
Total	25	96.1	1	3.9	26	100		

Information: *NE: Non-eligible, E: Eligible*

Statistically, the chi square test showed no relationship between waste container and fly density with p=0.713. The result of the risk calculation obtained RP=1.045 (95% CI 0.958-1.141) which indicated that non-eligible waste container had a risk of 1.045 times resulting in a high fly density compared to eligible waste container. Although there was no statistical relationship, the bivariate analysis table (Table 2) revealed that non-eligible waste container had a higher number of fly density compared to eligible waste container.

Table 3. Relationship between Waste Transportation and Fly Density.

Transportation	Fly Density				N	%	p-value	RP (95%CI)
	High		Low					
	N	%	N	%				
NE	15	57.7	0	0	15	57.7	0.234	0.754 -1.096
E	10	38.4	1	3.9	11	42.3		
Total	25	96.1	1	3.9	26	100		

Information: *NE: Non-eligible, E: Eligible*

Statistically, the chi square test showed no relationship between waste transportation and fly density with p=0.234. The result of the risk calculation obtained RP=0.909 (95% CI 0.754-1.096) which indicated that non-eligible waste transportation had a risk of 1.909 times resulting in a high fly density, Although there was no statistical relationship the bivariate analysis table (Table 3) revealed that non-eligible waste transportation had a higher number of fly density compared to eligible waste transportation.

DISCUSSION

Waste that is not managed properly causes environmental and health problems in humans, such as aesthetic problems, environmental pollution, and an increase in vector-borne diseases such as those transmitted through flies. There should be proper waste management which includes waste sorting, container and transportation so that it does not become a breeding ground for flies. The high density of flies in restaurants is not only caused by improper waste management, but it can also be caused by various types of food processed, such as fish-based dishes. Types of food such as grilled fish, fish sauce, and others which have fishy smell can invite flies to perch on the food. In addition, food processing places such as kitchens must be kept clean, so as not to cause high fly density.

Relationship between Waste Sorting and Fly Density at Kadompe Restaurants. The Waste sorting referred to in this study was separation of organic and inorganic waste at Kadompe Restaurants. According to Law no. 18 of 2008 concerning waste management, waste management activities involve waste sorting through separation of organic waste and inorganic waste. Organic waste refers to waste in the form of food scraps, vegetables and fruits. Meanwhile, inorganic waste refers to waste in the form of plastic, drink bottles, cans and others[13].

Based on the result of a study conducted at Kadompe Restaurants on Maahas Coast in Luwuk City, it was found that 14 restaurants (53.8%) had non-eligible waste sorting with a high level of fly density. This was due to some restaurant owners did not separate organic and inorganic waste

Waste in the form of leftover vegetables, leftover food, and fish bones was usually separated and then thrown into the sea, while waste consisting of plastic food, drink bottles, unused leftover food ingredients and dry leaves was wrapped in plastic to make it easier for restaurant managers to throw it in the trash before being transported by waste collectors. There were other restaurants that did not perform waste sorting, where organic and inorganic waste were combined. This led to waste mixing and decomposition which further invited flies to look for food in that place. Based on the Regulation of the Minister of Public Works Number 03/PRT/M/2013, waste may not be mixed again after waste sorting and collection because this can be a means of breeding for vectors such as flies[17].

The study finding is in line with a study conducted by Octavianingsih (2022) concerning the Relationship between Waste Management and fly density at Pasar Kebayoran Lama Food Stalls, South Jakarta, which showed that there was no relationship between waste sorting and fly density with a p-value of 0.394[18]. Furthermore, a study conducted by Syahputro (2018) concerning the relationship between waste management and fly density in the temporary shelters (TPS) of Madiun City, found that the high density of flies could be due to waste management that tended to have less awareness to waste sorting[19].

Relationship between Waste Containers and Fly Density at Kadompe Restaurants. Waste container referred to in this study was the waste container provided by the managers of Kadompe Restaurants. According to Law no. 18 of 2008 concerning waste management, waste management activities involve waste containers, trash containers which should be made of waterproof material, not easily corroded, have a cover, and be tightly closed. Trash cans that are not covered can make it easier for insect vectors such as flies to come and become a breeding ground for them[13].

Based on the results of the study, it was shown that there was no relationship between waste container and the level of fly density at Kadompe Restaurants. According to observations regarding waste containers, some restaurant managers used plastic trash cans, plastic bags, used paint buckets, cardboard boxes, used fish boxes, and rubber bins, some of which had covers and were tightly closed. However, most of trash cans had no covers and were not covered, thus triggering the presence of flies in such sites. According to the Decree of the Minister of Health of the Republic of Indonesia Number (1098/Menkes/SK/VII/2003), trash cans must be made of water-resistant materials, not easily corroded, have a cover and leftovers of fast-decaying food should use sepcific plastic bags[20].

Based on the results of observation, the high density of flies was caused by the use of non eligible trash containers by the Kadompe Restaurant managers. Most of trash containers used did not have a cover and were not closed, which is one of the triggers for the presence of

flies in such sites. In contrast, eligible waste containers had a low fly density because the restaurant managers put proper waste containers that were watertight, not easily corroded, had a closed lid and were tightly closed.

The study finding is not in line with a study conducted by Octavianingsih (2022) on the Relationship between Waste Management and Fly Density at Pasar Kebayoran Lama Food Stalls, South Jakarta, which showed that there was a relationship between waste containers and fly density with a p-value of 0.033[18]. Furthermore, a study conducted by Afrilia (2017) on relationship between house conditions and fly density around the land showed that waste disposal facilities that were not watertight and not closed could result in a high density of flies[21]. A study conducted by Putri and Dewi (2017) further revealed that 12 pecel tumpang food stalls in Kediri City had a poor trash condition because the trash cans owned by sellers did not have lids, there was no separation of types of waste, and some used plastic bags for waste storage. Open trash can will make it easier for flies and other insects to infest it, besides that it will also cause an unpleasant smell that disturbs the humans live around[22].

A study conducted by Novitry et.al. (2021) showed that there was a significant relationship between trash cans and the level of fly density with a p value of 0.03. The trash cans in several food stalls did not meet the health requirements, since they were not watertight, not covered, dry and wet waste were not separated, and were full of flies because the waste had decomposed. There were also food stalls that didn't have trash cans or the trash was placed in plastic and placed in a certain place continually until there were piles of waste[23].

Relationship between Waste Transportation and fly density at Kadompe Restaurants. The Waste transportation referred to in this study was the transportation of waste at Kadompe Restaurant location carried out by the Environmental Service. According to Law no. 18 of 2008 concerning waste management, waste transportation must be carried out every day or no more than 24 hours and all waste must be removed so that there are no scattered piles of waste that can invite the presence of flies[13].

Based on the results of the study, there was no relationship between waste transportation and the level of fly density at Kadompe Restaurants. According to the results of observations, most restaurants did not transport waste every day and sometimes waste was not completely collected or there was still some left over. Waste transportation schedule was not appropriate for only 3 times a week, and sometimes was late. This situation caused a lot of accumulation of organic waste from the restaurants which can cause unpleasant smell, resulting in a high level of fly density.

CONCLUSION

Based on the results of the study it can be concluded that there was no relationship between waste sorting, container and transportation of with the level of fly density at Kadompe Restaurants on Mahaas Coast. DLH (Environmental Service) agencies should transport waste every day at Kadompe Restaurants located on Maahas coast in Luwuk City.

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CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Kristanti I, Banowati L, Herawati C, Thohir T, Faridasari I. Hubungan pengelolaan sampah dengan tingkat kepadatan lalat di tempat penampungan sementara (TPS). Jurnal Kesehatan. 2021 Jun 22;12(1):9-16.https://doi.org/10.38165/jk.v12i1.230.

2. Yin JH, Kelly PJ, Wang C. Flies as vectors and potential sentinels for bacterial pathogens and antimicrobial resistance: a review. Veterinary Sciences. 2022 Jun 16;9(6):300. https://doi.org/10.3390/vetsci9060300

3. Kanan M. Isolasi dan Identifikasi Biokimiawi Bakteri Patogen pada Saluran Pencernaan Lalat Hijau (Chryzomya megachepala): Isolation and Biochemical Identification of

Pathogenic Bacteria In the Green Flies Digestive Tract (Chryzomya Megachepala). Jurnal Kesmas Untika Luwuk: Public Health Journal. 2019 Jun 30;10(1):31-40. https://doi.org/10.51888/phj.v10i1.6.

4.   Kanan M, Salaki C, Mokosuli YS. Molecular Identification of Bacterial species from Musca domesfica L. and Chrysomya megachepala L. Luwuk City, Central Sulawesi, Indonesia. J Pure Appl Microbiol. 2020;14(2):1595-607. https://doi.org/10.22207/JPAM.14.2.58

5.   Zhang Y, Li J, Ma Z, Shan C, Gao X. Multiple mutations and overexpression of the MdaE7 carboxylesterase gene associated with male-linked malathion resistance in housefly, Musca domestica (Diptera: Muscidae). Scientific Reports. 2018 Jan 9;8(1):224. https://doi.org/10.1038/s41598-017-17325-x.

6.   Zhou SX, Wang LP, Liu MY, Zhang HY, Lu QB, Shi LS, Ren X, Wang YF, Lin SH, Zhang CH, Geng MJ. Characteristics of diarrheagenic Escherichia coli among patients with acute diarrhea in China, 2009–2018. Journal of Infection. 2021 Oct 1;83(4):424-32. https://doi.org/10.1016/j.jinf.2021.08.001

7.   Khan JR, Hossain MB, Chakraborty PA, Mistry SK. Household drinking water E. coli contamination and its associated risk with childhood diarrhea in Bangladesh. Environmental Science and Pollution Research. 2022 May;29(21):32180-9. https://doi.org/10.1007/s11356-021-18460-9

8.   Husin, H. Identifikasi Kepadatan Lalat Di Perumahan Yang Berada Di Tempat Pembuangan Akhir (TPA) Sampah Air Sebakul Kecamatan Selebar Kota Bengkulu. Journal of Nursing and Public Health, 2018; 5(1):80-7. https://doi.org/10.37676/jnph.v5i1.603.

9.   Magdalena, A. Mekanisme Penularan Penyakit oleh Lalat. Jakarta: Sehati Intermedia; 2019.

10. Andiarsa D. Lalat: Vektor yang Terabaikan Program?. Balaba: Jurnal Litbang Pengendalian Penyakit Bersumber Binatang Banjarnegara. 2018 Dec 14:201-14. https://doi.org/10.22435/blb.v14i2.67.

11. Kementerian Kesehatan. Permenkes No. 50 Tahun 2017 Tentang Standar Baku Mutu Kesehatan Lingkungan Dan Persyaratan Kesehatan Untuk Vektor Dan Binatang Pembawa Penyakit Serta Pengendaliannya. Ber Negara Republik Indones. 2017.

12. Wulandari DA, Saraswati LD, Martini M. Pengaruh Variasi Warna Kuning Pada Fly Grill Terhadap Kepadatan Lalat (Studi Di Tempat Pelelangan Ikan Tambak Lorok Kota Semarang) Effect Of Variation The Color Yellow On Fly Grill To Density Of Flies (Study At Fish Ouction Place Tambak Lorok Semarang Cit. Jurnal Kesehatan Masyarakat. 2017 Dec 13;3(3):130-40.

13. Presiden Republik Indonesia. Undang-undang (UU) tentang Pengelolaan Sampah. 2008.

14. Kasiono, AM., Umboh, JM., & Boky, H.B. Hubungan Antara Sanitasi Dasar Dengan Tingkat Kepadatan Lalat Di Rumah Makan Pasar Tuminting Kota Manado. 2016; 1-10

15. Wardaningrum E. Tingkat Kepadatan Lalat Di Sekolah Menengah Atas Negeri (SMAN) Wilayah Kabupaten Madiun Oleh : Ervianwardaningrum Peminatan Kesehatan Lingkungan Program Studi S1 Kesehatan Masyarakat Stikes Bhakti Husada Mulia Madiun. 2019;

16. Saryono A. Metodologi penelitian kualitatif dalam bidang kesehatan. Yogyakarta: Nuha Medika. 2010.

17. Menteri Pekerjaan Umum Republik Indonesia. Permen PU Nomor 3/PRT/M/ 2013 tentang Penyelenggaraan Prasarana dan Sarana Persampahan dalam Penanganan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga. Permen PU Nomor 3/PRT/M/ 2013 [Internet]. 2013;Nomor 65(879):2004–6. Available from: https://peraturan.bpk.go.id/Home/Details/144707/permen-pupr-no-03prtm2013-tahun-2013

18. Octavianingsih L. Hubungan Pengelolaan Sampah dengan Kepadatan Lalat di Warung Makan

Pasar Kebayoran Lama, Jakarta Selatan Tahun 2022. Skripsi, 2022.

19. Syahputro AS. Hubungan Pengelolaan Sampah Dengan Tingkat Kepadatan Lalat di Tempat Penampungan Sementara (TPS) Kota Madiun. Skripsi, 2018.

20. Kepmenkes Republik Indonesia Nomor 1098/MENKES/SK/VII/2003 tentang Persyaratan Hygiene Sanitasi Rumah Makan dan Restoran.

21. Afrilia EN, Wispriyono B. Hubungan Kondisi Rumah dan Kepadatan Lalat di Sekitar Tempat Pembuangan Akhir Sampah. Jurnal Fakultas Kesehatan Masyarakat. 2017;11(2):99-104.

22. Putri GG & Dewi, Y. K. Praktik Higiene Perorangan dan Sanitasi Warung Pecel Tumpang di Kota Kediri. Jurnal Ilmu Kesehatan Masyarakat, 2017;13(2):155-162.

23. Novitry F, Lilia D, Harto T. Analisis Hubungan Sanitasi Dasar Dengan Angka Kepadatan Lalat Pada Warung Makan Di Pasar Atas Baturaja Tahun 2021. Journal Of Safety And Health. 2021 Dec 1;1(2):19-28.

Original Article

Analysis on the Utilization of Digital Application as the Covid-19 Mitigation Effort

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ABSTRACT

Covid-19 has an obvious impact on people's lives. Therefore, the government continues to make efforts to suppress and reduce the negative impacts. One of the efforts being made is to develop the pedulilindungi application to make it easier to track Covid-19 cases. However, the problem that occurs is the lack of utilization of the pedulilindungi application by the public. This study aims to analyze the effect of technology acceptance and technology readiness on the level of utilization of the pedulilindungii application as a Covid-19 mitigation effort. This was a quantitative study with a survey method. This study was conducted from June to August 2022. The population in this study were lecturers, staffs and students within the Muhammadiyah University of Sidenreng Rappang as many as 3394. The study samples were selected using random sampling technique with a target of 358 respondents. Data were collected using a questionnaire based on the technology readiness index (TRI) to assess the level of technology readiness and the Technology Acceptance Model (TAM) to assess the level of technology acceptance. Furthetmore, the data were analyzed using Path Analysis to determine the direct effect and variables of Technology Acceptance and Technology Readiness on mitigation effort, as well as the indirect effect through perception towards the Covid-19 policy. The study results showed that the values of the direct effect of Technology Acceptance and Technology Readiness variables on mitigation efforts were 0.228 and 0.095, respectively, while the indirect effect through the perception towards Covid-19 policy perception were 0.479 and 0.115, respectively. Thus, it was revealed that there wolud be an increase in the effect of Technology Acceptance and Technology Readiness on mitigation efforts if they were supported by government policies. It can be concluded that Technology Acceptance and Readiness had a significant effect on mitigation efforts through the use of the Pedulilindungi application supported by perception towards the Covid-19 policy.

Keywords : User Perception, Pedulilindungi, Mitigation, Covid-19.

INTRODUCTION

Corona virus disease 2019 (COVID-19) was discovered in December 2019 in Wuhan, China. Then, in a very short time, the virus spread globally. As of March 2022, data showed that more than 520 million people have contracted COVID-19 and more than 4 million people have died due to the disease. COVID-19 is an acute respiratory disease characterized by persistent cough, high fever and shortness of breath. The rapid spread of COVID-19 prompted the World Health Organization (WHO) to declare a pandemic. Many healthcare systems around the world have been affected and challenged by the large number of patients who require medical care[1]. According to WHO data as of 13 September 2022, there were more than 605 million confirmed cases of Covid-19 and more than 6 million deaths. Since Covid-19 was declared a global pandemic, the number of cases has fluctuated, reaching a statistical peak

of 14 million daily cases in mid to late January 2022. At the end of January 2021, there were over 15,000 deaths documented daily, the highest number ever recorded. the United States occupied the highest number of positive cases of Covid-19, which reached over 93 million cases, with the highest number of cases occurring on January 10, 2020 when more than 5 million daily cases was reported[2].

In 2020, the Singapore government implemented three mitigation measures against the pandemic disaster: quality of health services, government legitimacy, and community social capital[3]. In Indonesia, one of the models for managing pandemic problems is the pentahelix approach, namely the involvement of various elements, such as government, business people, academics, communities and the media[4].

Mitigation effort for the spread of COVID-19 cases can be performed in various ways, some of them are tracing, tracking and warning[5,6]. Previous study showed that digital technology, such as contact tracing application and the use of social media, were very useful in efforts to prevent and monitor Covid-19 cases[7]. Therefore, the existence of digital-based applications such as Pedulindungi needs to be utilized optimally, because in addition to tracking cases, this application also provides vaccination and consulting services so as to implement efforts to accelerate the management of the pandemic properly.

Based on a study conducted in Japan, an effort to mitigate COVID-19 were carried out by disseminating information related to social distancing, wearing masks and washing hands. Information dissemination was carried out through social media, television media, as well as in public places such as train stations and airports. In addition, restriction on working hours was also carried out to reduce contact that might cause transmission of COVID-19[8].

Digitization in the field of health services is an effort made to expand the affordability of services and make it easier for service users to contact health service providers[9]. Digital transformation in the health sector is an opportunity as well as a challenge for health professionals and for patients themselves[10]. The need for large amounts of health data and information requires sophisticated technology in managing it so that the results will be more accurate. The need for fast and accurate information flow is a demand that arises in the

relationship between patients and health care providers[11]. European countries such as Austria have used the Electronic Heat Record Act (HER-Act) since 2012. Moreover, people in Belgium have been using BeHealth since 2004, which is a system that processes electronic information related to the field of health services[12].

Digitization of the health service sector in Indonesia has been experienced since the Covid-19 pandemic hit the world. The need for data and information related to the spread of the disease is very important. The government then launched the pedulilindungi application with the aim of controlling the spread of Covid-19 cases. The existence of this application has goals and benefits for both the government and the people. This application can be a means of controlling the implementation of Social Distancing in public spaces, tracking indicated communities, tracing patterns of distribution, input for policy making as well as a means of consulting through teledoctor services. Meawhile at the community side, this application can provide information on the case distribution zones, so that the users can avoid areas that are prone to Covid-19 cases[13].

The current health service challenge is the need to improve service quality at a low cost. One of the triggers is the advancement of information and communication technology[14]. Therefore, the government through the Ministry of Health and the Ministry of Communication and Informatics developed the pedulilindungi Application as a tool used in tracking so that the spread of cases can be controlled[15]. Based on information obtained on the www.pedulilindungi.id page, the pedulilindungi application was developed in order to make it easier for the government to track Covid-19 cases. This application also requires community participation in awareness of sharing location so that contact history with sufferers can be done easily. The public can get notifications from the application if they are in the red zone of the Covid-19 case.

Several previous studies regarding the pedulilindungi application found that such application was still not ready to operate massively and there were also many problems resulting from the use of the application which was contrary to applicable national law[10]. Another study found that pedulilindungi application had not fully implemented the principles of personal data protection when

collecting, processing and storing personal data[16]. Information security is very necessary to protect personal information and data from unauthorized misuse[17]. It was previously found that the ease of use of the pedulilindungi application had a significant effect on its usability and attitude in using it. Furthermore, attitude in the use and usability of the pedililindungi application had a significant effect on the intention to use it[18]. Based on findings of previous studies, this study aims to analyze the effect of technology acceptance and technology readiness on the level of acceptance of the pedulilindungi application as a Covid-19 mitigation effort.

METHOD

This was a quantitative study with a survey. Information regarding the perception of the Pedulilindungi application as an effort to mitigate the Covid-19 infection were collected from respondents. The study was conducted at Muhammadiyah Sidenreng Rapang University for three months from June to August 2022. The study population consisted of 3,394 lecturers, staffs, and students at Muhammadiyah University of Sidenreng Rappang. A target sample of 358 individuals was selected using the random sampling method and the Slovin sample formula[19].

The initial stage of this study was identification of problems that existed in society as actual problems and a literature study was further conducted to find problems and theoretical gaps for further research. Based on the results of the literature study, a conceptual framework related to the study problem to be studied was developed. After that, the researcher determined the study variables, study hypotheses and research questions as the focus of problem solving. An appropriate study design was developed in order to achieve the study objectives. The study samples that represented the population were further selected. Data were collected using instrument that had previously been tested for validity and reliability so that then it could actually be applied to assess variables validly. After the data were collected, data analysis was carried out and finally conclusions were made.

The researcher applied a questionnaire as a data collection instrument in this study. Such instrument consisted of several questions to assess existing variables. The SPSS application was used to analyze the data that hac been collected thorugh the path analysis method with a significant value of α<0.05. Path analysis was used to determine the relationship between variables that had been determined by the researcher. The independent (exogenous) variables were Technology Acceptance and Technology Readiness, which were analyzed to determine the direct effect on the dependent variable (mitigation effort) as well as the indirect effect through the mediator variable (Covid-19 policy).

RESULTS
Table 1. General Characteristics of Respondents.

Variable	Respondent (n=358)	Percentage (%)
Gender		
Male	165	46
Female	193	54
Position		
Student	223	62
Staff	43	12
Lecturer	84	24
Other	8	2
Age (Years)		
17 to 25	217	61
26 to 35	72	20
36 to 45	48	13
46 to 55	17	5
56 to 65	4	1
Education		
JHS	2	1
SHS	233	65
Bachelor Degree	36	10
Master's Degree	73	20
Doctoral Degree	14	4

Table 1 describes the general characteristics of a total of 358 respondents. The distribution of respondents by gender showed that 165 respondents (46%) were male was and 193 respondents (54%) were female. Furthermore, the distribution of respondents by position showed that 223 respondents (62%) were students, 43 respondents (12%) were staffs, 84 respondents (24%) were lecturers, and 8 respondents (2%) had other professions. The distribution of respondents by age showed that 217 respondents (61%) aged 17 to 25 years, 72 respondents (20%) aged 26 to 35 years, 48 respondents (13%) aged 36 to 45 years, 17 respondents (5%) aged 46 to 55 years, and 5 respondents (1%) aged 56 to 65 years.

Table 2. Effect of Technology Acceptance and Technology Readiness on Perception towards Covid 19 Policy.

Model	Standardized Coefficients	Sig.	R Square
	Beta		
Technology Acceptance	0.694	0.000	
Technology Readiness	0.166	0.000	0.677

Based on table 2, it was revealed that Technology Acceptance variable obtained a significance value of 0.000 (<0.05). So, it can be concluded that the Technology Acceptance variable had a significant effect on the perception towards Covid-19 policy with an effect size of 0.694. On the other hand, the Technology Readiness variable obtained a significance value of 0.00 (<0.05). Thus, Technology Readiness also had a significant effect on perception towards the Covid-19 policy with an effect size of 0.166. It was obtained an R Square value of 0.677. Thus, it can be interpreted that the contribution of Technology Acceptance and Technology Readiness variables to the use of Pedulilindungi application was 66.7%.

Table 3. Coefficient Value of the Effect of Technology Acceptance, Technology Readiness and Perception towards Covid-19 Policy on Covid-19 Mitigation Effort.

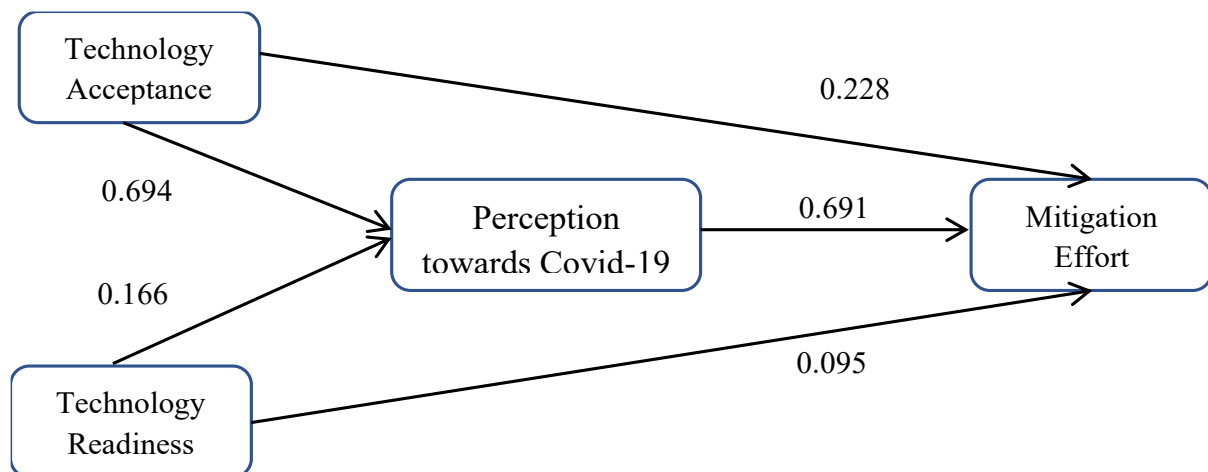| Model	Standardized Coefficients	Sig.	R Square
	Beta		
Technology Acceptance	0.694	0.000	
Technology Readiness	0.166	0.000	0.677

Figure 1. Path Diagram of the Effect of Technology Acceptance, Technology Readiness and Perception towards Covid-19 Policy on Covid-19 Mitigation Effort

Table 4 revealed that the significance value of the technology acceptance variable was 0.00 (<0.05). Thus, it can be concluded that the Technology Acceptance variable had a significant effect on the mitigation effort variable with a practical value of 0.228. Furthermore, the significance value of the Technology Readiness variable was 0.00 (<0.05), which meant that the Technology Readiness variable also had a significant effect on the mitigation effort variable with an effect size of 0.095. The significance value of the Perception towards Covid-19 Policy variable was 0.00 (<0.05), which meant that the Perception towards Covid-19 Policy variable also had a significant effect on the mitigation effort variable with an effect size of 0.691. Figure 1 presented an R Square value of 0.915. Thus, it can be interpreted that the contribution of the Technology Acceptance, Technology Readiness, and Perception towards Covid-19 policy variables on mitigation effort was 91.5%.

Based on the results of the regression test analysis, it was determined a Path Analysis which showed the effect of Technology Acceptance, Technology Readiness and Perception towards Covid-19 policy on Covid-19 Mitigation Effort as shown in Figure 1.

Figure 1 showed that the size of the direct effect of the Technology Acceptance variable on the Covid-19 mitigation effort variable was 0.228. The indirect effect of the Technology Acceptance variable on the mitigation effort variable through the perception towards Covid-19 policy variable was 0.694 x 0.691 = 0.479. Based on the results of this interpretation, it can be seen that the direct effect value was lower than the indirect value. Thus, it can be concluded that indirectly technology acceptance through perception towards Covid-19 policy had a significant positive effect on Covid-19 mitigation effort.

DISCUSSION

This study found that Technology Acceptance or the level of acceptance of the Pedulilindungi application and Technology Readiness had a significantly effect on Covid-19 mitigation effort through the Covid-19 policy. In addition, we might see that the level of technology acceptance towards the pedulilindungi application could directly affect the community's efforts to mitigate Covid-19, even though the result was small. Thus, we can conclude that digital technology was used to mitigate Covid-19 through the policy or rules set by the government.

The results of this study are in line with previous study which found that digital technology had a vital role to play during a pandemic but required strong policy so as to create effective contribution[20]. Another study conducted in Vietnam showed that a fast, proactive and practical policy system contributed to the successful management of Covid-19[21]. Thus, the effective application of digital technology as a Covid-19 mitigation effort requires the establishment of solid policy. People will take advantage of digital technology as a Covid-19 mitigation effort if the government stipulates regulations that encourage the use of applications. For example, the government requires the use of the pedulilindungi application when traveling by air.

Digital technology in health services has developed rapidly since the Covid-19 pandemic, developing various applications and functions for controlling Covid-19[1,22]. Digital technology has proven to be used as a coordinating medium to respond to the spread of Covid-19 cases in all existing health facilities. Some examples of the use of technology in the Covid-19 management were robotic systems in medicine, aerial drones, and the use of the internet in managing and detecting cases. One of the important steps in the medical treatment of Covid-19 is the PCR test and medical imaging. A previous study proved that Computed Tomography had a PCR test accuracy of 98%. Thus this technology becomes an innovation and an opportunity to deal with Covid-19 effectively[23,24]. Therefore, the success of Digital Health in managing this pandemic will become the basis for the development of the health system in the future[25].

Digital technology during this pandemic is vital, especially in diagnosing or detecting cases early, making it more effective and efficient[26,27,28,29], since the use of technology can increase the effectiveness of cases finding and tracing[30,31]. Various features and facilities are available in the Pedulilindungi application to track and trace cases. This tracking feature aims to track location digitally so that if a user is detected to be exposed to Covid-19, related parties can track and detect the user's movements in the last 14 days. In

addition, this application will also provide notifications if the user is in a zone or area that is at risk of being exposed.

The use of digital application as a mitigation effort is also influenced by the level of technology acceptance and technology readiness. The higher the level of acceptance, the greater the opportunity for a technology or application to be used by its users. The result of this study is in accordance with a study conducted by Kurniawati (2020) which found that the ease of use of the pedulilindungi application technology affected the level of use and user attitudes[32]. Another study found that there was a significant relationship between ease of use and attitudes in using online learning applications[18]. Thus, the development of a digital application must consider the user's perspective[33].

CONCLUSION

Based on the results of the study, it can be concluded that Technology Acceptance and Technology Readiness of the pedulilindungi application had a significant direct as well as indirect effects on Covid-19 mitigation effort with Covid-19 policy as a mediator variable. The indirect effect was more significant than the direct impact. Therefore, the successful implementation of mitigation efforts requires the implementation of strong and effective policy so that the community can be more compliant and the pandemic can be controlled. The pedulilindungi application developer should continue to improve the quality of the application according to user needs. In addition, government has to develop strong policy which may lead to effective policy implementation.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCE

1. Alghamdi NS. The Role of Digital Technology in Curbing COVID-19. Int J Environ Res Public Health. 2022;19(14).

2. WHO. WHO Coronavirus (COVID-19) Dashboard [Internet]. 2022. Available from: https://covid19.who.int/?mapFilter=cases

3. Hennida C. The Success of Handling COVID-19 in Singapore: The Case of the Migrant Worker Cluster and the Economic Recession. J Glob Strateg. 2020;14(2):241.

4. Ardiansyah Fikky, Pradana GW. kolaborasi Model Pentahelix dalam upaya penanganan bencana wabah Covid-19 di Kabupaten Bojonegoro. J Publika. 2021;9(4):545–60.

5. Putri CE, Hamzah RE. Aplikasi Pedulilindungi Mitigasi Bencana Covid-19 Di Indonesia. J Pustaka Komun. 2021;4(1):66–78.

6. Yusuf I, Sarkinfada F. Commentary Gaps in the implementation of COVID-19 mitigation measures could lead to development of new strains of antimicrobial resistant pathogens : Nigerian perspective. 2021;

7. Golinelli D, Boetto E, Carullo G, Nuzzolese AG, Landini MP, Fantini MP. Adoption of Digital Technologies in Health Care During the COVID-19 Pandemic: Systematic Review of Early Scientific Literature. J Med Internet Res. 2020 Nov 6;22(11):e22280–e22280.

8. Aryanto B. Characteristics of Directive Speech Acts in the Dissemination of COVID-19 Mitigation Information in Japan. Japanese Res Linguist Lit Cult. 2020;3(1):13–26.

9. Holt KA, Karnoe A, Overgaard D, Nielsen SE, Kayser L, Røder ME, et al. Differences in the level of electronic health literacy between users and nonusers of digital health services: An exploratory survey of a group of medical outpatients. Interact J Med Res. 2019 Apr;8(2).

10. Dratva J, Juvalta S, Gemperle M, Händler-Schuster D, Scheermesser M, Klamroth-Marganska V. Digital health literacy of health care profession students. Eur J Public Health. 2019 Nov 1;29(Supplement_4):ckz185.069.

11. Mehta S, Grant K, Ackery A. Future of blockchain in healthcare: potential to improve the accessibility, security and interoperability of electronic health records. BMJ Heal Care Informatics. 2020 Nov 23;27(3):e100217.

12. Said S, Samsualam, Batara AS. Efektivitas Sistem Berbasis Data Terkomputerisasi pada Pelayanan Rawat Jalan (Studi Kasus di Puskesmas Barukku Kab. SIDRAP). J Ilm Kesehat Diagnosis. 2019 Jan 29;13(6 SE-):618–21.

13. Maharani AP, Rivai M, Sugianti S, Fauzi RA, Ningsih S, Lailiya U, et al. Literasi Digital : Efektifitas Aplikasi Pedulilindungi dalam Memberikan Informasi pada Mahasiswa FIP UPI. 2021;3(2):2–7.

14. Gopal G, Suter-Crazzolara C, Toldo L, Eberhardt W. Digital transformation in healthcare – architectures of present and future information technologies. Clin Chem Lab Med. 2019 Feb 25;57(3):328–35.

15. Haerani E, Rahmatulloh A. Analisis User Experience Aplikasi Peduli Lindungi untuk Menunjang Proses Bisnis Berkelanjutan. SATIN - Sains dan Teknol Inf. 2021;7(2):1–10.

16. Pratama AM, Pati UK. Analysis Principles of Personal Data Protection on COVID-19 Digital Contact Tracing Application: PeduliLindungi Case Study. Lex Sci Law Rev. 2021;5(2):65–88.

17. Andani SR. Analysis of Information Security in Data Leaks in The PeduliLindungi Application. Int J Informatics Comput Sci. 2021;5(3):246–9.

18. Kusumadewi AN, Lubis NA, Prastiyo R, Tamara D. Technology Acceptance Model (TAM) In The Use of Online Learning Applications During The Covid-19 Pandemic For Parents of Elementary School Students. Edunesia J Ilm Pendidik. 2021;2(1):272–92.

19. Tejada JJ, Punzalan JRB. On the Misuse of Slovin ' s Formula. 61(1):129–36.

20. Bayram M, Springer S, Garvey CK, Vural O. COVID-19 Digital Health Innovation Policy : 2020;24(8):460–9.

21. Le T anh T, Vodden K, Wu J. Policy Responses to the COVID-19 Pandemic in Vietnam. 2021;

22. Scott BK. Advanced digital health technologies for COVID-19 and future emergencies. Telemed e-Health. 2020;26(10):1226–33.

23. Alhasan M, Hasaneen M. Computerized Medical Imaging and Graphics Digital imaging , technologies and artificial intelligence applications during COVID-19 pandemic. Comput Med Imaging Graph [Internet]. 2021;91(May):101933. Available from: https://doi.org/10.1016/j.compmedimag.2021.101933

24. Barrat A. Effect of manual and digital contact tracing on COVID-19 outbreaks: A study on empirical contact data. J R Soc Interface. 2021;18(178).

25. Dehbi ZEO. Moroccan Digital Health Response to the COVID-19 Crisis. Front Public Heal. 2021;9.

26. Pagliari C. Digital health and primary care : Past , pandemic and prospects. 2021;11:1–9.

27. Han JK, Al-khatib SM, Albert CM. Changes in the digital health landscape in cardiac electrophysiology : A pre- and peri-pandemic COVID-19 era survey. Cardiovasc Digit Heal J [Internet]. 2020;2(1):55–62. Available from: https://doi.org/10.1016/j.cvdhj.2020.12.001

28. Eruchalu CN, Pichardo MS, Bharadwaj M, Carmen B. The Expanding Digital Divide : Digital Health Access Inequities during the COVID-19 Pandemic in New York City. 2021;183–6.

29. Smm R, Sm H, Mu J. Digital Health During COVID-19 Pandemic and Beyond. 2020;66–7.

30. Nachega JB, Atteh R, Ihekweazu C, Sam-agudu NA, Adejumo P, Nsanzimana S. Perspective Piece Contact Tracing and the COVID-19 Response in Africa : Best Practices ,

Key Challenges , and Lessons Learned from Nigeria , Rwanda , South Africa , and Uganda. 2021;104(4):1179–87.

31. López JAM, García BA, Bentkowski P, Bioglio L, Pinotti F, Boëlle P yves, et al. Anatomy of digital contact tracing : Role of age, transmission setting, adoption, and case detection. 2021;(April):1–12.

32. Kurniawati, Khadapi M, Riana D, Arfian A, Rahmawati E, Heriyanto. Public Acceptance of Pedulilindungi Application in the Acceleration of Corona Virus (Covid-19) Handling. J Phys Conf Ser. 2020;1641(1).

33. Tanjung MR, Parsika TF, Interaktif P, Pustaka K. Pengembangan Aplikasi Multimedia Pengenalan Dan Pembelajaran Origami Dengan Pendekatan ADDIE. 2014;3:128–33.

Original Article

Relationship between Knowledge, Attitude and Anxiety with the Implementation of Health Protocols among Food Vendors at the UMS Campus Environment

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ABSTRACT

Food vendors are a group that is prone to contracting Covid-19 because they are still selling foods during a pandemic which can be a source of contamination through droplets or touching surfaces affected by droplets. Food vendors who do not implement health protocols are very vulnerable to being infected with Covid-19 which can further infect other people. This study aims to determine the relationship between knowledge, attitude and anxiety with the implementation of health protocols among food vendors at the UMS campus environment. This was an analytical observational study with a cross sectional approach. The current study was conducted at the Suherman Medical University (UMS) campus Environment, Pasir Gombong area, Bekasi District, from September to November 2021. The population in this study involved food vendors in the Pasir Gombong area with a sample size calculated using the Lemeshow formula which obtained 64 food vendors. The samples were selected using accidental sampling technique. Data collection was conducted by enumerators through interviews using questionnaires and observations. Data were analyzed using Chi-Square test, fisher's exact and logistic regression to determine the relationship between each variable. Furthermore, multivariate analysis was applied using the logistic regression test. The results of the study showed that there was a significant relationship between anxiety and implementation of health protocols with a p-value of 0.024 and OR=11.7 (1.214–113.3), between knowledge and implementation of health protocols with a p-value of 0.001 and OR= 6.3 (1.937–20.880); between attitude and implementation of health protocol with a p-value of 0.000 and OR=8.6 (2.579-29.126). It can be concluded that knowledge, attitude and anxiety had a significant relationship with the implementation of health protocols among food vendors. Continuous education can be an effort to prevent health problems.

Keywords : Knowledge, Attitude, Anxiety, Health Protocols, Food Vendors.

INTRODUCTION

A food vendor is someone who sells food every day to meet people's demands. Implementation of health protocols among food vendors is an effort to prevent the spread of COVID-19 which can occur through droplets or by touching the surface of objects affected by droplets. According to a study conducted by Kuntardjo in 2020, it was found that there were still many people who did not comply with certain protocols such as applying physical distance, washing hands and using masks properly[1]. If such practices are continuously performed, there will be worse spread of Covid-19 infection as well as food contamination. One way of to prevent the spread of Covid-19 infection is through implementation of health protocols related to washing hands after handling objects or surfaces before touching face, wearing masks and applying physical distance [2].

Based on WHO data, Indonesia was ranked 5th in the world with the highest positive

cases of Covid-19. Meanwhile, according to data derived from the Indonesian Ministry of Health, West Java was the 2nd highest Province in Indonesia for the prevalence of positive cases of Covid-19 with the highest number of cases being in the vulnerable age group of 31-45 years. One of the Government's efforts to reduce the spread of Covid-19 cases is through the Decree of the Minister of Health concerning sanitation hygiene requirements in restaurants regarding the implementation of the Covid-19 protocols in services, provision of a place to wash hands with soap, etc. This policy is an effort to prevent the spread of Covid-19 in public dining areas [3].

The implementation of health protocols among food vendors is very important to prevent contamination through direct droplets or droplets on the surface of objects. In addition, bacterial contamination in foods can cause further health problems among customers/community. Based on the results of initial observation, many food vendors in the Suherman Medical University (UMS) environment did not implement the Covid-19 protocols. If such practice is not followed up well, it can become a source of contamination that can spread to other people. the UMS area was selected as the study site since it is located in an industrial environment and close to a hospital which could be crowded with people and students.

Based on the description above, the author is interested in conducting a study on the relationship between knowledge, attitude and anxiety with the implementation of health protocols among food vendors in the UMS campus environment.

METHOD

This was an analytical observational study with a cross sectional approach. The current study was conducted from September to November 2021 at the UMS Campus Environment, Pasir Gombong area, Bekasi District. The population in this study involved food vendors in the Pasir Gombong area with a sample size calculated using the Lemeshow formula which obtained 64 food vendors. The samples were selected using accidental sampling technique. The study site was the UMS campus environment, namely the UMS campus canteen and around the UMS campus in the Pasir Gombong area. The study applied a relationship approach between the dependent variable and the independent variable. The dependent variable in this study was the behavior of implementing health protocols and the independent variables were knowledge, attitude and anxiety. Data collection was carried out based on the results of interviews and observations among food vendors using a study questionnaire that had been previously used in other studies. The contents of the questionnaire were related to knowledge, attitude and anxiety of food vendor, which were assessed based on the questionnaire provided. Data were analyzed using Chi-Square test, fisher's exact and logistic regression processed in SPSS 24 program. Furthermore, multivariate analysis was applied using the logistic regression test.

Table 1. Characteristics of Respondents

Variable	n= 64	%
Gender		
Male	31	48.4
Female	33	51.6
Age		
Young (≤ 25 years old)	7	10.9
Adult (> 26 years old)	57	89.1
Level of Education		
High (SHS-College)	31	48.4
Low (Elementary - JHS)	33	51.6
Marital Status		
Unmarried	16	25.0
Married	48	75.0
Years of Service		
< 3 years (New)	47	73.4
≥ 3 years (Old)	17	26.6
Type of Canteen		
UMS Canteen	6	9.4
Roadside stall	58	90.6
Anxiety		
Yes	59	92.2
No	5	7.8

Source: Primary Data in 2021

Table 1 shows a description of characteristics of the respondents reagrding gender, age, level of education, marital status and type of canteen. Based on the results of the univariate test, it was shown that the total sample of this study was 64 people which was dominated by 33 female vendors (51.6%), while the remaining 31 people (48.4%) were male vendors. Most of the food vendors in this study were adults aged >26 years old, as many as 57 people (89.1%). Furthermore, most of respondents had low level of education as many as 33 people (51.6%); were married as many as

48 people (75.0%). 6 people (9.4%) were food vendors in the UMS canteen and 58 people (90.6%) were food vendors around UMS (Pasir Gombong area). Most of food vendors involved here were anxious about the Covid-19 pandemic, as many as 59 people (92.2%).

Table 2. Relationship between characteristics of the respondents and the implementation of health protocols.

Characteristic	Implementation of health protocols				p-value
	Complied		Didn't Comply		
	n	%	n	%	
Gender					
Male	23	51.1	8	42.1	0.510
Female	22	48.9	11	57.9	
Age					
Young (≤ 25 years)	7	100	0	0.0	0.094
Adults (> 26 years)	38	66.7	19	33.3	
Level of Education					
High (SHS-College)	25	80.6	6	19.4	0.080
Low (Elementary - JHS)	20	60.6	13	39.4	
Marital Status					
Unmarried	10	22.2	6	31.6	0.530
Married	35	77.8	13	68.4	
Type of Canteen					
UMS Canteen	5	11.1	1	5.3	0.660
Roadside stall	40	88.9	18	94.7	
Years of Service					
< 3 years (New)	37	82.2	10	52.6	0.014*
≥ 3 years (Old)	8	17.8	9	47.4	

Table 2 shows the relationship between characteristics of the respondents and the implementation of health protocols. Based on the table, it was revealed that there was a significant relationship between years of service and implementation of health protocols with a p-value of 0.014 and OR = 4.168 (1.278 – 13.561). Such finding indicated that people with years of service of <3 years were 4.163 times more compliant in implementing health protocols compared to those with years of service of ≥ 3 years.

Table 3. Relationship between knowledge, attitude and anxiety with the implementation of health protocols.

Relationship	Implementation of health protocols				p-value	OR (95%CI)
	Complied		Didn't Comply			
	n	%	n	%		
Knowledge						
Good	37	82.2	8	42.1	0.001*	6.3
Poor	8	17.8	11	57.9		(1.937 – 20.880)
Attitude						
Positive	36	80.0	6	31.6	0.000*	8.6
Negative	9	20.6	13	68.4		(2.579 – 29.126)
Anxiety					0.024**	11.7
Yes	44	97.8	15	78.9		(1.214 – 113.3)
No	1	2.2	4	21.1		

Table 3 shows the relationship between knowledge, attitude and anxiety with the implementation of health protocols. Based on the table, it was revealed that there was a significant relationship between knowledge and compliance with the implementation of Covid-19 protocols with a p-value of 0.001 and OR=6.359 (1.937 – 20.880). Furthermore, relationship between attitude and compliance with the implementation of Covid-19 protocols obtained a p-value of 0.000 and OR=8.667 (2.579-29.126), and relationship between anxiety of food vendors with the implementation of Covid-19 protocols obtained a p-value of .024 and OR=11.73 (1.214 – 113.3).

Table 4. Multivariate Analysis.

Variable	B	Sig (p-value)	Exp (B)	95% CI
Attitude	1.7	0.010	5.5	1.505-20.665
Knowledge	1.1	0.081	3.2	0.863- 12.486

DISCUSSION

Knowledge

Implementation of the protocols is highly recommended for food vendors as an effort to prevent transmission of Covid-19, namely by using masks, washing hands with soap/hand sanitizer, applying physical distance, reducing mobilization and avoiding crowds. The study finding showed that there was a significant relationship between knowledge, attitude, anxiety and years of service with the implementation of health protocols. People who had good knowledge could increase compliance with the implementation of the Covid-19 protocol 6.3 times compared to those had poor knowledge. Such finding is in line with a study conducted by Syadidurrahman which found that people who had good knowledge had the opportunity to apply physical distancing 1.7 times better than those who had poo knowledge [4]. Another supporting study conducted by Tetartor et al (2021) found that health protocols ignorance of food vendors wsa due to poor knowledge about COVID-19 [5]. Several studies also revealed that there was a significant relationship between knowledge and the use of masks during the COVID-19 pandemic [6,7].

Attitude

In addition to knowledge, attitude also had a significant relationship with the implementation of health protocols with a p value of 0.000. Such finding indicated that people with a positive attitude tended to have compliance with the implementation of health protocols 8.6 times compared to those with a negative attitude. A positive attitude had a significant relationship with the implementation of health protocols [8, 9].

This is supported by several studies which found that knowledge and attitude had a significant relationship with the implementation of health protocols as a preventive effort [9,10,11,12,13].

Another factor that supported the implementation of health protocols was anxiety. Food vendors who were anxious about the pandemic situation and the Covid-19 virus had the opportunity to implement the health protocol 11.7 times compared to those who were not anxious about the pandemic situation. This statement is supported by a study conducted by Sari and Utami which found that there was a relationship between anxiety levels and compliance with health protocol implementation during the Covid-19 pandemic [14]. In addition, according to Laksmi, the high level of public anxiety led to changes in behavior in using masks [15]. The level of anxiety surely affected a person in implementing health protocols recommended by the government [16,17]. In addition to anxiety related to Covid-19 transmission, many people also felt anxious about the economy, social and income [18].

In addition to knowledge, attitude and anxiety, there were also factors related to the implementation of health protocols, namely years of service. In this study, someone with years of service of <3 years had a 4.1 times higher chance of implementing health protocols compared to those years of service of >3 years. Such finding is due to in terms of business development prospects, the 3 year period is a development period wherein certain unwanted things, such as Covid-19 infection, can cause a decrease in business income. Therefore, many food vendors implemented the Covid-19 protocols to prevent unwanted things (Covid-19 infection) which might cause a decrease in

business income. According to Ferdous, there was a significant relationship between income and implementation of health protocols [19].

The results of this study also revealed that a factor that had a strong relationship with the implementation of health protocols was attitude. people with a positive attitude tended to have compliance with the implementation of health protocols 8.6 times compared to those with a negative attitude. Such finding is supported by a study conducted by Rahman which revealed that there was a significant relationship between attitude and implementation of health protocols [20]. Based on the results of this study, it was found that good knowledge and positive attitude could improve a person's behavior in implementing health protocols and there is a need for continuous education towards food vendors.

CONCLUSION

The results of the study indicated that there was a significant relationship between knowledge, attitude, anxiety and years of service (effort) with the implementation of health protocols. Efforts are needed to provide continuous education by the Department of Trade or the Department of Health so that food vendors can implement health protocols during a pandemic. The results of this study can be used as material for further research related to the effect of good knowledge and positive attitude towards health protocols on food safety in food administration.

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CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Kuntardjo N, Sebong PH. Pola Interaksi Dan Kepatuhan Protokol Kesehatan Oleh Pedagang Di Pasar X Kota Semarang: Studi Kualitatif Eksploratif. VITASPHERE [Internet]. 2020 [cited 2023 Feb 16]; Available from: http://repository.unika.ac.id/23194/

2. Ding Y, Du X, Li Q, Zhang M, Zhang Q, Tan X, et al. Risk perception of coronavirus disease 2019 (COVID-19) and its related factors among college students in China during quarantine [Internet]. PLoS ONE. 2020 [cited 2023 Feb 16]. Available from: https://doi.org/10.1371/journal.pone.0237626

3. Kemenkes RI. Keputusan Menteri Kesehatan Republik Indonesia Nomor 1098/MENKES/SK/VII/2003 Tentang Persyaratan Hygiene Sanitasi Rumah Makan Dan Restoran. Inorganica Chim Acta [Internet]. 2003 [cited 2023 Feb 16]; Available from: https://www.kemkes.go.id/index.php

4. Syadidurrahmah F, Muntahaya F, Islamiyah SZ, Fitriani TA, Nisa H. Perilaku Physical Distancing Mahasiswa UIN Syarif Hidayatullah Jakarta pada Masa Pandemi COVID-19. Perilaku dan Promosi Kesehatan: Indonesian Journal of Health Promotion and Behavior [Internet]. 2020 [cited 2023 Feb 16];2(1):29. Available from: https://journal.fkm.ui.ac.id/ppk/article/view/4004/991

5. Tetartor RP, Anjani I, Simanjuntak MR, . D. Faktor-Faktor Yang Berhubungan Dengan Kepatuhan Pedagang Dalam Pelaksanaan Protokol Kesehatan Covid-19 Di Pasar Petisah Kota Medan Sumatera Utara. Jurnal Kesmas Dan Gizi (Jkg) [Internet]. 2021 [cited 2023 Feb 16];3(2):114–22. Available from: https://ejournal.medistra.ac.id/index.php/JKG/article/view/489

6. Fansuri G, Milkhatun. Hubungan Pengetahuan Masyarakat dengan Kepatuhan Penggunaan Masker Sebagai Upaya Pencegahan Covid-19. Borneo Student Research. 2021;4(1):6.

7. Mukhlis SH, Karminingtyas SR. Tingkat Pengetahuan Masyarakat tentang Covid-19 dan Perilaku Masyarakat di Masa Pandemi Covid-19. Indonesian Journal of Pharmacy and Natural Product [Internet]. 2021

[cited 2023 Feb 16];4(2):491–504. Available from: https://jurnal.unw.ac.id/index.php/ijpnp/article/view/1301

8. Okello G, Izudi J, Teguzirigwa S, Kakinda A, van Hal G. Findings of a Cross-Sectional Survey on Knowledge, Attitudes, and Practices about COVID-19 in Uganda: Implications for Public Health Prevention and Control Measures. Biomed Res Int [Internet]. 2020 [cited 2023 Feb 16];2020. Available from: https://www.hindawi.com/journals/bmri/2020/5917378/

9. Natnael T, Adane M, Alemnew Y, Andualem A, Hailu F. COVID-19 knowledge, attitude and frequent hand hygiene practices among taxi drivers and associated factors in urban areas of Ethiopia. PLoS One. 2021;16(8 August):1–19.

10. Reuben RC, Danladi MMA, Saleh DA, Ejembi PE. Knowledge, Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-Central Nigeria. J Community Health. 2021;46(3):457–70.

11. Fitri SY, Syarif H, Nurhidayah I. Hubungan Pengetahuan dan Sikap Mengenai COVID-19 dengan Penerapan Protokol Kesehatan pada Keluarga Pasien. JIM FKep [Internet]. 2022 [cited 2023 Feb 16];IV(23):301–16. Available from: https://jim.usk.ac.id/FKep/article/view/20113

12. Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z. Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-research that is available on the COVID-19 resource centre - including this with acknowledgement of the origin. 2020 [cited 2023 Feb 16];(January). Available from: https://pubmed.ncbi.nlm.nih.gov/32437822/

13. Nirmawati M. Faktor Yang Berhubungan Dengan Penerapan Protokol Kesehatan Pada Pelaku Usaha Mikro Selama masa Pandemi Covid -19 Factors Related to the Implementation of Health Protocols in Micro Business Actors During the Covid -19 Pandemic. 2020 [cited 2023 Feb 16];3:116–25. Available from: https://ojs.unm.ac.id/UEJ/article/viewFile/16210/9377

14. Sari RP, Utami U. Hubungan Kecemasan Dan Kepatuhan Dalam Pelaksanaan Protokol Kesehatan Di Posyandu Malangjiwan Colomadu. Jurnal Stethoscope [Internet]. 2021 [cited 2023 Feb 16];1(2):114–22. Available from: https://ejurnal.stikesmhk.ac.id/index.php/JURNAL_ILMIAH_KEPERAWATAN/article/view/811

15. Laksmini et. al. Tingkat Kecemasan dan Perilaku Protokol Kesehatan pada Mahasiswa di Pulau Jawa pada Masa Pandemi Covid-19. Jurnal Kesehatan Indonesia (The Indonesian Journal of Health) [Internet]. 2021 [cited 2023 Feb 16];XI(3):111–5. Available from: https://journal.stikeshb.ac.id/index.php/jurkessia/article/view/339

16. Hastuti N, Djanah SN. Studi Tinjauan Pustaka: Penularan Dan Pencegahan Penyebaran Covid-19. An-Nadaa: Jurnal Kesehatan Masyarakat [Internet]. 2020 [cited 2023 Feb 16];7(2):70. Available from: https://ojs.uniska-bjm.ac.id/index.php/ANN/article/view/2984

17. Marwanti S, Antriyandarti E. The Effect of Anxiety on Farmers' Compliance in Implementing COVID-19 Preventive Health Protocol in Daily Life: A Case Study in Rural Java. Revista Argentina De Clinica Psicologica. 2020;XXIX:743–52.

18. Yandrizal, Febriawati H, Suryani D, Angraini W, Sarkawi, Sumarni T. Analysis of anxiety and community activities in the covid 19 period in Bengkulu Province. Pakistan Journal of Medical and Health Sciences [Internet]. 2020 [cited 2023 Feb 16];14(4):1885–90. Available from: https://pjmhsonline.com/2020/oct_dec/1885.pdf

19. Ferdous MZ, Islam MS, Sikder MT, Mosaddek ASM, Zegarra-Valdivia JA, Gozal D. Knowledge, attitude, and practice regarding COVID-19 outbreak

in Bangladesh: An onlinebased cross-sectional study. PLoS One. 2020;15(10 October):1–17.

20. Rahman IA, Supriadi D, Fadilah EK, Kurniawan R, Noviati E, Sukmawaty I, et al. Community Knowledge of and Attitudes Towards the Implementation of Health Protocols to Prevent COVID-19. KnE Life Sciences [Internet]. 2022 [cited 2023 Feb 16];2022(4):22–31. Available from: https://knepublishing.com/index.php/KnE-Life/article/view/10283

Original Article

Activeness of Visits to Integrated Healthcare Post and the Quality of Life among the Elderly in Peguyangan Kangin Village, North Denpasar, Bali

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ABSTRACT

The number of people aged over 60 years exceeds seven percent of the total world population which is currently in the era of aging population. Elderly Integrated Healthcare Post (Posyandu) provide social, religion, education, skills, sports, arts and culture services and other services with the aim of improving the quality of life of the elderly. This study aims to determine the relationship between activeness of visits to Posyandu and the quality of life among the elderly. This was a cross-sectional study conducted in Peguyangan Kangin Village, North Denpasar, Bali from April 2022-May 2022. The independent variable was the activeness of visits and the dependent variable was the quality of life of the elderly. The samples involved 158 respondents who were selected using a purposive sampling technique. Demographic data and questions related to quality of life were obtained by distributing questionnaires containing informed consent during the elderly Posyandu activities. Meanwhile, data on the activeness of the elderly for the last six months was taken from attendance data recorded by cadres in 10 banjars/hamlets. Bivariate analysis towards data with ordinal and nominal scales using the Spearman rho test obtained a p value of 0.873. Thus, statistically there was no relationship between the activeness of visits to Posyandu and the quality of life among the elderly in Peguyangan Timur Village, Denpasar. Healthcare workers and elderly Posyandu cadres are recommended to focus not only on the presence of the elderly at the Posyandu, but also try to implement the elderly Posyandu program properly.

Keywords : Activeness, Quality of Life, Integrated Healthcare Post (Posyandu), Elderly.

INTRODUCTION

Indonesia is starting to enter an era of aging population, where it is estimated that there will be an increase in the number of elderly people to 15.77% (48.2 million people) in 2035. One of the reasons for this increase in the number of elderly people is an increase in life expectancy. Elderly who are independent, active, healthy, productive and qualified and have a lot of experience can provide useful contributions to the Indonesian state. An increase in the number of elderly will be a challenge due to suboptimal quality of life of the elderly[1]. Based on a study conducted by

Malairu (2020), it was found that 70% of 20 respondents had a moderate quality of life. Furthermore, a study conducted by Indrayani (2017) also found that 46.7% of 242 samples had a poor quality of life [2,3].

World Health Organization-Quality of Life (WHOQOL) (2015) explains that quality of life is an individual's perception in the context of culture and related value systems in society in achieving goals, expectations, standards and concerns for their lives. Physical health, social relationships, individual relationships, personal beliefs and psychological states are involved in a complex concept that underlies the quality of life of the

elderly[4]. According to Nakane (1999), psychiatric psychological disorders often appear along with the aging process which results in a decrease in the quality of life among the elderly[5]. Depression is a psychiatric disorder that appears in the elderly as a result of natural processes. According to a study conducted by Puspadewi (2017), 57.4% of the elderly experienced depression and a study conducted by Livana (2018) further showed that 41.6% and 11.5% of the elderly had mild and severe depression, respectively[6,7].

According to the Central Bureau of Statistics (2020), the Elderly Integrated Healthcare Post or so called The Elderly Posyandu is a strengthening program of community-based health efforts to facilitate the elderly. Such services focus on promotive and preventive efforts carried out by the community together with non-governmental organizations, the private sector, government and social organizations. Posyandu for the elderly provides social, religious, educational, skills, sports, arts and culture services, and other services with the aim of improving the quality of life. Such goal can be achieved by improving the health and welfare needed by the elderly, as well as helping encourage the elderly to be active and develop self-potentials. Education and health are important aspects that have an impact on the quality of life of the elderly[8].

Several studies regarding the correlation between visits to posyandu and the quality of life among the elderly showed inconsistent findings. A study conducted by Arbiah (2016) in Pontianak found that there was no significant relationship between visits to Posyandu and the quality of life among the elderly. In contrast, a study conducted by Hidayah et al (2021) revealed a correlation between activeness of visits and the quality of life. Another study was also carried out by Malairu in 2020 which only involved the elderly in nursing homes. The current study involved the elderly in one village who had various characteristics [9,10,2].

There is the Elderly Family Development (BKL) involved in the Posyandu program which includes counseling, home visits, recording, reporting and referral activities in order to created better quality of life among the elderly. The elderly are not a threat if they are productive in terms of education and health that are developed which further aims to make the tough elderly

program[8]. Based on the results of a preliminary study conducted in November 2021 in Peguyangan Kangin Village, there were 260 elderly and as many as 195 elderly were active in elderly posyandu activities. This study aims to determine the relationship between activeness of visits to Posyandu and the quality of life among the elderly.

METHOD

This was a quantitative study with a correlational design and a cross-sectional approach conducted in Peguyangan Kangin Village, Denpasar, Bali from April to May 2022. The study variables consisted of the independent variable, namely the activeness of visits to posyandu and the dependent variable, namely the quality of life. The questionnaire applied to assess the quality of life was the standard WHOQOL-BREF questionnaire (World Health Organization, 2015)[4]. The questionnaire consisted of 26 questions regarding the characteristics and the quality of life of the elderly. The quality of life was focused on how often an activity/phenomenon was experienced by the elderly during the last four weeks. Elderly visit was considered to be active if a respondent visited ≥75% of 11 Posyandu activities and was considered to be not active if respondent visited less than 75% of 11 Posyandu activities. Data on attendance for one year was obtained from posyandu cadres from each banjar in Peguyangan Kangin Village.

The sample size was 158 respondents who were selected using a non-probability sampling, namely purposive sampling technique. Data collection was carried out every Sunday according to the Posyandu schedule in each banjar. The researchers together with five enumerators further selected the study samples based on certain inclusion criteria, namely the elderly registered at the Posyandu for more than one year and those who agreed to be respondents. The elderly who were sick and being treated at the hospital were not involved. Samples were taken by distributing

questionnaires to elderly Posyandu activities which had inserted an informed consent form provided by the ITEKES Bali research ethics commission. This study has obtained permission for its implementation as well as a statement of ethical clearance No: 04.0042/KE-PITEKES-BALI/II/2022. Univariate analysis showed the percentage of each variable. In addition, bivariate analysis towards data with ordinal and nominal scales used the Spearman rho test to determine the relationship between the two variables.

Table 1. Distribution of Respondents' Characteristics (n=158).

Characteristic	Frequency	%
Age		
60-74 years	135	85.4
75-90 years	23	14.6
Education		
No Formal Education	45	28.5
Elementary	62	39.2
JHS	23	14.6
SHS	11	07.0
Higher Education	17	10.8
Employment Status		
Employed	66	41.8
Unemployed	92	58.2
Gender		
Male	52	32.9
Female	106	67.1
Distance to the Posyandu		
Close	140	88.6
Far	18	11.4

Table 1 revealed that most of respondents were in the age range of 60-74 years. Furthermore, 62 respondents (39.2%) had an Elementary education, 92 respondents (58.2%) were unemployed, 106 respondents (67.1%) were female, and 140 respondents (88.6%) had a long distance to the Posyandu.

Table 2. Activeness of Visits to Integrated Healthcare Post among the Elderly in Peguyangan Kangin Village, North Denpasar, Bali (n=158).

Variable	Frequency	%
Activeness		
Active	122	77.2
Not Active	36	22.8
Quality of Life		
Good	94	59.5
Moderate	64	40.5
Poor	0	0

Table 2 revealed found that most of the elderly were active to visit Posyandu, as many as 122 respondents (77.2%) and had a good quality of life, as many as 94 respondents (59.5%).

Table 3. Results of Statistical Test on the Correlation between Activeness of Visits to Integrated Healthcare Post and the Quality of Life among the Elderly in Peguyangan Kangin Village, North Denpasar, Bali (n=158).

| | | Quality of Life | | | | Total | | p-value |
| | | Good | | Moderate | | | | |
		f	%	f	%	f	%	
Activeness	Active	73	59.8	49	40.2	122	100	0.873
	Not Active	21	58.3	15	41.7	36	100	
Total		94	59.5	64	40.5	158	100	

Table 3 revealed that among 94 respondents (58.3%) who had a good Quality of Life were not active to visit Posyandu. Based on the spearman rho test result, it was found that there was no relationship between the activeness of visits to Posyandu and the quality of life among the elderly in Peguyangan Kangin Village, North Denpasar with a p value of 0.873.

DISCUSSION

Activeness of Visits to Integrated Healthcare Post among the Elderly in Peguyangan Kangin Village, North Denpasar, Bali. This study found that most of the elderly actively participated in the Elderly Posyandu activities. Compliance is individual behavior towards a recommendation, action or regulation regarding treatment that has been suggested or prescribed by healthcare workers [11].

The study finding is in line with a study conducted by Hidayah et al (2021) at the Gatak Community Health Center which showed that most of elderly people actively visited the elderly posyandu, as many as 50 out of 80 elderly (62.5%) [10]. However, the study finding is in contrast with a study conducted by Arbiah (2016) which showed that most of the elderly or 74.40% did not actively visit the elderly Posyandu due to the level of education. Education can create the best decision-making attitude [9]. In the current study conducted at Peguyangan Kangin, North Denpasar, most of respondents had elementary school level of education but were active in elderly Posyadu activities. Such phenomenon was possibly caused by the distribution of snacks in the form of mung bean porridge and eggs in every elderly Posyandu activity, so that it attracted the interest of the elderly to come.

Quality of Life of the Elderly in Peguyangan Kangin Village, North Denpasar, Bali. The results of this study found that most of the elderly in Peguyangan Kangin had a good quality of life. Quality of life refers to an individual's perception of his life in society in the context of culture and existing value systems related to goals, expectations, standards and concerns consisting of four dominant factors namely physical, social relations, psychology and environmental factors [4].

The study finding is in line with a study conducted by Hidayah et al (2021), Rekawati (2022), Putri (2019) and Samper (2017) which found that most of the elderly had a good quality of life [10,12,13,14]. Sampler (2017) further stated that this was probably because the elderly could still enjoy old age meaningfully, with a good quality, usefulness, could carry out activities according to their abilities along with a happy feeling [14]. However, the study finding is in contrast with the study conducted by Rohmah (2012) which found that most of the elderly had a moderate quality of life [11]. Rohmah further argued that this could be due to the factors that affected the quality of life according to WHOQO have not led to an optimal state of well-being [15].

The researchers argue that the quality of life o the elderly can be different one another because each individual assesses each part of his life differently. When the elderly are able to maintain physical, psychological, social functions and obtain support from the surrounding environment, a good quality of life will be achieved.

Correlation between Activeness of Visits to Integrated Healthcare Post and the Quality of Life among the Elderly in Peguyangan Kangin Village, North Denpasar, Bali. The result of this study found that statistically, there was no relationship between thctiveness of visits to the Elderly Posyandu and the quality of life among the elderly in Peguyangan Kangin Village, North Denpasar. Such finding is in line with a study conducted

by Arbiah (2016) in Pontianak which found that there was no significant relationship between visits to the elderly Posyandu and quality of life. Arbiah (2016) explained that Posyandu arranged gymnastic activity for the elderly once a month to maintain the fitness of the elderly, but there were some elderly who said that one of the obstacles was physical pain which affected their quality of life[9]. The achievement of economic and social needs as well as the development of the elderly in their lives tends to affect the quality of life, and places more emphasis on perceptions related to satisfaction with their position and condition [16]. The study finding is in contrast with a study conducted by Hidayah et al (2021) which revealed that the activeness of visits was related to quality of life. There was a tendency of improvement in the quality of life along with the increase in the activeness of visits, the more active the level of activeness of visits, the higher the quality of life of the elderly [10].

Based on the results of this study, most of the elderly who actively attended in the posyandu activities had a good quality of life, although they did not participate optimally in the elderly posyandu activities. Quality of life is not only influenced by active participation in posyandu (social and environmental relations) but also influenced by physical, economic and psychological factors. Some elderly could not participate in posyandu activities because they were sick and unable to walk, and such condition affected the quality of life. Balinese people, especially in Peguyangan Kangin Village, North Denpasar, still adhere to the extended family. There can be three generations in one family, including the elderly. Some elderly people only came record their names and took the snacks provided and then went home without participating in posyandu activities, sometimes with the excuse of selling or caring for grandchildren. Such finding is in line with the opinion stated by Sarabia (2021) that raising children will require time, money, physical and lead to mental burden, but parenting also has positive aspects to one's satisfaction which can affect quality of life [17].

Based on the results of the quality of life questionnaire, most of the respondents answered very well to the question "how good are your social skills?". Elderly who came to posyandu could meet their peers so that they could interact and support each other. Social support among the elderly, one of which is by being active in posyandu activities can affect the quality of life of the elderly. According to Marques (2014), quality life means feeling happy, feeling peace, being able to interact with neighbors, having a healthy body, doing hobbies and having satisfaction in life [18].

Different finding was obtained from the question "how satisfied are you with your sleep?". Most of the answers were unsatisfied. Lack of sleep can reduce physical activity in the elderly. The elderly have the least need for rest and sleep among the existing aggregates, but if it is not met, the quality of life may decrease.

If associated with one of the characteristics, namely gender, the majority of respondents in this study were female. Campos (2014) states that women who have good physical health and psychosocial health may have a good quality of life. However, it is different from men, wherein the quality of life will be good if it is supported by high socio-economic and good physical conditions [19]. Acording to Tavares (2013), the quality of life of the elderly may decrease due to lack of interaction with other people, decreased body function, education, illness and low income [20].

CONCLUSION

Statistically, there was no relationship between the quality of life of the elderly and the activeness of participating in posyandu in Peguyangan Kangin Village, North Denpasar. advice to health workers and elderly posyandu cadres, focus not only on the presence of the elderly during posyandu activities, but also try to implement the elderly posyandu program properly.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Kementerian Kesehatan Republik Indonesia. Profil Kesehatan Indonesia 2020. Kementerian Kesehatan Republik Indonesia, 2020. Available from: https://www.kemkes.go.id/downloads/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-Indonesia-Tahun-2020.pdf p.
2. Malairu SR, Pitoyo J. Perbedaan

Kualitas Hidup Lansia yang Aktif Mengikuti Posyandu Lansia dengan yang Tidak Aktif Mengikuti Posyandu Lansia di Kelurahan Mojolangu Kecamatan Lowokwaru. Prof Heal J. 2020;2(1):65–72. https://doi.org/10.54832/phj.v1i2.106

3. Indrayani I, Ronoatmodjo S. Faktor-faktor yang berhubungan dengan kualitas hidup lansia di Desa Cipasung Kabupaten Kuningan Tahun 2017. Jurnal Kesehatan Reproduksi. 2018 Nov 23;9(1):69-78. https://doi.org/10.22435/kespro.v9i1.892.69-78

4. World Health Organization. WHOQOL User Manual. Program Ment Heal [Internet]. 2015;1–88. Available from: http://apps.who.int/iris/bitstream/handle/10665/77932/WHO_HIS_HSI_Rev.2012.03protect LY1extunderscore eng.pdf;jsessionid=6BC7AC984CA0F8801C86C8296D9D4B2A?sequence=1%0Ahttp://www.springerreference.com/index/doi/10.1007/SpringerReference_28001%0Ahttp://mipa

5. Nakane Y, Tazaki M, Miyaoka E. Whoqol. Iryo To Shakai. 1999;9(1):12331.https://doi.org/10.2188/jea.JE20100093

6. Puspadewi AA, Rekawati E. Depresi berhubungan dengan kualitas hidup lansia di Panti Sosial Tresna Werdha di Jakarta. Jurnal Keperawatan Indonesia. 2017 Nov 11;20(3):133-8. https://doi.org/10.7454/jki.v20i3.636

7. Livana, Susanti Y, Darwati LE, Anggraeni R. Gambaran Tingkat Depresi Lansia. J Keperawatan dan Pemikir Ilmu. 2018;80–93. Available from: https://core.ac.uk/reader/236375310.

8. Statistik Penduduk Lanjut Usia. Badan Pusat Statistik. 2020. Available from: https://www.bps.go.id/publication/2020/12/21/0fc023221965624a644c1111/statistik-penduduk-lanjut-usia-2020.html.

9. Arbi'ah S, Saleh I, Abrori A. Hubungan Keaktifan Datang Ke Posyandu Dengan Kualitas Hidup Lanjut Usia Wanita Di daerah Binaan Puskesmas Parit H. Husin II Pontianak. Jumantik. 2016 Dec 8;3(2).

10. Hidayah RN, Romadhon YA, Mahmudah N, Agustina T. Correlation of Education Level and Visit Activity with Quality of Life at Elderly. J Kedokt. 2021;1196–204. Available from: http://hdl.handle.net/11617/12820.

11. Notoatmodjo S. Promosi Kesehatan & Ilmu Perilaku. Jakarta: Rineka Cipta. 2012.

12. Rekawati E, Sahar J, Kusumawati DN, Andriyanto A. Determinant Factors of Quality and Life Satisfaction of the Older People. J Keperawatan Indones. 2022;25(1):1–8. https://doi.org/10.7454/jki.v25i1.1752.

13. Putri AM, Fitriangga A, Fandi FK. Perbedaan Kualitas Hidup Lansia dengan Hipertensi yang Aktif dan yang Tidak Aktif Mengikuti Posyandu Lansia di Wilayah Kerja Puskesmas Perumnas II Pontianak. BIMIKI (Berkala Ilmiah Mahasiswa Ilmu Keperawatan Indonesia). 2019;7(2):11-9.https://doi.org/10.53345/bimiki.v7i2.19.

14. Samper TP, Pinontoan OR, Katuuk M. Hubungan interaksi sosial dengan kualitas hidup lansia di BPLU Senja Cerah Provinsi Sulawesi Utara. Jurnal keperawatan. 2017 Jan 18;5(1).https://doi.org/10.35790/jkp.v5i1.14695.

15. Rohmah AIN, Purwaningsih, Bariyah K. Kualitas Hidup Lanjut Usia. J Keperawatan. 2012;120–32. https://doi.org/10.22219/jk.v3i2.2589.

16. Yuliati A, Baroya N, Ririanty M. Perbedaan Kualitas Hidup Lansia yang Tinggal di Komunitas dengan di Pelayanan Sosial Lanjut Usia. J Pustaka Kesehat. 2014;2(1):87–94 Available from: https://jurnal.unej.ac.id/index.php/JPK/article/view/601.

17. Sarabia-Cobo C, Sarriá E. Satisfaction with Caregiving among Informal Caregivers of Elderly People with Dementia Based on the Salutogenic Model of Health. Appl Nurs Res. 2021;62.https://doi.org/10.1016/j.apnr.2021.151507.

18. Gonçalves Marques EMB, Pinto MIAC, Nunes MJA. Perception of the Quality of Life of a Group of Older People. Egitania Sci. 2014;1(15).

Available from: http://hdl.handle.net/10314/3357.

19. Campos ACV, Ferreira EF e., Vargas AMD, Albala C. Aging, Gender and Quality of Life (AGEQOL) study: Factors Associated with Good Quality of Life in Older Brazilian Community-Dwelling Adults. Health Qual Life Outcomes. 2014;12(1):1–11 Available from: https://link.springer.com/article/10.1186/s12955-014-0166-4.

20. Tavares DMDS, Diass FA, Santos NMDF, Hass VJ, Miranzi SDCS. Factors Associated with the Quality of life of Elderly Men. Rev da Esc Enferm. 2013;47(3):678–85. https://doi.org/10.1590/S0080-623420130000300022

Original Article

Analysis of Factors Related to Spiritual Distress Among HIV/AIDS Patients

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ABSTRACT

The severity of the problems experienced by PLWHA (People Living with HIV/AIDS) can affect the psychological, social and spiritual aspects, as well as the ability and capacity of the health services. People living with HIV/AIDS experience psychosocial problems, such as anxiety towards illnesses they cannot predict. Patients commonly experience financial problems, chronic grief, depression, guilt, depression, and fear of death. Other psychosocial problems include withdrawal, impaired socialization, role disturbance, worry about relationships with partners, lifestyle changes, loss of enthusiasm due to limitations and feelings of alienation. This study aims to determine the factors related to spiritual distress among HIV/AIDS patients at Sawerigading General Hospital in Palopo. This was a quantitative study using a cross-sectional design. The study samples were selected using purposive sampling technique. Samples were selected among patients who came to the PCT unit of Sawerigading Hospital, Palopo City. The results showed that there was a relationship between self-relationship (p=0.005), relationship with others (p=0.024), art, music, literature and nature (p=0.024) and greater power (p=0.022) with spiritual distress. It can be concluded that there was a relationship between the independent variables of self-relationship, relationship with others, art, music, literature and nature, greater power with the dependent variable of spiritual distress.

Keywords : Spiritual Distress, HIV/AIDS.

INTRODUCTION

HIV (Human Immunodeficiency Virus) is a virus that causes a decrease in human immunity, which infects white blood cells[1]. The quality of life of PLWHA can decrease, even the quality of life for PLWHA is worse than the general population and people with chronic diseases [2]. Assessment of the quality of life among 216 PLWHA in Indonesia showed prominent fatigue and sleep disturbances[3]. In short, the quality of life of people living with HIV remains an important performance objective to pay attention to. Certain factors such as compliance with Antiretroviral (ARV) medication, level of sprirituality, family acceptance and clinical stage affected the

quality of life of PLWHA[4]. Adequate ARV therapy achieves therapeutic outcomes in PLHIV, such as viral load and CD4 count. Optimal fulfillment of life functions properly due to compliance with ARV treatment is one of the factors that often affects the quality of life of PLWHA. This shows that comiance with ARV medication is an important outcome measure in the management of PLWHA[5].

Spirituality is a human need to overcome social and cultural deviations, worry, fear, death and dying, and social alienation. It is the philosophy of spiritual life as the source of the human mind. Philosophy gives meaning in the relationship between oneself with others, Groups, and God [6].

Some indicators of spiritual needs related

to self-relationship include the need to have meaning and purpose in life, to express creativity, to have expectations of more meaningful life challenges, to have self-esteem, to have personal appreciation, to give thanks, to have a vision for life, as well as preparing for and accepting death[7]. Spiritual needs related to relationships with other people include the need to forgive others, and adapt to overcome problems related to the loss of a person or object, both actual and perceived. Spiritual needs related to group relationship include the need to contribute to the group, uphold group norms and values, and know what and when to give or receive in the group. Spiritual needs related to God or other supernatural powers are the need to ensure the existence of God's power or great powers in nature, the belief that God loves and cares for all of His people, and the need to perform worship.

The severity of the problems experienced by PLWHA (People Living with HIV/AIDS) can affect the psychological, social and spiritual aspects, as well as the ability and capacity of the health services. People living with HIV/AIDS experience psychosocial problems, such as anxiety towards illnesses they cannot predict. Patients commonly experience financial problems, chronic grief, depression, guilt, depression, and fear of death[8]. Other psychosocial problems include withdrawal, impaired socialization, role disturbance, worry about relationships with partners, lifestyle changes, loss of enthusiasm due to limitations and feelings of alienation.

Issues such as near-death conditions, lifestyle changes, loneliness, self-isolation, and unexpected life events may lead to mental distress. The main outcome for those experiencing mental distress is an improvement in mental status, which can be observed in the linguistics of meaning and purpose in life, satisfaction with the meaning of life, and a sense of empowerment[6]. There is a relationship between increased spirituality/religiosity and slower disease progression, and doctors should be aware of such fact. Given the potential health implications of changes in spirituality/religiosity associated with an HIV

diagnosis, clinicians, as well as psychologists, social workers, and clergy should consider religious/spiritual treatment. In fact, several studies found that many patients felt comfortable when doctors talk to them about spirituality[9]. Most people's perceptions about HIV/AIDS are still wrong. HIV/AIDS is considered a problem only for people with deviant sexual behavior and is often associated with immoral people, sinners, etc. Stigma in society can lead to discrimination against people living with HIV/AIDS (PLWHA) and it needs to be addressed immediately.

Some people are completely aware of the importance of spiritual aspect, some are not. A previous qualitative study concluded that after a patient was diagnosed with HIV/AIDS, it had a negative impact on his psyche[10]. If someone is diagnosed with HIV/AIDS for the first time, that person experiences various psychological problems, including stress, anxiety, anger, depression, denial, shame, sadness, and grief. Mental health is a sense of harmony, intimacy between oneself, others, nature and the highest life[11].

The study objective is to determine the factors related to spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City.

METHOD

This was a quantitative study using a cross-sectional design. The study samples were selected using purposive sampling technique. Samples were selected among patients who came to the PCT unit of Sawerigading Hospital, Palopo as many as 35 patients. Data collected involved primary data, and secondary data which were analyzed using the chi-square test.

RESULTS

The study aims to determine factors related to spiritual distress by using the chi-square test with a significance level of ($p < 0.05$)

Table 1. Analysis of Factors Related to Spiritual Distress among HIV/AIDS Patients.

Variable	Spiritual Distress				Total		p-value
	Yes		No				
Self-relationship	N	%	N	%	N	%	
Good	3	11.5	23	88.5	26	100	0.005
Poor	6	66.7	3	33.3	9	100	
Relationship with others							
Good	4	14.8	23	85.2	27	100	0.024
Poor	5	62.5	3	37.5	8	100	
Art, Music, Literature and Nature							
Good	4	14.8	23	85.2	27	100	0.024
Poor	5	62.5	3	37.5	8	100	
Greater Power							
Good	2	9.5	19	90.5	21	100	0.022
Poor	7	50	7	50	14	100	

Table 1. revealed that there was a relationship between the independent variables of self-relationship, relationship with others, art, music, literature and nature, greater power with the dependent variable of spiritual distress. Furthermore, a multivariate test was conducted on the independent variables. Multivariate analysis was performed using multiple linear regression test to analyze relationships between self-relationship, relationship with others, art, music, literature and nature, and greater power on spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City.

Table 2. Summary Model.

Model	R	R Square	Adjusted R Square	Std Error of the Estimate
1	.644[a]	.414	.336	.361

a. Predictor (Constant): Greater Power, Relationship with Others, Art, Music, Literature and Nature, Self-relationship
b. Dependent Variable: Spiritual Distress

Table 2 showed that the size of the correlation or relationship (R) value was 0.644, which indicated a determination coefficient (R square) of 0.414. Thus, there was a relationship between the independent variables (self-relationship, relationship with others, art, music, literature and nature, greater power) with the dependent variable (spiritual distress) by 41.4%.

Table 3. ANOVA.

Model		Sum of Squares	df	Mean Square	F	Sig
1	Regression	2.770	4	.692	5.305	.002[b]
	Residual	3.916	30b!	.131		
	Total	6.686	34			

Based on the results presented in Table 3, it was obtained a significance value (sig.) of P=0.002 or <0.05. Such value indicated that there was a relationship between Greater Power, Relationship with others, art, music, literature and nature, Self-relationship with the spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City.

DISCUSSION

a. Relationship between Self-relationship and Spiritual Distress.

Spirituality is the expression of the deepest meaning and purpose of life. Humans express spirituality through their unique ability to think, contemplate, and explore the meaning and purpose of life[12]. Spiritual needs are interrelated between relationships with God, human intrapersonal relationships, and interpersonal relationships with humans. Self-relationship includes: anger, lack of peace, unloved feeling, guilty feeling, lack of acceptance or obedience, poor self-management, lack of resilience, and lack of meaning in life.

In The current study applied the chi-square test which obtained a p value of 0.005 or

<0.05, which indicated that there was a relationship between self-relationship and spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City. In self-relationship, 16 respondents (46%) felt guilty towards themselves, followed by problems locking themselves up throughout the day. It was a form of maladaptive behavior that reflected poor fulfillment of spiritual needs[13]. Such finding is supported by a study conducted by Hardiansyah, Amiruddin, and Asyad (2014) regarding the quality of life of among 21 HIV/AIDS patients in Makassar City. There were 33.3% of respondents who were spiritually worried about the future and 38.1% of respondents who were afraid of death and ultimately felt that live was vain[14].

b.   Relationship between Relationship with Others and Spiritual Distress.

Relationship with others included expressing feelings of alienation, refusal to interact with spiritual leaders, refusal to interact with people who were considered important, and separation from support systems.

In the study, it was obtained a p value of 0.024, which indicated that there was a relationship between relationship with others and spiritual distress among people with HIV/AIDS at Sawerigading General Hospital, Palopo City. In this study, 23 respondents (85.2%) most respondents had good relationship with others.

According to the researchers' assumption, such finding was due to most of respondents were routinely socialized by HIV/AIDS counseling staffs at Sawerigading General Hospital, Palopo. One of the counseling staffs or motivators was also PLHIV. The diagnosis of HIV/AIDS experienced by patients could lead to interference, alienation or stigmatization. A study conducted by Ahwan (2014) on HIV/AIDS stigmatization and discrimination found that forms of stigma and discrimination occurred both in the domestic environment and in the public sphere [15].

c.   Relationship between Art, Music, Literature and Nature with Spiritual Distress.

In relation to art, music, literature, nature, it was found inability to express prior creative states (singing, listening to music or writing), and disinterest in nature or reading spiritual literature. The result of the study found that 23 of respondents (85.2%) did not experience spiritual distress. In this study, respondents generally answered no to statements of being able to sing, loved to listen to music, write, and nature (environment, plants, pets). In the statistical test results, it was obtained a p value = 0.024 <0.05. It was indicated that there was a relationship between art, music, nature and literature with spiritual distress.

d.   Relationship between Greater Power and Spiritual Distress.

Based on the result of the study, it was found that 19 respondents (90.5%) had a good relationship with God. Most of the respondents expected guidance and advice from religious leaders. There was a relationship between greater power and spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City. Spiritual needs found here were religious needs, needs for self-existence, needs for peace, and needs for giving. Religious needs tended to stand out. However, there were differences in terms and levels of individual needs.

This study found that the majority of HII/AIDS patients were adults (26-35 years old). At that age, people may realize that their lives had to be closer to God. This confirms that the patient's spirituality can mean acceptance and obedience to God, but there should be efforts and hard work to get healed. One way to cope with disease is to get closer and increase piety to Allah. An aspect of religion as the highly desirable spiritual need of patients is religious practice. For patients, spirituality can mean acceptance and submission to God, but it also means effort and struggle to get healed. One form of effort that is usually done is continuous treatment and prayer. The spiritual need in the religious dimension that patients consider very necessary is to pray both for themselves and to be prayed for by others[16]. Religious practice or worshiping God is one way to relate to God. The level of obedience to Allah SWT can help people reduce anxiety, fear, and stress that they cannot overcome. These patients also experienced spiritual problems, including blaming God, refusing to worship, worshiping outside the rules, disruption of worship and spiritual needs, and spiritual pressure. Sometimes, after being sick, they made a big change in life. However, people

with HIV/AIDS did not find way to overcome such disease and found difficulty in finding wisdom behind the disease they experienced. The spirituality of PLHIV usually deteriorates after they have been diagnosed with HIV/AIDS[17]. Factors that influenced spirituality included cultural context, family, level of development, and health. Family and environmental factors were found to have an effect on spiritual beliefs. Health could also affect spirituality and vice versa. For example, when seriously ill, many people turned to religion for support. In some cases, a person's belief system could also influence treatment [18].

According to Anggraini & Suci (2014), in general a religious person who is in a difficult situation will involve religious factors to overcome all the problems he gaces[19]. In addition, a study conducted by Hulu & Siregar (2018) found that religious coping strategies are significantly related to self-regulation among HIV/AIDS patients at Gunungsitoli Regional General Hospital with a correlation value of 0.883 [20].

CONCLUSION

Based on the result of study, it can be concluded that there was a relationship between self-relationship and spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City.

In the study, it was found a p value of 0.024, which indicated that there was a relationship between relationship with others and spiritual distress among people with HIV/AIDS at Sawerigading General Hospital, Palopo City.

In this study, respondents generally answered no to statements of being able to sing, loved to listen to music, write, and nature (environment, plants, pets). In the statistical test results, it was obtained a p value = 0.024 <0.05. It was indicated that there was a relationship between art, music, nature and literature with spiritual distress.

Based on the result of this study, it was revealed a relationship between greater power and spiritual distress among HIV/AIDS patients at Sawerigading General Hospital, Palopo City. The results of this study can be used as evaluation material for spiritual nursing practice in improving the quality of nursing care through education and training. Nurses on duty at the hospital should provide nursing care

related to spiritual distress to increase the patient's spirituality. Therefore, further researchers could conduct further study by observing other variables.

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CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Ramadani SP, Hastuti MF, Yulanda NA. Kebutuhan Spiritual dengan Kualitas Hidup Pasien HIV/AIDS: Literature Review. ProNers. 2020;5(2).

2. Martin NK, Vickerman P, Dore GJ, Grebely J, Miners A, Cairns J, Foster GR, Hutchinson SJ, Goldberg DJ, Martin TC, Ramsay M. Prioritization of HCV treatment in the direct-acting antiviral era: an economic evaluation. Journal of hepatology. 2016 Jul 1;65(1):17-25. https://doi.org/10.1016/j.jhep.2016.02.007

3. Lindayani L, Chen YC, Wang JD, Ko NY. Complex problems, care demands, and quality of life among people living with HIV in the antiretroviral era in Indonesia. Journal of the Association of Nurses in AIDS Care. 2018 Mar 1;29(2):300-9. https://doi.org/10.1016/j.jana.2017.10.002

4. Desyani NL, Waluyo A, Yona S. The relationship between stigma, religiosity, and the quality of life of HIV-positive MSM in Medan, Indonesia. Enfermeria clinica. 2019 Sep 1;29:510-4. https://doi.org/10.1016/j.enfcli.2019.04.077

5. Edison C, Setyowati S, Waluyo A. Pengalaman Aktivitas Spiritual pada

Orang dengan HIV/AIDS (ODHA) dalam Menjalani Proses Penyakitnya. Faletehan Health Journal. 2021 Dec 4;8(03):216-22. https://doi.org/10.33746/fhj.v8i03.209

6. Yusuf A, Nihayati HE, Iswari MF, Okviansanti F. Kebutuhan spiritual: konsep dan aplikasi dalam asuhan keperawatan. Buku Referensi. 2016:1-316. Available from: www.mitrawacanamedia.com

7. Kozier B, Erb G, Park T, Parker B, Reid-Searl K, Stanley D, Berman A, Snyder S, Levett-Jones T, Dwyer T, Hales M. Kozier and Erb's Fundamentals of Nursing: First Australian Edition. 2010. Available on https://hdl.handle.net/1959.11/7548

8. Armiyati Y, Rahayu DA, Aisah S. Manajemen masalah psikososiospiritual pasien hiv/aids di kota semarang. InProsiding Seminar Nasional & Internasional 2015. The 2nd University Research Coloquium 2015, 548-556.

9. Ironson G, Stuetzle R, Fletcher MA. An increase in religiousness/spirituality occurs after HIV diagnosis and predicts slower disease progression over 4 years in people with HIV. Journal of general internal Medicine. 2006 Dec;21:S62-8. https://doi.org/10.1111/j.1525-1497.2006.00648.x

10. Ghoni A, Andayani SA. Hubungan Dukungan Sosial dan Spiritual Penderita HIV/AIDS dengan Kualitas Hidup Penderita HIV/AIDS. Citra Delima: Jurnal Ilmiah STIKES Citra Delima Bangka Belitung. 2020;3(2):118-26. https://doi.org/10.33862/citradelima.v3i2.87

11. Potter PA& PAG. Buku Ajar Fundamental Keperawatan: Konsep, Proses, dan Praktik. 1st ed. 2005.

12. Barbara Lynn Yoos Lynne Crawford. Fundamentals of Nursing: Active learning for collaborative practice. 1st ed. 2016.

13. Tanjung DM. *Karakteristik Distress Spiritual pada Orang dengan HIV/AIDS (ODHA) di RSUP Haji Adam Malik Medan. Skripsi.* Universitas Sumatera Utara.

14. Hardiansyah H, Amiruddin R., Arsyad DS. Kualitas hidup orang dengan HIV dan AIDS di kota Makassar. Universitas Hasanuddin. 2014.. 1-11.

15. Ahwan Z. Stigma dan diskriminasi HIV & AIDS pada orang dengan HIV dan AIDS (ODHA) di masyarakat basis anggota Nahdatul Ulama (NU) Bangil. Studi kajian peran Faith Based Organization (FBO) dalam isu HIV. 2012.

16. Amal AI, Khofsoh E. Potret kebutuhan spiritual pasien HIV/AIDS. *Unissula Nursing Conference Call for Paper & National Conference, 2018;*1(1):70-74.

17. Dianita EM., Lismayanti l, Rosianti M. Kebutuhan Spiritual Pasien HIV/AIDS [Internet]. 2022 [cited 2023 Feb 27]. Available from: https://www.researchgate.net/publication/361948711_KEBUTUHAN_SPIRITUAL_PASIEN_HIVAIDS/download

18. Andrianto MB. Praktik Keagamaan pada Penderita HIV/AIDS. Jurnal Kesmas Asclepius. 2021 Jun 29;3(1):34-40.

19. Anggraini BDS. Hubungan Antara Religious Coping Dengan Stress Pada Mahasiswa. Malang: UMM Malang; 2014.

20. Hulu ISA & Siregar AR. Hubungan Strategi Koping Religius dengan Penyesuaian Diri pada Pasien HIV/AIDS di RSUD Gunungsitoli [Internet]. USU; 2018 [cited 2023 Feb 27]. Available from: https://repositori.usu.ac.id/handle/123456789/7390

Original Article

Correlation between the Level of Knowledge and Attitude Regarding Early Marriage among Female High School Students

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ABSTRACT

The rate of early marriage in West Kalimantan in 2018 occupied the 14th place with a percentage of 21.22%, while in 2020 it increased to 24%. A study conducted at Kubu Raya District in 2014, showed that there were 63.6% of 88 prospective brides in the work area of Sungai Kakap Community Health Center who experienced unwanted pregnancies. The results of the Program Performance and Accountability Survey (SKAP) in 2019 showed that 63 out of 1,000 women in the age range of 15-19 years had given birth. This problem is also related to the incidence of unwanted pregnancies in West Kalimantan which reached 23.4% as reported in the 2019 SKAP survey data. This study aims to identify and analyze the correlation between the level of knowledge and attitude related to early marriage among female students at SMAN 1 of Sungai Kakap. This was a quantitative study using the cross sectional method. The study samples were selected using purposive sampling technique which obtained 81 respondents. The data collection instruments applied here were a questionnaire related to the level of knowledge regarding early marriage and a questionnaires related attitude regarding early marriage. The data collected were analyzed based on the frequency distribution and statistical test of the Spearman correlation test. The study findings based on the Spearman test obtained a significance value or p-value=0.000 (<0.005) and the correlation coefficient value of 0.556. Someone with a good level of understanding about early marriage would also have good character or an unsupportive attitude regarding underage marriage. Thus, it can be concluded that there was a significant correlation between the level of knowledge and attitude regarding early marriage among female students at SMAN 1 of Sungai Kakap. It is expected that the study finding can be applied as a guide for conducting further research, especially regarding the correlation between the level of knowledge and attitude regarding early marriage among female adolescents, as well as the basis for community service.

Keywords : Early marriage, Female Adolescent, Attitude, Knowledge level.

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INTRODUCTION

Marriage has been regulated in Law no. 16 of 2019 which reads "Marriage is only permitted if a man and a woman have reached the age of 19 (nineteen) years[1]. Based on data derived from the Indonesian Ministry of Health in 2014, Indonesia was one of the countries with the highest number of child marriages in the world, namely in the 37th rank. In ASEAN region, Indonesia ranked second after Cambodia[2]. Marriage of women aged 10-14 years accounted for 0.2%, or more than 22,000 women. The marriage rate among women aged 15-19 years was 11.17%, while among men it was 1.6%. Based on such facts, it can be concluded that underage marriage among women was higher than underage marriage among men[3].

Impacts that may occur if an adolescent girl becomes pregnant at an early age include the aspects of education, health (birth complications) and employment opportunities which will further affect their lives in the future.

In addition, children born by underage women will also be at risk of death, stunting and low birth weight[4]. In some cases of underage marriages among couples who are not ready financially, they end up becoming financially dependent on their families[5]. According to a previous study, pregnancy and childbirth under the age of 20 can cause 2-5 times more maternal deaths than those between the ages of 20-29. In addition, young couples who are mentally immature can cause family problems that lead to divorce. Such finding is also supported by a study conducted by Fujiana which found that young women who had underage marriage were often treated less well at home. Besides that, there are problems such as lack of finances and abusive treatment towards the wife by the husband[6].

Researchers from the Association of Indonesian Demographic Enthusiasts in West Kalimantan Province recorded that 22.9% of adolescents in West Kalimantan Province had given birth and were in the first pregnancy. A study conducted at Kubu Raya District in 2014, showed that there were 63.6% of 88 prospective brides in the work area of Sungai Kakap Community Health Center who experienced unwanted pregnancies[7]. In addition, the results of the Program Performance and Accountability Survey (SKAP) in 2019 showed that 63 out of 1,000 women in the age range of 15-19 years had given birth. This problem is also related to the incidence of unwanted pregnancies in West Kalimantan which reached 23.4% as reported in the 2019 SKAP survey data[8].

Some respondents who had negative attitude regarding early marriage were also caused by a lack of education, so that understanding regarding early marriage was still far from the good category. Besides that, many underage marriages in the surrounding environment also influenced their attitude[9]. Such finding is also supported by a study conducted by Fujiana which found that female adolescents who had given birth were more vulnerable to health problems. In addition, pregnancy and childbirth are not only physically risky for the mother and fetus, but can also be related to the readiness of her new role as a mother. In this study, it was found that there was a lack of the role of female adolescents as mothers since pregnancy until the period of caring for the baby. This can be die to a lack of knowledge and experience to carry out their role as mothers [10].

According to a study conducted by Putri, it was found that poor understanding was due to the respondents got information from sources with unknown accuracy. In addition, the information obtained by adolescents also varied so that it could affect the level of knowledge and understanding of adolescents about the risks of underage marriage. Inaccurate information will result in suboptimal knowledge[11]. Based on the data derived from a preliminary study conducted at the high school, there were still some students who did not know about early marriage and its effects. One of the students stated that there had been no counseling about early marriage so they did not know about it. This study aims to identify and analyze the correlation between the level of knowledge and attitude related to early marriage among female students at SMAN 1 of Sungai Kakap.

METHOD

This was a quantitative study with a correlative analytical study design. This study has obtained ethical review approval determined in Pontianak on March 9, 2022 by the Research Ethics Committee of the Faculty of Medicine of Tanjungpura University through ethical approval registration number No. 1683/UN22.9/PG/2022. Data collection was carried out at SMAN 1 of Sungai Kakap in March. The study samples were selected using purposive sampling technique which obtained 81 respondents. The variables in this study consisted of two variables, namely the independent variable (level of knowledge) and the dependent variable (attitude). The data collection instruments applied here were a questionnaire related to the level of knowledge regarding early marriage (adopted from the study conducted by Aisah (2017)[12] and a questionnaire related attitude regarding early marriage (Adopted from the study conducted by Habibah (2017)[13]. The questionnaire related to the level of knowledge consisted of 32 with 19 positive questions and 13 negative questions with "true" and "false" answer choices. Whereas the questionnaire related to attitude consisted of 20 questions with 8 positive questions and 12 negative questions with the answer choices of "Strongly Agree", "Agree", "Rather Agree", "Disagree" and "Strongly Disagree". Data were analyzed using the Spearman rank test to determine the correlation between variables since the data were not

normally distributed. Statistical analysis was performed by using SPSS software.

Table 1. Frequency Distribution of Respondents' Characteristics.

	Data on Respondent	Frequency	Percentage
Age	15 Years	8	9.9%
	16 Years	35	43.2%
	17 Years	25	30.9%
	18 Years	13	16.0%
Major	Science	39	46.9%
	Social	42	53.1%
Class	X	30	37%
	XI	26	32.1%
	XII	25	30.9%

Based on the data presented in table 1, it was shown that most of respondents who filled out the questionnaires aged 16 years with a percentage of 43.2%. Furthermore, most of respondents were those in Social major with a percentage of 53.1%. Most of respondents were those in class X with a percentage of 37%.

Table 2. Distribution of Knowledge Level and Attitude.

Variable	Frequency (f)	Percentage (%)
Knowledge level		
Good	26	32.1
Moderate	48	59.3
Poor	7	8.6
Attitude		
Supported	0	0
Did Not Support	81	100.0

The results of the study showed that 59.3% of respondents had a moderate level of knowledge, 32.1% of respondents had a good level of knowledge, and 8.6% of respondents had a poor level of knowledge. In addition regarding attitude, all respondents (100%) did not support early marriage.

Table 3. Correlation between knowledge level and attitude related to early marriage among high school students.

Knowledge Level	Attitude				Total	
	Supported		Did Not Support		n	%
	n	%	n	%		
Good	0	0.0%	26	32.1%	26	32.1%
Moderate	0	0.0%	48	59.3%	48	59.3%
Poor	0	0.0%	7	8.6%	7	8.6%
				Total	81	100%
			p-value = 0.000			
			Correlation coefficient = 0.556			

The results of statistical test through the Spearman test obtained a p value of 0.000 ($0.000<0.05$). Such finding indicated that there was a significant correlation between the two variables. Furthermore, it was obtained a correlation coefficient of 0.556 which indicated a strong correlation between variables (0.51-0.75). The correlation coefficient showed a positive value, so that the two variables were declared to be in the same direction.

DISCUSSION

This study was conducted among 81 female high school students with the characteristics of the respondents of age, major

and class. Age has an important role in forming knowledge and attitudes towards early marriage. The older a person is, the more comprehension and mindset will develop which further lead to better knowledge and attitudes[14]. According to Batubara, the age of 15-18 years is the period when adolescents begin to develop behavioral maturity, learn to control impulsivity and can make early decisions related to the vocational goals to be achieved[15].

Based on the result of the study, it can be seen that the low level of knowledge could be due to the fact that many respondents were looking for inaccurate sources of information so that the knowledge of respondents about underage marriage became inaccurate as well. This fact resulted in sub-optimal knowledge so that they might misinterpret early marriage and its impacts.

In addition, the lack of knowledge regarding early marriage could be due to a lack of education provided regarding early marriage. Respondents in this study stated that they had never received counseling related to early marriage. However, there were several respondents who joined the PIK-R extracurricular at their school which discussed the mature age for marriage, and those who joined such activity knew little about underage marriages.

The result of the study showed that all respondents had attitude that rejected or did not support early marriage by 100%. Positive attitude (did not support) towards underage marriage could be due to female students had seen many facts in their surroundings that early marriage could cause the risk of divorce, domestic violence and so on. Such finding is also supported by a study conducted by Supriati, whulich found that female adolescents had a positive attitude regarding early marriage[16].

Based on the test result, it was shown that Ha was accepted while H0 was rejected. Thus, it can be concluded that there was a significant correlation between the two variables, namely the level of knowledge variable and the attitude variable among female adolescents at SMAN 1 of Sungai Kakap. In addition, it was obtained a correlation coefficient value of 0.556 which indicated a strong correlation between variables (0.51-0.75). The positive correlation coefficient value indicated that the two variables were declared to be in the same direction. Therefore, the higher the level of knowledge of the students, the higher their attitude.

The study finding is supported by a study conducted by Agtikasari (2017) which found that there was a significant correlation between the level of knowledge and attitude related to underage marriage. This is based on certain theory that the attitude framework consists of three mutually supportive components[16]. One of the three components is the cognitive component, namely the depiction of something that is believed by an attitude owner and relates to individual perceptions, knowledge and beliefs. The cognitive component includes stereotyped beliefs regarding something (opinions), especially those related to controversial issues or cases [15]. The study finding is also in accordance with a study conducted by Tambunan (2020) which revelaed that there was a correlation between knowledge and attitude of female adolescents towards underage marriage with a p-value of 0.000 [17].

A study conducted by Sari (2016) revealed that if an individual had good level of knowledge, then he would also have a good attitude since knowledge was one of the factors that influenced the formation of an attitude [18]. Moreover, a study conducted by Ekawati and Indriyanti (2017) found that the better the understanding obtained, the better the attitude of the individual will be. Participants who had good level of knowledge would be unsupportive towards underage marriages and participants who had moderate or low level of knowledge usually tended to support underage marriages [19].

Based on observations and interviews conducted by researchers with several respondents, they stated that there were many of their friends who should still be in high school but were already married either because of unwanted pregnancy or just wanted to get married rather than continue their study at school.

Several respondents also agreed to enter into early marriage if their parents asked them to marry because they were afraid it would be a sin if they did not follow their parents' wishes and hoped that they could lighten their parents' burden through their marriage. In addition, there were also several students who thought that if they didn't get married soon, even though they were still underage, they worried to be old maids.

Based on this, it can be seen that there are many factors for someone to get married early, namely economic factors, self-will, unwanted pregnancies, parents' wishes to marry off their children and environmental factor that was familiar with underage marriages. However, according to the researcher, there were still many participants with a good level of knowledge supported early marriage.

Based on the explanation above, it can be concluded that there was a significant correlation between the level of knowledge and attitude regarding early marriage among female students at SMAN 1 of Sungai Kakap. People with a good understanding regarding underage marriage might have attitude that supported or did not support underage marriage. The results of the study showed that there was a positive correlation between the level of knowledge and attitude.

The limitation in this study was related to the collection of data originating from respondents that could not be carried out at the same time. The researcher had to adjust to the schedule provided by the school and there was still an effect of the Covid-19 pandemi, and the school divided the class into several sessions so that the researcher could not collect data at the same time. Therefore, at the time of data collection, the researcher divided several classes. Data were collected in some classes on the first day and the rest of classes were continued to be studied on the second day.

CONCLUSION

It can be concluded that there was a significant correlation between the level of knowledge and attitude regarding early marriage among female students at SMAN 1 of Sungai Kakap. It is expected that the study finding can be applied as a guide for conducting further research, especially regarding the correlation between the level of knowledge and attitude regarding early marriage among female adolescents, as well as the basis for community service. In addition, the future research is expected to conduct an analysis on the correlation between parenting styles and culture with the incidence of early marriage.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCE

1. Presiden Republik Indonesia. Undang-Undang Republik Indonesia Nomor 16 Tahun 2019 Tentang Perubahan Atas Undang-Undang Nomor 1 Tahun 1974 tentang Perkawinan. Jakarta; Presiden Republik Indonesia, 2019.
2. Kementerian Kesehatan Republik Indonesia. Profil Kesehatan Indonesia. Jakarta; Kementerian Kesehatan Republik Indonesia, 2014
3. Istawati R. Hubungan Pengetahuan dengan Sikap Remaja Putri tentangPendewasaan Usia Perkawinan di MA Pondok Pesantren Teknologi. Jurnal Ilmu Kebidanan (Journal of Midwifery Sciences). 2019; 8(1) : 34-39.
4. Buentjen C, Walton K. In Indonesia, A New Tool is Being Used To Fight Child Marriage. Blog Pembangunan Asia. 2019.
5. Andina E. Meningkatnya Angka Perkawinan Anak saat Pandemi Covid-19. 2021; 8(4)
6. Fujiana F, Setiyowati E. The Experiences of Female Teenagers in Early Marriage: A Phenomenological Study. Medicine & Public Health. 2021; 24(3): 1-7.
7. Marbun, J. Remaja Kalbar Dinilai Lebih Dewasa Sebelum Waktunya. Pontianak: Republika ; 2014.
8. Rakhman, A. BKKBN Kalbar: Remaja usia produktif harus menjadi aktor pembangunan. Pontianak : ANTARA ; 2020.
9. Husna R, Mulyani Y, Hammad. Sikap Remaja Tentang Pernikahan Dini Berdasarkan Karakteristiknya di Kecamatan Loksado Kabupaten Hulu Sungai Selatan. Jurnal Forum Kesehatan. 2017; 1-5.
10. Fujiana F. Studi Fenomenologi : Pengalaman Remaja Perempuan Menjalankan Peran sebagai Ibu. Jurnal Keperawatan Muhammadiyah Bengkulu. 2020; 8(1): 26-33.
11. Putri DF. Gambaran Pengetahuan Remaja tentang Risiko Pernikahan Dini di SMA N 2 Wonosari. Naskah Publikasi. 2019 ; 1-15.
12. Aisah UN. Hubungan Tingkat Pengetahuan Remaja tentang

Pernikahan Dini dengan Kejadian Pernikahan Dini di Kecamatan Saptosari Kabupaten Gunungkidul Tahun 2017. Skripsi. 2017; 1-67.

13. Habibah, N. (2017). Pengetahuan, Sikap dan Nilai-Nilai Budaya Remaja terhadap Pernikahan Dini si SMP Negeri 1 Rancabali Kabupaten Bandung. *Skripsi*, 17-51.

14. Supriati. Hubungan Pengetahuan dan Sikap pada Remaja tentang Pernikahan Dini di Dusun IV Desa Kolam Kecamatan Percut Sei Tuan Kabupaten Deli Serdang Tahun 2018. Jurnal Darma Agung Husada. 2019 ; 4(1) : 52-61.

15. Batubara, J. R. Adolescent development (Perkembangan Remaja). Sari Pediatri 2016 ; 12(1) : 9-21.

16. Agtikasari N. Hubungan Pengetahuan tentang Pernikahan Usia Dini dengan Sikap Siswa tentang Pernikahan Usia Dini di SMA Negeri 2 banguntapan tahun 2015. Jurnal Ners dan Kebidanan. 2017; 4(1): 51-55.

17. Tambunan IY. Hubungan PengetahuanDengan Sikap Remaja Putri Tentang Pernikahan Dini Di SMK N.1 Siborong-Borong Kelas X Tahun 2020. Journal Of Midwifery Senior. 2020; 3(1) : 103-107.

18. Sari AN. Hubungan Pengetahuan dengan Sikap mengenai Perilaku Seksual di SMK Kesehatan Donohuda Boyolali Tahun 2016. Akademi Kebidanan Mamba'ul 'Ulum Surakarta. 2016 ; 119-128.

19. Ekawati, Andriyani K. Sikap Remaja Putri terhadap Pernikahan Dini di Dusun Wonontoro Desa Jatiayu Kecamatan Karangmajo Kabupaten Gunungkidul. JoH. 2017 ; 4(1) : 35-41.

Original Article

Audiovisual Media Increases Stunting Prevention Knowledge Among Pregnant Women in The Working Area of Wani Health Center: Pretest, Posttest 1 dan Posttest 2

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ABSTRACT

Health education about stunting prevention using audiovisual media has never been done for pregnant women in the working area of the Wani Health Center. This study aims to Analyzing the effect of health education through audiovisual media on stunting prevention knowledge among pregnant women in the working area of the Wani Health Center. This study is a pre-experimental study with a one-group pretest posttest design. The population is all pregnant women in four villages in the working area of the Wani Donggala Health Center, Central Sulawesi. The sample consist of 43 respondents. The instruments used were pretest, posttest 1 and posttest 2 questionnaires, with 21 statement numbers. Pre, post 1 and post 2 data collection was carried out at the village office and auxiliary health centers in four villages. Health education materials through audiovisual media is related to stunting prevention. Audiovisual is self-made using animation with a duration of 8 minutes and 12 seconds. Univariate analysis is the frequency distribution and bivariate with the Friedman test. The results showed that the average value of the pretest: 52.18, posttest 1: 71.722 and posttest 2: 90.86. Friedman test obtained a value of ρ 0.000 (<0.05). The conclusions is health education through audiovisual media in posttest 2 significantly increases knowledge of stunting prevention in pregnant women. It is hoped that health workers will increase the use of audiovisual media as a preventive effort to prevent stunting.

Keywords : Health Education, Audiovisual Media, Knowledge, Stunting Prevention.

INTRODUCTION

Until 2022, the prevalence of stunting in children under five years of age is still a problem in poor and developing countries in the world. This is indicated by the high prevalence of stunting in several countries. Research in Ethiopia found the prevalence of stunting in toddlers to be 39.5% [1]. Sub Saharan Africa 41% (2). Pakistan 50,7% [3], and Timor Leste 44,4% [4]. In Indonesia, the prevalence of stunting has decreased in the last 10 years. Prevalence of stunting in children under five years of age in 2013 was 37.2%, 2018 (30.8%)[5] dan 2022 (21,6%). In Central Sulawesi, although the prevalence of stunting under five in 2022 has also started to decrease to 28.2%, it is still high when compared to the national figure. The highest prevalence of stunting under five is Sigi Regency (36.8%) and Donggala ranks fourth (32.4%) out of 13 regencies/cities[6]. In the working area of the Wani Health Center, the stunting toddler data for 2020 was 28.2% and 2021 decreased to 21.7% [7]. Even though it has decreased, it has not reached the target of stunting cases in 2022, which is 18.4%.

Stunting in children under five years of age is not only caused by one factor but multifactors. Research by Widyaningsih et al (2022) shows that short mothers, low education, high household expenditure, unhealthy snacks, poor sanitation, good nutrition services are related to stunting[8]. A study by Yunitasari et al (2022) revealed that the determinants of stunting in the Covid 19 pandemic era were related to household sanitation facilities and household water treatment. Significant risk factors were male gender, older children, coming from social quintiles low economy, do not participate in prenatal care in health facilities[9]. Therefore, multi-sectoral interventions are needed to reduce the prevalence of stunting in children under five years of age.

Efforts to reduce stunting are carried out based on contributors and stunting intervention targets. Avula et al (2022) stated that the main contributors to reducing stunting include health and nutrition interventions, health education and health services[10,11]. Pregnant women are one of the target groups for stunting reduction interventions[12,13]. Health education can be implemented with various media. Research by Anggraini et al (2020) concluded that there were differences in knowledge before and after audiovisual media interventions in stunting prevention [14]. A study by Artikasari et al (2022) concluded that there were differences in the knowledge of pregnant women before and after being given tiktok media about nutrition during pregnancy[15]. Studies on stunting prevention through audiovisual media have been carried out by several researchers. However, it only measures the pretest and posttest. This study will measure respondents' knowledge about stunting prevention through pretest, posttest 1 and pottest 2.

One of the strategies in providing counseling about stunting prevention in pregnant women is through audiovisual media [16]. This media contains material on understanding, prevention, impact of stunting, breast care, early breastfeeding initiation (IMD), correct breastfeeding techniques and exclusive breastfeeding. Prevention of stunting is carried out from pre-conception, during a mother's pregnancy up to 1000 First Days of Life (FDL). Pregnant women in the villages in the working area of the Wani Health Center have not received optimal health education about stunting prevention. Health education on stunting prevention using audiovisual media was the first intervention carried out for pregnant women in the working area of the public health center. The aim of the study was to analyze the effect of Health Education Using Audiovisual Media on Knowledge of Stunting Prevention in Pregnant Women in the Working Area of the Wani Health Center.

METHOD

This study is a pre-experimental study with a one-group2 pretest posttest design. The study was conducted in the Work Area of the Wani Health Center, namely Wani Satu Village, Wombo Kalonggo, Wombo Induk and Wombo Mpanau, Donggala Regency, Central Sulawesi. The study lasted for three weeks from April 13 to May 3, 2022. The study population was all pregnant women who came to check their pregnancies in the working area of the Wani Health Center. The sample consists of 43 respondents. The sample is determined by consecutive sampling method. Pretest, posttest 1 and posttest 2 data were collected at the village office and auxiliary health centers in each village. The variable that is measured is the respondent's knowledge of stunting prevention. The results of measuring knowledge are considered good if the value of the respondent's answers is ≥ 76, considered sufficient if the value is 50-75, and considered poor if the value is ≤ 50. The intervention used was audiovisual media which contained material on stunting prevention. The instrument used to measure respondents' knowledge about stunting prevention was a questionnaire consisting of 21 statements. Knowledge is measured through pretest, posttest 1 and posttest 2 using the same questionnaire. Pretest and posttest 1 were measured on the same day, while posttest 2 was measured 1 week later. Health education through audiovisual media given to pregnant women contains materials related to stunting prevention. This audiovisual is self-made using interesting animations or pictures and has a duration of 8 minutes and 12 seconds. The analysis used is univariate and bivariate using the Friedman test with a confidence level of 95% ($\alpha=5\%$).

RESULTS

Table 1. Characteristics of pregnant women in the working area of the Wani Health Center (n=43).

Variable	Frequency (f)	Percentage (%)
Age		
<20 Years old	5	11.6
20-35 Years old	35	81.4
>35 Years old	3	7.0
Education		
Elementary	11	25.6
Secondary	28	65.1
High	4	9.3
Profession		
Working	7	16.3
Unemployed	36	83.7

Table 1 shows that the age group of 20-35 years is the largest age group, namely 35 people (81.4%), the most education is secondary education, namely 28 respondents (65.1%) and 36 respondents (83.7%) are unemployed.

Table 2. Frequency Distribution of Respondents' Characteristics.

Education	Pretest		Post test 1		Post test 2	
	F	%	f	%	F	%
Good	10	23,3	27	62.8	38	88.4
Sufficient	9	20.9	5	11.6	2	4.6
Poor	24	55.8	11	25.6	3	7
Total	**43**	**100**	**43**	**100**	**43**	**100**

Table 2 it shows that the respondents' knowledge before (pretest) being given stunting prevention health education was defic ient, namely 24 people (55.8%) and well knowledge able as many as 10 people (23.3%). In posttest 1, good knowledge increased to 27 people (62.8%) and those with poor knowledge became 11 people (25.6%), and 1 week later the respondents were given posttest 2 about stunting prevention health education, where the number of respondents who had good knowledge increased to 38 people (88.4%) and those with poor knowledge decreased to 3 people (7%).

Table 3. The effect of health education on stunting prevention before (pretest), after (posttest 1), and one week after being given (posttest 2) on increasing the knowledge of pregnant women in the working area of the Wani Health Center using the Friedman test.

Variable	N	Mean	Minimum	Maximum	SD	ρ
Pretest	43	52.19	19	90	21.87	
Posttest 1	43	71.72	24	95	21.86	0,000
Posttest 2	43	90.86	33	100	16.73	

Table 3 shows that the average value of knowledge of pregnant women before (pretest) health education is carried out, namely 52.19. After being given counseling (posttest 1) the average value was 71.72 and one week after being given treatment (posttest 2) the average value was 90.86. This means that there is an increase in the average pretest, posttest 1 and posttest 2 for health education about stunting prevention among pregnant women in the Wani Health Center work area, with a minimum score of "19" in the pretest and a maximum pretest score of 90. Then the minimum score in the posttest 1 is 24 and the maximum value is 95. While the minimum score in posttest 2 is 33 and the maximum value is 100.

DISCUSSION

This study analyzed differences in respondents' knowledge about stunting prevention through audiovisual media interventions with pretest, posttest 1 and posttest 2. The number of respondents was 43 respondents taken from four villages in the working area of the Wani Health Center. The results of the study showed that there was an increase in the knowledge of respondents in the "good" category by 38.7% from pretest to posttest 1. Respondents' knowledge in the "sufficient" and "poor" categories decreased by 9.1% and 29.5% from pretest to posttest 1. Based on the mean value, there was an increase of 19.53 from pretest to posttest 1. The statistical test results showed a significant value. Thus, the intervention using audiovisual media significantly increased the respondents' knowledge about stunting prevention before (pretest) and after (posttest 1) the intervention.

Meanwhile, a very significant increase in respondents' knowledge was obtained from pretest to posttest 2. In the "good" category there was an increase of 63.7%. The knowledge of respondents in the "sufficient" and "poor" categories from pretest to posttest 2 decreased by 16% and 47.7%. Based on the mean value, there was also a significant increase of 38.67 from pretest to posttest 2. The statistical test results also showed a very significant value. Compared to the increase in respondents' knowledge in posttest 1, the increase in respondents' knowledge in posttest 2 is very high. So that the measurement of the increase in respondents' knowledge in posttest 2 is better than posttest 1. The very significant increase in posttest 2 can be caused by respondents' exposure to stunting prevention material through audiovisual media repeatedly so that they can store information and remember this information well.

Audiovisual media is a work designed by combining audio and video technology that can be heard and seen. Audiovisual media includes video presentations that can be watched and studied by someone[17]. Audio-visual learning media is a teaching tool and educational tool that can activate the eyes and ears of students when learning and teaching activities occur[18]. Several studies have shown that educational media is very effective in increasing pregnant women's knowledge and attitudes towards stunting[19]. A study by Suryani et al (2022) found that audiovisual media was more effective in increasing pregnant women's knowledge of nutritional issues compared to booklets[20]. This happens because respondents prefer to watch compared to reading and opening booklets sheet by sheet.

Prevention of stunting is very important not only when a mother is experiencing pregnancy, but can be started during preconception[21]. During preconception, knowledge about reproductive health, nutrients for the needs of the mother and fetus, growth and development of the fetus in the womb and after the baby is born is very important to be known by prospective pregnant women[22]. Nutritional interventions for pregnant women to prevent stunting are supplementary feeding to reduce chronic energy and protein deficiencies. In addition, it is important to overcome deficiencies of folic acid, iron, iodine, calcium, malaria and intestinal worms. Nutrition for breastfeeding mothers, exclusive breastfeeding for babies up to six months, immunization, prevention of infectious diseases, zinc supplementation and iron fortification are also things that need attention in preventing stunting[23].

CONCLUSION

Health education through audiovisual media in posttest 2 significantly increased knowledge of stunting prevention in pregnant women in the working area of the Wani Health Center. It is recommended that health workers increase the use of audiovisual media in preventing stunting.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCE

1.	Gebreayohanes M, Dessie A. Prevalence of stunting and its associated factors among children 6–59 months of age in pastoralist

community, Northeast Ethiopia: A community-based cross-sectional study. Goli S, editor. PLoS One [Internet]. 2022 Feb 3;17(2):e0256722. Available from: https://api.elsevier.com/content/abstract/scopus_id/85124036224

2. Quamme SH, Iversen PO. Prevalence of child stunting in Sub-Saharan Africa and its risk factors. Clin Nutr Open Sci [Internet]. 2022 Apr;42:49–61. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2667268522000092

3. Haq I ul, Mehmood Z, Afzal T, Khan N, Ahmed B, Nawsherwan, et al. Prevalence and determinants of stunting among preschool and school-going children in the flood-affected areas of Pakistan. Brazilian J Biol [Internet]. 2022;82. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1519-69842022000100252&tlng=en

4. Maulina R, Qomaruddin MB, Kurniawan AW, Fernandes A, Astuti E. Prevalence and predictor stunting, wasting and underweight in Timor Leste children under five years: An analysis of DHS data in 2016. J Public Health Africa [Internet]. 2022 Jul 26;13(2). Available from: https://api.elsevier.com/content/abstract/scopus_id/85135636200

5. Kemenkes RI. Hasil Riset Kesehatan Dasar Tahun 2018. Kementrian Kesehat RI [Internet]. 2018;53(9):1689–99. Available from: https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-riskesdas-2018_1274.pdf

6. Kemenkes R.I. Buku Saku Hasil Survei Status Gizi Indonesia (SSGI) 2022. In: Buku Saku [Internet]. Kementerian Kesehatan R.I.; 2023. Available from: https://drive.google.com/file/d/1NejY10eGIUd9e-v-BCT1o8BYOrU6Rz_1/view

7. Puskesmas Wani. Data Stunting Puskesmas Wani. Donggala; 2021.

8. Widyaningsih, Mulyaningsih, Rahmawati, Adhitya. Determinants of socioeconomic and rural-urban disparities in stunting: evidence from Indonesia. Rural Remote Health [Internet]. 2022 Mar 21;22(1):1–9. Available from: https://api.elsevier.com/content/abstract/scopus_id/85126844955

9. Yunitasari E, Lee BO, Krisnana I, Lugina R, Solikhah FK, Aditya RS. Determining the Factors That Influence Stunting during Pandemic in Rural Indonesia: A Mixed Method. Children [Internet]. 2022 Aug 8;9(8):1189. Available from: https://www.mdpi.com/2227-9067/9/8/1189

10. Avula R, Nguyen PH, Tran LM, Kaur S, Bhatia N, Sarwal R, et al. Reducing childhood stunting in India: Insights from four subnational success cases. Food Secur [Internet]. 2022 Aug 1;14(4):1085–97. Available from: https://api.elsevier.com/content/abstract/scopus_id/85127556814

11. Siswati T, Iskandar S, Pramestuti N, Raharjo J, Rubaya AK, Wiratama BS. Drivers of Stunting Reduction in Yogyakarta, Indonesia: A Case Study. Int J Environ Res Public Health [Internet]. 2022 Dec 8;19(24):16497. Available from: https://api.elsevier.com/content/abstract/scopus_id/85144528825

12. Arie Nugroho. Intervensi Kepada Ibu Balita Dan Ibu Hamil Sebagai Ujung Tombak Pencegahan Stunting Di Desa Banjar Mulya Kecamatan Baradatu Kabupaten Way Kanan. Jompa Abdi J Pengabdi Masy [Internet]. 2022 Sep 1;1(3):8–14. Available from: https://jurnal.jomparnd.com/index.php/jpabdi/article/view/181

13. Saputri RA, Tumangger J. Hulu-Hilir Penanggulangan Stunting di Indonesia. J Polit Issues [Internet]. 2019;1(97671). Available from: https://mpra.ub.uni-muenchen.de/97671/1/MPRA_paper_97671.pdf

14. Anggraini SA, Siregar S, Dewi R. Pengaruh Media Audio Visual Terhadap Tingkat Pengetahuan Dan Sikap Pada Ibu Hamil Tentang Pencegahan Stunting Di Desa Cinta Rakyat. J Ilm Kebidanan Imelda. 2020;6(1):26–31.

15. Artikasari L, Susilawati E, Sari DM. Pengaruh Video Tiktok Terhadap Pengetahuan danSikap Ibu Hamil

Tentang Gizi Selama Kehamilan. Jurnalilmiahobsgin [Internet]. 2022;14(2):39–48. Available from: https://stikes-nhm.e-journal.id/JOB/article/view/691/648

16. Ginting S, Simamora ACR, Siregar N. Pengaruh Penyuluhan Kesehatan dengan Media Audio Visual terhadap Perubahan Pengetahuan , Sikap dan Praktik Ibu dalam Pencegahan Stunting di Kecamatan Doloksanggul Kabupaten Humbang Hasundutan Tahun 2021 The Effect of Health Counseling with Audio Visual Me. J Heal Technol Med [Internet]. 2022;8(1):390–9. Available from: http://jurnal.uui.ac.id/index.php/JHTM/article/view/1996/1097#

17. Law Insider. Audiovisual Media Definition [Internet]. Law Insider. 2023 [cited 2023 Feb 6]. p. 1. Available from: https://www.lawinsider.com/dictionary/audio-visual-media

18. Bungfei. Pengertian Media Audio Visual, Kelebihan, Kekurangan dan Manfaatnya [Internet]. Bungfei.com. 2020 [cited 2023 Feb 6]. p. 1. Available from: https://www.bungfei.com/2020/02/pengertian-media-audio-visual-kelebihan.html

19. Nuradhiani A. Upaya Pencegahan Stunting Sejak Dini melalui Pemberian Edukasi pada Ibu Hamil. J Gizi Kerja dan Produkt. 2022;3(1):46.

20. Suryani S, Nurti T, Heryani N, Rihadatul 'Aisy R. Efektivitas Media Audiovisual dan Booklet Terhadap Pengetahuan Ibu Hamil Tentang Gizi Dalam Pencegahan Kekurangan Energi Kronis. Nurs Care Heal Technol J. 2022;2(1):48–54.

21. Taqwin T, Linda L, Suryani L, Nasrul N. Konseling Pra Konsepsi (Koprasi) pada Kader Kesehatan dalam Upaya Promosi dan Pencegahan Stunting. Poltekita J Pengabdi Masy. 2022;3(1):36–42.

22. Triawanti T, Sanyoto D, Fujiati F, Setiawan B, Erliyanti E, Juliati S. Upaya Pencegahan Stunting sejak Prakonsepsi melalui Modul NKR_CATEN dan Konseling. Pros Konf Nas Pengabdi Kpd Masy dan Corp Soc Responsib [Internet]. 2020 Dec 13;3:355–61. Available from: https://prosiding-pkmcsr.org/index.php/pkmcsr/article/view/862

23. Izwardi D. Kebijakan dan Penanggulangan Stunting di Indonesia [Internet]. Direktur Gizi Masyarakat; 2019. 1–64 p. Available from: https://persi.or.id/wp-content/uploads/2019/02/FINAL_PAPARAN_PERSI_22_FEB_2019_Ir._Doddy.pdf

Original Article

Identification of University Resources in an Effort to Design a Disaster Resilience Training Module

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ABSTRACT

The current disaster management paradigm emphasizes community empowerment, thus enabling the community to become a helping subject, not an object that needs help. Data shows that Indonesia is a country prone to all sources of natural disasters. The purpose of this research is to compile modules in creating a disaster resilient campus. After the modules are compiled, the next step is to socialize the modules, conduct training of trainers, training and evaluate the training that has been carried out based on the modules that have been prepared. Research methods. Quantitative research design, with a descriptive approach. Aims to identify the potential of higher education institutions in efforts to reduce disaster risk in an effort to develop training modules. The population and sample were FGD (Focus Group Discussion) participants and disaster management experts/experts, and 100 module trial participants.The research variables were obtained from the results of literature studies and FGDs. Furthermore, the identification results are used to develop modules that can be used as Field Rehearsal guides. Modules are obtained in 3 ways: identification, FGD and expert consultation. The variables of this study are the presence of disaster courses, the presence of disaster course lecturers, the competence of lecturer training, the existence of training modules for lecturers, the diversity of potential disaster sources. Result.The results of the analysis test on all variables which are learning activities, are valid and reliable. From the results of the analysis, it can be obtained that the item score with a total score is then compared with the r table value (5% significance with a 2-sided test and n = 110) in the amount of 0.195. The decision was that all the r values from the analysis were more than (>) the r table values. Conclusion. The results showed that the modules that had been developed by conducting literature studies, FGDs and expert consuls had been tried out. The results of the analysis test show that the module can be used for disaster risk reduction (DRR) training for campuses. The importance of conducting training by paying attention to the 10 learning activities as disaster training competency standards.

Keywords : Disaster Risk, Disaster Simulation, Campus Preparedness.

INTRODUCTION

The current disaster management paradigm emphasizes community empowerment so as to enable the community to become a helping subject, not an object that needs help. Elements in society that need to be empowered are families, groups and communities[1]. Community preparedness needs to be increased in efforts to reduce disaster risk (DRR). Disasters can be natural or man-made disasters such as earthquakes, hurricanes, hurricanes, regional conflicts or wars, and even outbreaks of infectious diseases[2]. Disaster is a serious threat or major destruction for the community, which causes huge losses resulting in the paralysis of community functions and capabilities in many aspects[3].

Indonesia is one of the countries with disaster-prone potential. Data shows that 20% of Indonesia's territory is a flood-prone area, 4% is a volcano-prone area, and 49% is a volcano-prone area, an earthquake-prone area[4].

Individual, community, and societal preparedness needs to be properly designed and prepared. One of the preparedness plans is carried out in the form of disaster preparedness training. Preparedness through planned and periodic training needs to be carried out by all institutions, both private and government. For that we need a set of modules that serve as a reference for individuals, groups, and communities. Individual preparedness can build group and community preparedness.

Disaster Preparedness Training is useful so that everyone can understand risks, be able to manage threats so that they can contribute to encouraging community resilience from disaster threats. The culture of the Indonesian people that prioritizes social interests, cooperation, and mutual trust is an adhesive value of social capital that has been tested and continues to be nurtured, both the ability of individual groups and the community collectively is an asset for disaster risk reduction.

Types of preparedness training that can be carried out include: 1) Activation of early warning signs; 2) Self Evacuation Training; 3) Implementation Test of Temporary Refugees. Special preparedness training also involves vulnerable groups, such as children, the elderly and the homeless, persons with disabilities and people with special needs[5].

Campus capacity in dealing with potential disaster risk relates to its ability to plan, analyze and implement disaster risk reduction activities. Therefore, the academic community needs provision to increase preparedness, through various mitigation strategies[6].

This research seeks to prepare tools in the form of modules that are used to conduct disaster preparedness training. It is hoped that the tools produced from this research can be applied to individuals, groups and communities so that they have disaster preparedness[7].

METHOD

This research has received ethical approval, from the Surabaya Poltekkes Health Research Ethics Commission No.EA/525/KEPK-Poltekkes_Sby/V/202. This research is the initial stage of a series of research on the design of disaster preparedness risk training in an effort to reduce disasters. In this study using a quantitative design, with a descriptive approach. The population and sample are FGD (Focus Group Discussion) participants and disaster management experts. The research variables were obtained from the results of literature studies and FGDs. Furthermore, it will be used for Disaster Management Simulation assistance. The substance of the module is obtained in 3 ways: literature study, FGD and expert consultation.

The variables of this study are the presence of disaster courses, the presence of disaster course lecturers, the competence of lecturer training, the existence of training modules for lecturers, the diversity of potential disaster sources.

The population in this study consisted of 49 FGD participants, namely 20 people on target-1, 20 on target-2. The experts in this study are methodologists and disaster experts. The sampel population shows that respondents in the productive age category, undergraduate education and long enough work experience have the capacity to become FGD participants. The population in this study can be divided into several criteria.

Table 1. Population table and research sample according to criteria.

No	Activity	Population	Population Size (Person)
1.	Module Trial	Diploma 4 Health Student	40
2.	TOT (Training of Trainer) Disaster Preparedness Training	Participants: Lecturer in charge of the course	20
		Trainer: BPBD instructor/volunteer	15
		Committee: Researchers and field assistants	10
3.	Implementation of training results	Students and the designated academic community	50

The analysis was carried out descriptively to describe each research variable, target population and research location using

the central tendency (8).

RESULTS

The validity of the factors is measured because the items are arranged using more than one factor. Measurement of the validity of this factor by correlating between factor scores (sum of items in one factor) with total factor scores (total factors). The validity testing technique uses Bivariate Pearson correlation [6,9].

Table 2. Test Results for the Validity and Reliability of the disaster module variables on a tough campus.

No	Variabel	V	R
1.	Material about building a commitment to learning disaster	0,884	0.980
2.	Disaster preparedness management.	0,910	0.980
3.	The concept of disaster mitigation, namely: the purpose of disaster mitigation	0,902	0.980
4.	The concept of training for the campus disaster task force.	0,940	0.980
5.	Disaster types and warning services	0,917	0.980
6.	Objectives of disaster mitigation training objectives, competence of training participants, training participants, resource persons and facilitators	0,946	0.980
7.	Materials related to on-campus disaster mitigation training: objectives of on-campus disaster mitigation training, competencies, training facilitators, on-campus training organizers	0,932	0.980
8.	Field rehearsal program structure (simulation), training methods, training	0,931	0.980
	program plan (RPP).		
9.	Material on self-evacuation drills.	0,916	0.980
10.	Material on supporting information on disaster emergency preparation, related	0,942	0.980

From the table above shows that the results of the analysis test on all variables which are learning activities, are valid and reliable. From the results of the analysis, it can be obtained that the item score with a total score is then compared with the r table value (5% significance with a 2-sided test and n = 110) in the amount of 0.195. The decision was that all the r values from the analysis were more than (>) the r table values.

In conclusion, all variables are valid. Furthermore, the reliability test was carried out with an Alpha value of 0.793, while the critical r value (2-sided test) at 5% significance with n = 110 (df = n-2 = 108), was obtained at 0.980, it can be concluded that the research module items it's reliable. It can be concluded that the items of the research module are reliable, so that all learning activities in the designed module can be used to design training for the disaster-resilient campus

DISCUSSION

The potential to be optimized in dealing with disaster risks for campuses is very strong. All campuses already have disaster courses. This is certainly very positive in reducing disaster risk. High community participation is an asset in reducing disaster risk [10]. The research results show that 96% have disaster courses on campus.

The results of the study show that only 8% of campuses have carried out disaster simulations. This illustrates the high risk in terms of disaster mitigation on campus. One of the reasons is because there is no disaster preparedness training learning activity module. While campuses that have held simulations regularly once a year are as much as 8%. This campus organizes training regularly once a year.

To develop disaster training learning modules, there are 10 learning activities, namely: 1) building learning commitment (BLC); 2) basic concept of disaster mitigation;

3) the concept of disaster management task force training; 4) the objective of disaster mitigation training; 5) structure of the field rehearsal program; 6) field rehearsal (disaster simulation); 7) disaster preparedness management; 8) types of disasters and warning services; 9) self-evacuation exercise; 10) supporting information on disaster emergency preparation.

After conducting FGDs with stakeholders, several changes in substance and material structure were obtained. Learning activities about building learning commitment (BLC) are needed. BLC is an effort to build beforehand a promise or ability, where the promise or ability is confirmed to do something or not do something [5]. Building commitment, it is intended that training participants have built commitment from the start as an important part of disaster volunteerism. With BLC, it is hoped that the training participants will have the ability to build a commitment to learning in disaster training programs through disaster learning, identifying aspects of BLC, and the learning process [11]. Expert opinion states that BLC can be used as one of the learning activities in the disaster training module.

Disaster mitigation is an important part of disaster management. Therefore disaster mitigation is carried out when conditions are far from potential and signs of a disaster occur. In areas that are frequently hit by floods, mitigation is carried out during the dry season. So that when the rainy season arrives, it is already able to carry out preparedness efforts in dealing with disasters [12]. Mitigation is a disaster risk reduction effort that requires a long-term activity and is part of sustainable development as a disaster risk reduction (DRR) effort. Through education it is hoped that disaster risk reduction with broader targets will be introduced earlier to the entire campus academic community [9].

The concept of disaster preparedness training is a form of coordination, communication and evacuation exercises involving the entire campus academic community, from leaders to the lowest levels of staff. In essence, when a disaster occurs, there is no longer any classification of leaders and subordinates, all of them have the same opportunity to be helpers and at the same time be the ones being helped. Therefore, in the concept of preparedness training, there is a need for a fusion of the roles of all elements in the academic community. The top leader during a disaster is the field coordinator, who may not be held by the top leadership, but carries a very important mission[13]. The entire academic community, from directors to security guards, and lowest level employees, must be involved in simulating real disaster situations, with reference to disaster scenarios that are made closer to real conditions [13].

In the learning activities for the objectives of the training, there are 8 issues of learning activities, namely: objectives, competence of trainees, training participants, resource persons/facilitators, organizers of quiz training, games and bibliography. The academic community's understanding of basic disaster knowledge should be provided through courses. It can be general courses, compulsory courses, or local content courses. This is an academic guarantee for the process of achieving competency for students. Thus it is hoped that it can bring about the resilience of the academic community. Practical learning and games designed with the intention that students can have skills in disaster, which includes preparedness, emergency exercises, and preparing disaster management plans and contingency plans. Students are also expected to be able to apply disaster management skills well on campus and off campus. So it is expected that the outcome of the disaster learning process is the profile of graduates who have an insight into disaster risk reduction [14,13].

For the entire academic community, especially lecturers and education staff, it is necessary to obtain sufficient disaster preparedness. Through design training and simulations that involve the entire academic community, it is hoped that it will provide a good understanding of preparedness to become a campus that is resilient to disasters. Thus it is necessary to design a good field gladiator structure. Several considerations in preparing the structure of the gladilapang include: the training process, training procedures, training methods and Training Program Plans (TPP).

It is also necessary to design procedures for self-evacuation drills which consist of: natural, non-natural, social and disaster based on local wisdom. Self-evacuation procedures require an understanding of the common types of threats and potential disasters in Indonesia, early warning systems, drills for evacuation of earthquakes, tsunamis, building fires, landslides/subsidence, volcanic eruptions,

floods, etc. Included in local wisdom are disasters that are often found in the area but not/rarely found in other places, for example tidal floods, exposure to chemicals from laboratories, etc [15].

The academic community also needs to be equipped with technical competence skills for emergency assistance during a disaster, for example first aid techniques, Basic Life Support (BLS), ambulation of disaster victims, identification of poisoning, etc. This practical knowledge is very useful when in a disaster emergency. Moreover, at that time there were no medical personnel present at the disaster site. Experience in several major disaster events shows that technical skills in emergency medical assistance like this are very useful in saving lives [13].

The capacity of lecturers for disaster courses has an important role in efforts to reduce disaster risk. This means that capacity building is needed for lecturers to carry out disaster training according to the standard capacity of the teacher by using the modules that have been arranged. Because if they do not have good capacity, it will be difficult in efforts to reduce disaster risk [16].

CONCLUSION

The results showed that the modules that had been developed by conducting literature studies, FGDs and expert consuls had been tried out. The results of the analysis test show that the module can be used for disaster risk reduction (DRR) training for campuses. The importance of conducting training by paying attention to the 10 learning activities as disaster training competency standards. Still referring to the existence of disaster courses, the existence of disaster course lecturers, the competence of lecturer training, the existence of training modules for lecturers, the diversity of potential disaster sources. It is necessary to socialize disaster preparedness training modules in an effort to reduce disaster risk.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Chandra RK, Supriharjo RD. Mitigasi Bencana Banjir Rob di Jakarta Utara. J Tek Pomits. 2013;2(1):25–30.
2. Sumasto H., Suparji, Wisnu NT., Ngestiningrum AH, Setiawan, Sugito BH, Najib M. Trauma healing during the earthquake disaster emergency response phase in Lombok, Indonesia. Indian J Forensic Med Toxicol. 2019;13(4):1745–8.
3. Said NB, Chiang VCL. The knowledge, skill competencies, and psychological preparedness of nurses for disasters: A systematic review. International Emergency Nursing. Elsevier Ltd; 2020.
4. Kamil PA, Utaya S, Sumarmi, Utomo DH. Improving disaster knowledge within high school students through geographic literacy. Int J Disaster Risk Reduct. 2020 Feb 1;43.
5. Hery Sumasto, Surtinah NW. Vulnerability dan Capacity sebagai Penentu Pemetaan Risiko Bencana Pada Keluarga Yang Mengalamai Masalah Kesehatan Ibu dan Anak. 2017;
6. Hery Sumasto, Nurwening Tyas Wisnu NS. Development of Instruments to Detect Disaster Risk in Children Under Five. Humanist Netw Sci Technol. 2018;2(2).
7. Hidayati D, Widayatun, Hartana P, Triyono, Kusumawati T. Panduan Mengukur Tingkat Kesiapsiagaan Masyarakat dan Komunitas Sekolah. 2017;(January 2011).
8. Takim R, Mohammad MF, Nawawi AH. Malaysian Entrepreneurship through "Building Back Better" (BBB) Agenda in the Redevelopment of Banda Aceh. Procedia Eng. 2018;212(2017):324–31.
9. Kawasaki H, Yamasaki S, Rahman MM, Murata Y, Iwasa M, Teramoto C. Teachers-parents cooperation in disaster preparation when schools become as evacuation centers. Int J Disaster Risk Reduct. 2020 Apr 1;44.
10. Arifin MH. Kesiapsiagaan Bencana Berbasis Masyarakat Strategi dan Pendekatan. I. Enna Sudartama, editor. Jakarta: Markat PMI Pusat; 2007.
11. Damayanti HN. Kajian Kesiapsiagaan Individu Dan Rumah Tangga Dalam Menghadapi Bencana Tsunami Di Kecamatan Grabag Kabupaten Purworejo. [skripsi]. Fak Ilmu Sos Univ Negeri Semarang [Internet]. 2015;1–124. Available from: http://lib.unnes.ac.id/21848/1/32114110 28-S.pdf

12. Wati W. Pengembangan Modul Pembelajaran Fisika SMA Terintegrasi Penanggulangan Bencana Tanah Longsor. J Ilm Pendidik Fis Al-Biruni. 2015;4(1):109–19.

13. Gardner AK, DeMoya MA, Tinkoff GH, Brown KM, Garcia GD, Miller GT, et al. Using simulation for disaster preparedness. In: Surgery (United States). Mosby Inc.; 2016. p. 565–70.

14. Suharwoto G., Nurwin D. Modul Manajemen Bencana di Sekolah. 2015;

15. Umam Q, Rahman F. SENA SAKTI (Sekolah Bencana; Siaga, Aksi dan Mitigasi). J Ilm Ilmu Sos. 2018;4(1):6–11.

16. Riskianingrum D. Penanganan Bencana dan Transformasi Pengetahuan Tentang Kegempaan Di Masa Kolonial. Paramita. 2013;23(1):1–13.

Original Article

Prevalence and Determinants Stunting Among Children Under Two Years in Indonesian District

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ABSTRACT

The study aims to analyze the prevalence and determinants of stunting in children under two years of age in Tojo Una-Una District, Indonesia as focus location of stunting. The method is Cross-sectional study design, the sample of 300 children aged 0-23 months, stratified random sampling technique. Data collection in June-July 2022. Stunting data was obtained by measuring body length using the length measuring board. The WHO-Antro 2005 software was used to determine the Z-Score height per age. Univariate, bivariate, and multivariate analyzes used SPSS version 22.00. The Results of this research show that 33.7% of children under the age of two are stunted. Stunting in children under the age of two is associated with child age, birth weight, and food insecurity. In addition to a history of low birth weight (AOR=2.7, 95% CI: 1.2-5.7) and experiencing food insecurity (AOR=1.9, 95% CI: 1.1-3.5), children aged 12-23 months (AOR=3.5, 95% CI: 1.7-7.2) have a higher tendency to experience stunting than those who are not. The Conclusion is the prevalence of stunting which is more than 20 percent is a priority health problem that must be resolved by 2024. Interventions to reduce stunting by reducing the incidence of low birth weight, reducing food insecurity, managing birth spacing > 3 years, number of children less than 3, and breastfeeding.

Keywords : Stunting, Low Birth Weight, Food Insecurity, Malnutrition, Child Health.

INTRODUCTION

Stunting is defined as an anthropometric measure of a child's height for age (HAZ) with a Z-score <-2 Standard Deviation from World Health Organization (WHO) standard [1]. Stunting is a diagnostic category in assessing a child's nutritional status that was introduced in 1973 by J. C. Waterlow. Stunting usually appears early in life, is a long-term linear growth obstacle, and is difficult to recover for further growth [2]. According to UNICEF/WHO and the World Bank [1] there are approximately 149 million stunted children worldwide, accounting for 22% of all children. The proportion of stunted children is concentrated in low-income (34.6%) and lower-middle-income (29.1%) countries. In 2020, more than half of all stunted children under the age of five lived in Asia, with Southeast Asia having the highest stunting prevalence (27.4%) [1].

Malnutrition, including stunting, is prevalent in Indonesia [3]. According to Ministry of Health data, the prevalence of stunting in children aged five and under remains high, at 30.8%[4]. Meanwhile, the Indonesian government hopes to reduce stunting to 14% by 2024 [5]. According to the World Bank (2020), Indonesia has done less well than upper middle-income countries and other countries in the region in terms of reducing stunting rates [6]. Stunting prevalence varies by region in Indonesia, with provinces in eastern Indonesia having a higher prevalence of stunting than other regions [4,7]. Central Sulawesi is one of the top ten provinces in Indonesia with the highest prevalence (28.2%), with Tojo Una-una district ranking fifth out of 14 districts [8]. In 2023, Tojo Una-una Regency will be the focus location (locus) for integrated stunting reduction interventions [9].

Stunting has serious consequences for children's physical and cognitive development, resulting in long-term health and well-being issues. Stunted children are more vulnerable to infectious diseases, and their cognitive development may be hampered, resulting in poor educational performance and lower productivity in adulthood [10,11]. Understanding the factors that contribute to stunting is essential for developing effective interventions to prevent and reduce stunting in children.

The most recent research from Rwanda, Gambia, Ethiopia, India, Uganda [12–16], and Indonesia [17,18] indicates that the causes of child stunting vary and are multifactorial. Stunting determinants include low birth weight [18–23], food insecurity [19,23–27], birth spacing [7,28–30], child age [31–34] number of children [35–38], and the inability to breastfeed exclusively [39–42]. Stunting increased significantly in children living in households with three or more children under five years of age, households with 5-7 household members, children whose mothers attended less than four antenatal care services during pregnancy, males, 12–23 months old, and low birth weight [43]. Non-exclusive breastfeeding for the first 6 months, low household socioeconomic status, premature birth, short birth, low maternal height, low education, poor latrines, untreated drinking water, poor access to health care, and living in rural areas are all determinants of stunting in Indonesia [44,45]. A study in Central Sulawesi discovered that low birth weight, poor hand-washing practices, and a lack of a latrine were

risk factors for stunting [46–48].

Despite the high prevalence of stunting in Tojo Una-Una district, limited research has been conducted on the determinants of stunting among children under two years of age. Therefore, this study aims to determine the prevalence of stunting and identify its determinants among children under two years of age in Tojo Una-Una district.

METHOD

This is a cross-sectional analytic study. Tojo Una-una District is the site of the research. As a stunting locus, there are 23 village areas spread across 9 sub-districts. There are three sub-districts on the mainland and six on the islands. Approximately thirteen to fourteen children under the age of two represent each village. The stratified random sampling technique was used to select the candidates. Nutrition workers who had received 5-day training collected measurement data.

The locus of stunting in a sample of 300 children aged 0-23 months. Data collected from the mothers of the study sample. The Data Technical Person in Charge checked the data for completeness and correctness.

The dependent variable is children's nutritional status, which is classified into two categories: normal and stunting. This category is based on the results of calculating the z-score for HAZ (< -2 SD categorized as stunting) using the WHO-Antro 2005 software. The independent variables are divided into mother and child factors.

Mother factors: the mother's age, mother's education, type of delivery, drinking water source, family latrine ownership, ownership index, breastfeeding, breastmilk, food insecurity, number of children, delivery distance, residence, utilization of health facilities, smoking family.

Child factors: child's gender, child's age in months, early breastfeeding initiation, birth length, low birth weight, supplementary feeding, receive growth stimulation, illness history, history of Acute Respiratory Illness (ARI), history of diarrhea, history of pulmonary tuberculosis, history of measles, history of intestinal worms, child condition during the study.

Stunting data was obtained by measuring body length using the Length Measuring Board (LMB) and measuring age by

reading the birth certificate or the Maternal Child Handbook (MCH) of the respondent's child. Other data were obtained by filling out the cobocollect questionnaire.

Data were analyzed in 3 stages. The first is univariate analysis to describe the frequency distribution of each variable. Second, bivariate analysis between the dependent variable and the independent variable to calculate the adjusted odds ratio (AOR), namely the relative risk between the stunting group and the normal group with a significant chi-square test $p<0.05$. The third multivariate analyzes used the backward logistic regression method. All analyzes were performed using SPSS 22.00 software (IBM Corp, Armonk, NY, USA) with a 95% confidence interval (CI) and a significance p-value ≤ 0.05.

Study ethical eligibility was obtained from the Ethics Commission of the Poltekkes, Ministry of Health, Palu Number 0010/KEPK-KPK/IV/2022.

RESULTS

According to our findings (table 1), the prevalence of stunting in toddlers in the Tojo Una-una District stunting locus area is 33.7%. where it was discovered that the characteristics of the mothers of stunted children were mostly aged 20 years or more (34.5%), had an education period of less than 9 years (35.0%), gave birth to their children normally (33.8%), did not breastfeed their children (40.1%), having more than 3 children (41.8%), and having a distance of 3 years or less (42.6%)

their children had a higher incidence of stunting. Mothers who use improved drinking water sources (34.5%), own family latrines (34.2%), have a middle down ownership index (37.0%), have food insecurity (44.4%), live on islands (35.4%), and do not smoke (40%) have a higher incidence of stunting in their children.

In our findings also found that food diversity in children under two years of age in the stunting locus is still less diverse, with children under two years of age consuming animal protein sources only 32.0% and vegetable protein sources only 9.3%. Drinking milk other than breast milk was 23.0%, consuming vegetables as sources of vitamin A only 8.3%, dark green vegetables only 19. 3%. Intake of fruit sources of vitamin A only 3.0%, but children under two years of age who had consumed snacks such as crackers or cheese balls were as much as 9.7%.

The most stunted children were aged 12-23 months (42.3%), initiated early breastfeeding (35.0%), born less than 48 cm (37.3%), born with low birth weight (47.2%), given supplementary feeding (39.7%), receiving growth stimulation (37.8%), having a history of illness (33.9%), both history of ARI, diarrhea, lung tuberculosis, and intestinal worms, and children who were in mild pain (41.9%). According to the bivariate analysis from statistical chi-square test showed a relation between stunting in children under two years with breastfeeding (p=0.020), food insecurity (p=0.42), and child's age (p=0.001) (table 1).

Table 1. Respondent characteristics and cross tabulation with stunting prevalence

Variable	Nutritional Status				p-value
	Stunting		Normal		
	n (101)	%	n (199)	%	
Mother's characteristics					
Mother's age (year)					
<20	12	28.6	30	71.4	0.451
≥20	89	34.5	169	65.5	
Mother's education					
<9 years	72	35.0	134	65.0	0.486
≥9 years	29	30.9	65	69.1	
Type of delivery					
Normal	93	33.8	182	66.2	0.854
Sectio Secarea	8	32.0	17	68.0	
Breast milk					
Not exclusive	68	33.0	138	67.0	0.863
Exclusive	31	33.0	63	67.0	
Breastfeeding					
No	59	40.1	88	59.9	0.020*
Yes	42	27.5	111	72.5	

Number of children					
>3 children	23	41.8	32	58.2	0.157
≤3 children	78	31.8	167	68.2	
Delivery Distance					
≤3 years	29	42.6	39	57.4	0.075
>3 years	72	31.0	160	69.0	
Utilization of health facilities					
No	12	33.3	24	66.7	0.964
Yes	89	33.7	175	66.3	
Drinking water Source					
Not Improved	5	22.7	17	77.3	0.259
Improved	96	34.5	182	65.5	
Family Latrine Ownership					
No	32	32.7	66	67.3	0.796
Yes	69	34.2	133	65.8	
Ownership index					
Middle down	57	37.0	97	63.0	0.208
Middle to above	44	30.1	102	69.9	
Food insecurity					
Yes	28	44.4	35	55.6	0.042*
No	73	30.8	164	69.2	
Residence					
Island	80	35.4	146	64.6	0.267
Non-island	21	28.4	53	71.6	
Smoking family					
No	8	40.0	12	60.0	0.535
Yes	93	33.2	187	66.8	
Child's characteristics					
Child age (month)					
0-6	18	27.3	48	72.7	0.001**
7-11	12	18.2	54	81.8	
12-23	71	42.3	97	57.7	
Early Breastfeeding Initiation					
No	43	30.7	97	69.3	0.599
Yes	56	35.0	104	65.0	
Birth Length					
<48 cm	28	37.3	47	62.7	0.438
≥48 cm	73	32.4	152	67.6	
Low birth weight					
Yes	17	47.2	19	52.8	0.067
No	84	31.8	180	68.2	
Supplementary feeding					
No	53	29.6	126	70.4	0.070
Yes	48	39.7	73	60.3	
Receive growth stimulation					
No	39	28.7	97	71.3	0.096
Yes	62	37.8	102	62.2	
Illness history					
No	14	32.6	29	67.4	0.868
Yes	87	33.9	170	66.1	
History of ARI					
No	60	30.9	134	69.1	0.174
Yes	41	38.7	65	61.3	
History of diarrhea					
No	92	33.5	183	66.5	0.797
Yes	9	36.0	16	64.0	
History of pulmonary tuberculosis					
No	100	33.6	198	66.4	0.642
Yes	1	50.0	1	50.0	

History of measles					
No	87	33.7	171	66.3	0.961
Yes	14	33.3	28	66.7	
History of intestinal worms					
No	97	33.4	193	66.6	0.666
Yes	4	40.0	6	60.0	
Child condition during the study					
Mild pain	18	41.9	25	58.1	0.219
Healthy	83	32.3	174	67.7	
Total	101	33.7	199	66.3	

*p < 0.05; **p < 0.001

Table 2 presents the results of the multivariate analysis where showed that children aged 12-23 months are 3.5 times more likely to experience stunting (95% CI 1.7-7.2) than children aged 0-6 months. Children under two years of age who were born with low birth weight were 2.7 times more likely to experience stunting (95% CI 1.2-5.7) compared to them who were born with normal weight. Children under two years of age who experience food insecurity are likely to experience stunting 1.9 times (95% CI 1.1-3.5) compared to them who do not experience food insecurity.

Table 2. Multivariate Analysis of Determinants of Stunting in Children Under Two Years Age in Indonesian District.

Variables	p-value	AOR	95%CI	
			Lower	Upper
Child age				
0-6	reff	1.0		
7-11	0.105	1.7	0.9	3.4
12-23	0.001**	3.5	1.7	7.2
Low birth weight				
No	reff	1.0		
Yes	0.011*	2.7	1.2	5.7
Food insecurity				
No	reff	1.0		
Yes	0.034*	1.9	1.1	3.5
Number of children				
>3 children	reff	1.0		
≤3 children	0.136	1.6	0.9	3.0
Birth spacing				
≤3 years	reff	1.0		
>3 years	0.066	1.7	1.0	3.1
Breastfeeding				
No	reff	1.0		
Yes	0.168	1.4	0.9	2.4

*p < 0.05; **p < 0.001

DISCUSSION

The stunting rate in children under two years of age is one of the most important health indicators globally [37]. The prevalence of stunting under two years of age in the stunting locus area of Tojo Una-una District in 2022 in this study is 33.7%. In other studies, the results of a survey on the nutritional status of Indonesian children under five conducted by the Ministry of Health of the Republic of Indonesia showed that there was an increase in the prevalence trend of child stunting in Tojo Una-Una District from 29.4% [49] in 2021 to 31.3% [50] in 2022 or an increase of 1.9% in a year. The results of this study indicate that the incidence

of stunting is significantly increasing in children born with a body weight <2500 gram, have a low level of food security, and are aged 12-23 months.

This study shows that the strongest predictor of stunting is in Tojo Una-Una districts is child's age. This study found that children under the age of 12-23 months had a significantly increased likelihood of experiencing stunting compared to children aged <12 months. Other study shows that the difference in body length between normal birth weight babies and low birth weight babies is increasingly visible starting from the age of 12 months until reaching the age of 2 years [51,52]. Inadequate growth with increasing age can be associated with the transition of feeding from exclusive breastfeeding to complementary foods [53]. Problems with child growth will occur if continued breastfeeding is not accompanied by adequate complementary breastfeeding based on age. An increase in the need for nutrients if accompanied by an insufficient intake of nutrients can cause a slowdown in growth [54,55]. In addition, exposure to various diseases and conditions as a consequence of increasing age, such as exposure to poor food hygiene and environmental sanitation, can have an impact on slowing growth [53]. As a result, adequate nutrition and a healthy environment are important during this critical period to promote healthy growth and development of the children.

This study shows that one of the strong predictors of stunting in Tojo Una-una is low birth weight of the baby which is in line with the findings of previous studies [45,56–58]. Studies in Indonesia, Rwanda, Malawi, India, Africa [18–23], Pakistan and Tanzania have also consistently demonstrated that low birth weight is a major risk factor for stunting [22,59–61]. A study in Tojo Una-una shows that low birth weight is 2.7 times more likely to experience stunting (95% CI 1.2-5.7) with children under two years of age who are born with normal weight, relevant to a study by Aryastami, et al (2017) which shows that babies born with low birth weight are 1.74 times more likely to experience stunting (95% CI 1.38-2.19) compared to babies born with normal weight [45]. Stunting usually begins in pregnancy, so the possibility of low birth weight babies experiencing underweight tends to persist in early childhood. The growth of low birth weight babies is reported to tend to be lower than normal birth weight babies [51,52]. The

growth that is not optimal during the perinatal period is a contribution from maternal malnutrition. However, in the postnatal period, these growth disturbances can be corrected by optimal feeding practices [53,56]. Therefore, in the postnatal period, if food intake (nutrients) is insufficient, compounded by unhealthy environmental conditions, toddlers will be susceptible to infectious diseases, which will reduce the body's ability to absorb nutrients and ultimately interfere with growth [53]. Birth weight is a strong predictor of stunting [48], as a result fulfillment of maternal nutritional intake before and during pregnancy is optimized so that children do not experience low birth weight, in this way it is hoped that the incidence of stunting will also decrease.

Lack of nutritional intake in children and mothers can be triggered by a low level of food security in the family. This study also shows that another strong predictor of stunting is family food security. Other studies have reported that the relationship between socioeconomic level and the incidence of stunting is generally mediated by food security [62,63]. In addition, a low level of food security will have an impact on low food diversity in toddler food intake [62,64]. The characteristics of complementary foods for children under two years of age are reflected in the diversity of foods that are still lacking in variety. Concerning stunting, the intake of animal protein sources for under-fives such as beef, chicken, fish, and eggs is still very low or less than 50%. Findings in Northern Ethiopia protein intake is very low [65]. Likewise, in areas in Indonesia where the prevalence of stunting is high, intake of animal protein is only 19.3% [66]. It also includes that food diversity also greatly influences the incidence of stunting in children[67,68]. Low dietary diversity is related to stunting. A study by Hlaing LM (2016) recommended local food-based complementary foods which were developed to increase problematic nutritional intake in children aged 12-23 months. Nutrients Ca, Zn, niacin, folate, and Fe are nutrients that do not achieve 100% of the recommended nutrient intake even when the diet is optimized. Chicken liver and anchovies are locally available nutrient-dense foods that will fill these nutritional gaps, however, alternative interventions, such as fortification, are still needed to ensure an adequate supply of all the required nutrients [69]. In line with Harper A (2022), this study

suggests that interventions that can improve household food security and nutritional status during the periconception and antenatal periods can reduce the prevalence of low birth weight and stunting in children [59]. Therefore, ensuring family food security is essential in preventing stunting and promoting healthy growth and development in children.

The results of this study indicate the importance of interventions to address these factors. Interventions focus on a multi-sectoral approach to address stunting effectively [70]. Strengthen the family planning program because larger families also have a higher risk of having stunted children [71]. The role of midwives and the implementation of sustainable midwifery care can help this program be implemented [72,73]. Specific intervention behavior in preventing stunting even in post-disaster conditions is breastfeeding for up to 2 years [39]. These interventions are expected to improve the socioeconomic status, sanitation, and hygiene. In addition, it is necessary to carry out agricultural development interventions to improve nutrition which will increase family food security, especially for households with many members and households with more than two children under five.

CONCLUSION

The determinants of stunting of children under two years are children aged 12-23 months, low birth weight, food insecurity, birth spacing between children less than 3 years, number of children over 3, and not breastfeeding. It is suggested to program implementers that stunting prevention campaigns be carried out as early as possible for pregnant women, and pre-conception mothers, to arrange the spacing of children more than 3 years and the number of children not to exceed 3 children, through the family planning program. The role of midwives and the implementation of sustainable midwifery care can help this program to be implemented. To effectively address stunting, interventions should take a multi-sectoral approach. These interventions are intended to improve socioeconomic conditions, sanitation, and hygiene.

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CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Kahssay M, Woldu E, Gebre A, Reddy S. Determinants of stunting among children aged 6 to 59 months in pastoral community, Afar region, North East Ethiopia: unmatched case control study. BMC Nutr. 2020 Dec;6(1):9.
2. Holdsworth EA, Schell LM. Stunting. Int Encycl Biol Anthropol. 2018;1–3.
3. UNICEF/WHO/WORLD BANK. Levels and trends in child malnutrition UNICEF / WHO / World Bank Group Joint Child Malnutrition Estimates Key findings of the 2021 edition. World Heal Organ [Internet]. 2021;1–32. Available from: https://www.who.int/publications/i/item/9789240025257
4. Kementerian kesehatan RI. Hasil Utama Riskesdas 2018. Jakarta; 2018.
5. Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional. *Rancangan Rencana Pembangunan Jangka Menengah Nasiional (RPJMN) 2020-2024*. Rencana Pembang Jangka Menengah Nas 2020-2024. 2019;313.
6. The World Bank. Spending Better to Reduce Stunting in Indonesia: Findings from a Public Expenditure Review. World Bank [Internet]. 2020; Available from: https://elibrary.worldbank.org/doi/abs/10.1596/34196
7. B.S. P, Guddattu V. Understanding the Change in the Prevalence and Factors Influencing the Childhood Stunting Using District-Level Data from NFHS-4 and NFHS-5 in India. Inq J Heal Care Organ Provision, Financ. 2022 Jan;59:004695802211271.
8. Kemenkes. Hasil Survei Status Gizi Indonesia (SSGI) 2022. 2023;1–7.
9. Bappeda Sulawesi Tengah. Rembuk Stunting dan Pemberian Penghargaan

Tahun 2022 Tingkat Provinsi Sulawesi Tengah [Internet]. 2022 [cited 2023 Mar 7]. Available from: https://bappeda.sultengprov.go.id/rembuk-stunting-dan-pemberian-penghargaan-tahun-2022-tingkat-provinsi-sulawesi-tengah/

10. Ekholuenetale M, Barrow A, Ekholuenetale CE, Tudeme G. Impact of stunting on early childhood cognitive development in Benin: evidence from Demographic and Health Survey. Egypt Pediatr Assoc Gaz [Internet]. 2020;68(1):31. Available from: https://doi.org/10.1186/s43054-020-00043-x

11. De Sanctis V, Soliman A, Alaaraj N, Ahmed S, Alyafei F, Hamed N. Early and Long-term Consequences of Nutritional Stunting: From Childhood to Adulthood. Acta Biomed. 2021 Feb;92(1):e2021168.

12. Umwali N, Kunyanga CN, Kaindi DWM. Determinants of stunting in children aged between 6–23 months in Musanze region, Rwanda. Front Nutr. 2022 Nov;9.

13. Asmare AA, Agmas YA. Determinants of coexistence of stunting, wasting, and underweight among children under five years in the Gambia; evidence from 2019/20 Gambian demographic health survey: application of multivariate binary logistic regression model. BMC Public Health. 2022 Aug;22(1):1621.

14. Fufa DA. Determinants of stunting in children under five years in dibate district of Ethiopia: A case-control study. Hum Nutr Metab. 2022 Dec;30:200162.

15. Das D. Evaluating Changes in Determinants of Stunting among Children Under 2 Years and Assessing Their Contribution to Socioeconomic Disparity in Child Nutritional Status across India. Indian J Community Med. 2022;47(1):96.

16. Namirembe G, Ghosh S, Ausman LM, Shrestha R, Zaharia S, Bashaasha B, et al. Child stunting starts in utero: Growth trajectories and determinants in Ugandan infants. Matern Child Nutr. 2022 Jul;18(3).

17. Eryando T, Sipahutar T, Budhiharsana MP, Siregar KN, Nur Aidi M, Minarto, et al. Spatial analysis of stunting determinants in 514 Indonesian districts/cities: Implications for intervention and setting of priority. Geospat Health. 2022 May;17(1).

18. Widyaningsih, Mulyaningsih, Rahmawati, Adhitya. Determinants of socioeconomic and rural-urban disparities in stunting: evidence from Indonesia. Rural Remote Health. 2022 Mar;22(1):1–9.

19. Niragire F, Ndikumana C, Nyirahabimana MG, Mugemangango C. Child stunting and associated risk factors in selected food-insecure areas in Rwanda: an analytical cross-sectional study. Pan Afr Med J. 2022 Apr;43:49–61.

20. Toledo G, Landes M, van Lettow M, Tippett Barr BA, Bailey H, Crichton S, et al. Risk factors for stunting in children who are HIV-exposed and uninfected after Option B+ implementation in Malawi. Matern Child Nutr. 2023 Jan;19(1).

21. Noor MS, Andrestian MD, Dina RA, Ferdina AR, Dewi Z, Hariati NW, et al. Analysis of Socioeconomic, Utilization of Maternal Health Services, and Toddler's Characteristics as Stunting Risk Factors. Nutrients. 2022 Oct;14(20):4373.

22. Halli SS, Biradar RA, Prasad JB. Low Birth Weight, the Differentiating Risk Factor for Stunting among Preschool Children in India. Int J Environ Res Public Health. 2022 Mar;19(7):3751.

23. Quamme SH, Iversen PO. Prevalence of child stunting in Sub-Saharan Africa and its risk factors. Clin Nutr Open Sci. 2022 Apr;42:49–61.

24. Ndagijimana S, Kabano I, Ntaganda J. Analysis of risk factors that influence stunting among Rwandan children under the age of five. African J Food, Agric Nutr Dev. 2022 Jul;22(5):20480–97.

25. Islam MS, Zafar Ullah AN, Mainali S, Imam MA, Hasan MI. Determinants of stunting during the first 1,000 days of life in Bangladesh: A review. Food Sci Nutr. 2020 Sep;8(9):4685–95.

26. Yazew T. Risk Factors of Stunting and Wasting among Children Aged 6–59 Months in Household Food Insecurity

of Jima Geneti District, Western Oromia, Ethiopia: An Observational Study. S. Razzaque M, editor. J Nutr Metab. 2022 Jan;2022:1–8.

27. Afolabi RF, Palamuleni ME. Exploring determinants of under-5 stunting in malawi using a generalised linear mixed model. SAJCH South African J Child Heal. 2021;15(1):18–24.

28. Tamirat KS, Tesema GA, Tessema ZT. Determinants of maternal high-risk fertility behaviors and its correlation with child stunting and anemia in the East Africa region: A pooled analysis of nine East African countries. Spradley FT, editor. PLoS One. 2021 Jun;16(6):e0253736.

29. Wati EK, Wahyurin IS, Sari HP, Zaki I, Dardjito E. Stunting Incidence in Infant Related to Mother's History During Pregnancy. J Kesehat Masy. 2022 Mar;17(4):535–41.

30. Dhingra S, Pingali PL. Effects of short birth spacing on birth-order differences in child stunting: Evidence from India. Proc Natl Acad Sci. 2021 Feb;118(8).

31. Adeyemi O, Toure M, Covic N, van den Bold M, Nisbett N, Headey D. Understanding drivers of stunting reduction in Nigeria from 2003 to 2018: a regression analysis. Food Secur. 2022 Aug;14(4):995–1011.

32. Nsubuga EJ, Arinda Kato I, Lee S, Ssenyondo M, Isunju JB. Predictors of Stunting and Underweight Among Children Aged 6 to 59 months in Bussi Islands, Wakiso District, Uganda: A Cross-Sectional Study. Nutr Metab Insights. 2022 Jan;15:117863882211251.

33. Suratri MAL, Putro G, Rachmat B, Nurhayati, Ristrini, Pracoyo NE, et al. Risk Factors for Stunting among Children under Five Years in the Province of East Nusa Tenggara (NTT), Indonesia. Int J Environ Res Public Health. 2023 Jan;20(2):1640.

34. Tello B, Rivadeneira MF, Moncayo AL, Buitrón J, Astudillo F, Estrella A, et al. Breastfeeding, feeding practices and stunting in indigenous Ecuadorians under 2 years of age. Int Breastfeed J. 2022 Dec;17(1):19.

35. Aheto JMK, Dagne GA. Geostatistical analysis, web-based mapping, and environmental determinants of under-5 stunting: evidence from the 2014 Ghana Demographic and Health Survey. Lancet Planet Heal. 2021 Jun;5(6):e347–55.

36. Afzal A. Determinants of stunting among under five children in pakistan: A cross sectional study. Pakistan Paediatr J. 2021;45(3):327–31.

37. Yunitasari E, Pradanie R, Arifin H, Fajrianti D, Lee BO. Determinants of Stunting Prevention among Mothers with Children Aged 6–24 Months. Open Access Maced J Med Sci. 2021 May;9(B):378–84.

38. Vale D, Andrade ME da C, Dantas NM, Bezerra RA, Lyra C de O, Oliveira AGR da C. Social Determinants of Obesity and Stunting among Brazilian Adolescents: A Multilevel Analysis. Nutrients. 2022 Jun;14(11):2334.

39. Hafid F, Taqwin T, Linda L, Nasrul N, Ramadhan K, Bohari B. Specific Interventions to Prevent Stunting in Children Under 2 Years after the Natural Disaster. Open Access Maced J Med Sci. 2021 Feb;9(E):64–9.

40. Hendraswari CA, Purnamaningrum YE, Maryani T, Widyastuti Y, Harith S. The Determinants of Stunting in 24-59 Month-Old Children in Kulon Progo District 2019. Kesmas Natl Public Heal J. 2021 May;16(2):71–7.

41. Huriah T, Handayani P, Sudyasih T, Susyanto BE. The determinant factors of stunting among children in urban slums area, Yogyakarta, Indonesia. Open Access Maced J Med Sci. 2021;9(T4):1–5.

42. Podungge Y, Yulianingsih E, Porouw HS, Saraswati E, Tompunuh MM, Claudia JG, et al. Determinant Factors of Stunting in Under-Five Children. Open Access Maced J Med Sci. 2021 Dec;9(B):1717–26.

43. Titaley CR, Ariawan I, Hapsari D, Muasyaroh A, Dibley MJ. Determinants of the Stunting of Children Under Two Years Old in Indonesia: A Multilevel Analysis of the 2013 Indonesia Basic Health Survey. Nutrients. 2019 May;11(5):1106.

44. Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in

Indonesia. Matern Child Nutr. 2018 Oct;14(4):e12617.

45. Aryastami NK, Shankar A, Kusumawardani N, Besral B, Jahari AB, Achadi E. Low birth weight was the most dominant predictor associated with stunting among children aged 12–23 months in Indonesia. BMC Nutr. 2017 Dec;3(1):16.

46. Nasrul. Pengendalian Faktor Risiko Stunting Anak Baduta di Sulawesi Tengah. Promot J Kesehat Masy. 2018;8(2):131–46.

47. Nasrul N, Taqwin T, Hafid F. The Prevention Against Morbidity and Stunting Through Vitamin A Supplementation In Sigi and Touna Districts. In: Pontianak International Health Conference (PIHC). ISBN 978-602-51424-0-6; 2017. p. 317–25.

48. Nasrul, Hafid F, Razak Thaha A, Suriah. Faktor Risiko Stunting Usia 6-23 Bulan di Kecamatan Bontoramba Kabupaten Jeneponto. Media Kesehat Masy Indones. 2015;11(3):139–46.

49. Kementrian Kesehatan Republik Indonesia. Buku Saku Hasil Studi Status Gizi Indonesia (SSGI) Tahun 2021. Jakarta: Badan Litbangkes - Kementerian Kesehatan Republik Indonesia; 2021.

50. Kementerian Kesehatan Republik Indonesia. Buku Saku Hasil Studi Status Gizi Indonesia (SSGI) Tahun 2022. Kemenkes RI. Jakarta: Badan Kebijakan Pembangunan Kesehatan Kementerian Kesehatan; 2022. 1–154 p.

51. Mbuya MNN, Chidem M, Chasekwa B, Mishra V. Biological, Social, and Environmental Determinants of Low Birth Weight and Stunting among Infants and Young Children in Zimbabwe. Zimbabwe Work Pap No7 Calverton, Maryland, USA ICF Macro. 2010;(7).

52. Martorell R, Flores R, Hickey M. Stunting in Guatemala: analyses of change over 15 years. Bethesda Abt Assoc Inc. 2002;

53. Akombi B, Agho K, Hall J, Wali N, Renzaho A, Merom D. Stunting, Wasting and Underweight in Sub-Saharan Africa: A Systematic Review. Int J Environ Res Public Health. 2017 Aug;14(8):863.

54. Derso T, Tariku A, Biks GA, Wassie MM. Stunting, wasting and associated factors among children aged 6–24 months in Dabat health and demographic surveillance system site: A community based cross-sectional study in Ethiopia. BMC Pediatr. 2017 Dec;17(1):96.

55. Thiombiano-Coulibaly N, Rocquelin G, Eymard-Duvernay S, Zougmoré ON, Traoré SA. Effects of early extra fluid and food intake on breast milk consumption and infant nutritional status at 5 months of age in an urban and a rural area of Burkina Faso. Eur J Clin Nutr. 2004 Jan;58(1):80–9.

56. Rahman MS, Howlader T, Masud MS, Rahman ML. Association of Low-Birth Weight with Malnutrition in Children under Five Years in Bangladesh: Do Mother's Education, Socio-Economic Status, and Birth Interval Matter? Islam FMA, editor. PLoS One. 2016 Jun;11(6):e0157814.

57. Islam MM, Alam M, Tariquzaman M, Kabir MA, Pervin R, Begum M, et al. Predictors of the number of under-five malnourished children in Bangladesh: application of the generalized poisson regression model. BMC Public Health. 2013 Dec;13(1):11.

58. Mishra K, Kumar P, Basu S, Rai K, Aneja S. Risk Factors for Severe Acute Malnutrition in Children below 5 y of Age in India: A Case-Control Study. Indian J Pediatr. 2014 Aug;81(8):762–5.

59. Harper A, Rothberg A, Chirwa E, Sambu W, Mall S. Household Food Insecurity and Demographic Factors, Low Birth Weight and Stunting in Early Childhood: Findings from a Longitudinal Study in South Africa. Matern Child Health J. 2022 Sep;

60. Abbas F, Kumar R, Mahmood T, Somrongthong R. Impact of children born with low birth weight on stunting and wasting in Sindh province of Pakistan: a propensity score matching approach. Sci Rep. 2021 Dec;11(1):19932.

61. Mtongwa RH, Festo C, Elisaria E. A comparative analysis of determinants of low birth weight and stunting among

under five children of adolescent and non-adolescent mothers using 2015/16 Tanzania Demographic and Health Survey (TDHS). BMC Nutr. 2021 Dec;7(1):64.

62. Roesler AL, Smithers LG, Wangpakapattanawong P, Moore V. Stunting, dietary diversity and household food insecurity among children under 5 years in ethnic communities of northern Thailand. J Public Health (Bangkok). 2019 Dec;41(4):772–80.

63. Mahmudiono T, Nindya T, Andrias D, Megatsari H, Rosenkranz R. Household Food Insecurity as a Predictor of Stunted Children and Overweight/Obese Mothers (SCOWT) in Urban Indonesia. Nutrients. 2018 Apr;10(5):535.

64. Ahmad I, Khalique N, Khalil S, Urfi, Maroof M. Dietary diversity and stunting among infants and young children: A cross-sectional study in Aligarh. Indian J Community Med. 2018;43(1):34.

65. Haileselassie M, Redae G, Berhe G, Henry CJ, Nickerson MT, Mulugeta A. The influence of fasting on energy and nutrient intake and their corresponding food sources among 6-23 months old children in rural communities with high burden of stunting from Northern Ethiopia. Nutr J. 2022 Dec;21(1):4.

66. Kusumawardani HD, Ashar H. Food Consumption Patterns for Children Under Two Years (Toddler) in Areas with High Stunting Prevalence. IOP Conf Ser Earth Environ Sci. 2022 May;1024(1):012071.

67. Gassara G, Chen J. Household Food Insecurity, Dietary Diversity, and Stunting in Sub-Saharan Africa: A Systematic Review. Nutrients. 2021 Dec;13(12):4401.

68. Adachi M, Urabe D. Diet diversity was limited in Malawi resulting in stunting despite availability of foods in markets. Pediatr Int. 2021 Mar;63(3):311–5.

69. Hlaing LM, Fahmida U, Htet MK, Utomo B, Firmansyah A, Ferguson EL. Local food-based complementary feeding recommendations developed by the linear programming approach to improve the intake of problem nutrients among 12–23-month-old Myanmar children. Br J Nutr. 2016 Jul;116(S1):S16–26.

70. Marume A, Archary M, Mahomed S. Predictors of stunting among children aged 6-59 months, Zimbabwe. Public Health Nutr. 2023 Jan;1–27.

71. Saha UR, van Wesenbeeck CFA. Changes in the determinants and spatial distribution of under-five stunting in Bangladesh: Evidence from Bangladesh Demographic Health Surveys (BDHS) 1996–97, 2014 and 2017/18. Bora JK, editor. PLoS One. 2022 Dec;17(12):e0278094.

72. Nurfatimah N, Ramadhan K, Entoh C, Longgupa LW, Hafid F. Continuity of Midwifery Care Implementation to Reduce Stunting. Open Access Maced J Med Sci. 2021 Dec;9(E):1512–6.

73. Sumiaty S, Ali MN, Muhamad H, Hafid F. Roles of Midwives and Indonesian Midwives Association in Reducing Risk Factors for Stunting in Indonesia. Open Access Maced J Med Sci. 2021 Jul;9(G):8–13.

Original Article

The Effectiveness of *Lullaby* Music Therapy on Cough Intensity in Toddlers with ARI

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ABSTRACT

ARI cases in the Banten area were 48,621 (53%). The age group that is most at risk of developing ARI is children under five (1-4 years) at 8.0%. The purpose of this study was to see the effectiveness of music therapy in reducing cough intensity. Quasi-experimental research method with pretest-posttest with the control group. The study sample consisted of 36 respondents (intervention and control groups). Inclusion criteria were patients with ARI, toddlers and preschoolers. place of research in the Banten regional hospital. Instruments are a scale for scoring cough and music Lullabies. Intervention and observation for the control group were carried out for 30 minutes 3 times with a pre and post-test. The analysis was carried out by frequency test and correlation test. Pre and post-cough intensity scores were analyzed using the dependent t-test. The results showed that Lullaby music therapy was effective on the cough intensity of children under five with ISPA (p<.05). Music therapy with complete administration has an effect on cough intensity (P<.05). Conclusion, music therapy is effective in reducing the cough intensity of toddlers with ARI.

Keywords : Music Therapy, Cough Intensity, ARI

INTRODUCTION

The incidence of acute respiratory infections (ARI) in Indonesia is 4.4% with a total of 1,017,290 sufferers, and in the Banten region, it is 53% with a total of 48,621 sufferers. The age group that is most at risk for ISPA occurs in toddlers (1-4 years) at 8.0%.[1].

ISPA is grouped into three groups including mild, moderate, and severe ISPA. The mild group of ARI describes that the child has a cough, hoarseness, runny nose, fever or fever, and body temperature over 37 degrees. Symptoms of cough rarely or once in a while. The picture of moderate ISPA is stated by the child suffering from symptoms of respiratory problems such as moderate cough frequency, fast breathing (>60x per minute), body

temperature exceeding 39 degrees Celsius, breathing sounds like snoring, earache or pus coming out of the ear canal, and red spots on the skin that looks like measles. The picture of severe ARI is expressed by complaints that the child is worried and fussy, symptoms of severe cough, difficulty breathing, lips or skin that turn blue, decreased consciousness, snoring breath sounds, looks restless, respiratory movements are visible, there is a pull on the chest wall, and a rapid pulse exceeds 160 beats per minute [2].

The worst symptom of ARI is coughing. Coughing can reduce other children's activities such as playing, eating and sleeping. This happens because when a child coughs,

there is a very strong reflex in the chest muscles and diaphragm muscles to expel secretions. Likewise, if there is a chronic cough, namely a cough that has symptoms for more than eight weeks. This cough is usually a sign or symptom of other, more severe diseases such as asthma, tuberculosis, bronchitis and soon[3] . Respiratory disorders that trigger coughing are due to the invasion of pathogenic germs which interfere with the immune system and trigger an inflammatory response in the respiratory tract. Inflammation of the lining of the respiratory tract produces secretions and stimulates a reflex mechanism to expel these secretions. These acute respiratory infections (ARI) include pharyngitis and sore throat. The viruses that most often cause ARI are respiratory syncytial virus (RSV) and influenza which cause cough symptoms [2].

Cough symptoms that appear to interfere with the child's respiratory tract need to be handled properly, namely pharmacological therapy and complementary therapy, namely music therapy. If not taken seriously, this respiratory tract disorder can have an impact on larger diseases such as bronchopneumonia and pneumonia[4]. Respiratory disorders that develop from ARI, namely Bronchopneumonia. This disease is an inflammatory process that results in increased secretion production which is more than mild ARI symptoms and causes more severe clinical manifestations including the amount of secreted secretions[5]. Another respiratory problem is pneumonia. This disease occurs due to an inflammatory process in the lung tissue or what is commonly called the lung parenchyma which can affect toddlers due to microbial invasion. Symptoms of this disease also show the presence of sputum secretion and produce a cough reflex [6].

ISPA disease has the potential to become severe, so it is necessary to pay attention to the handling mechanism. One of the interventions being considered is an attempt to treat cough. Cough symptoms can use pharmacological therapy and non-pharmacological therapy (complementary therapy). Pharmacological therapy that can be used is Bromhexine HCl, N-acetylcysteine, Glyceryl guaiacolate or guaifenesin (GG), Potassium iodide or Potassium iodide (KI) and Ammonium chloride while non-pharmacological therapy is music therapy [7]. Pharmacological therapy based on medical

therapy that has been used is still not the full authority of a nurse. In addition, pharmacological therapy cannot be given for a long time. Several complementary therapies can be done independently, one of which is music therapy. Music therapy is not therapy to address the source of the disease but to relieve cough symptoms experienced by patients [8–10].

Music therapy is a therapy that uses regulated or controlled music for clinical changes. This therapy is also often done and has a very low risk. Music therapy is feasible for patients with other respiratory disorders and has been tested by previous investigators. Interventions in music therapy can be in the form of listening to music, singing and so on [11].

Previous information that music therapy also provides relaxation for children, the rhythm of music can create a pleasant atmosphere and is known to affect emotional, academic, and social interaction processes [12]. This therapy can also be applied to children who suffer from asthma. Previous research states that music therapy provides a positive response or impact for children and can help speed up the recovery process for their illness so that children will be discharged from the hospital more quickly [13].

Various types of music that can be enjoyed include classical music, rock, jazz, blues, metal and so on. Several types of music can be used for music therapy, especially for children, namely classical music. An example is lullaby music. Lullaby music is often used to help the healing process in children, this music is included in the classical music of Brahma or Mozart. This music can regulate children's behaviour to be able to focus on themselves and also soothe them emotionally [14].

Lullaby music is one of the best music for children. This music is used as a therapy that can improve and stabilize children's respiratory conditions and can help increase weight in premature babies [15]. Giving music therapy varies greatly from 15 minutes, 20 minutes, and 30 minutes [16–18].

Previous information stated that of the eight respondents who were given murotal therapy treatment, it was shown that most of the respondents in the treatment group had experienced a significant decrease in respiratory rate. The difference in decreased respiratory rate is six to twenty times per minute. The average reduction in respiratory rate in the treatment group was fourteen breaths

per minute. Whereas the eight respondents in the control group showed that most of the respondents experienced a decrease in respiratory rate, but the decrease in respiratory rate was less significant, namely between two to four times per minute, and some even experienced an increase in respiratory rate two to six times per minute. The average decrease in Respiratory Rate is zero points five times per minute. The results of the analysis using the Wilcoxon test showed a significant value with p<.001 [19].

The novelty of this study is providing lullaby music therapy interventions for children, especially for anal toddlers who have ARI. This music therapy is to reduce the intensity of coughing. So the purpose of this study was to assess the effectiveness of music therapy in toddlers with ARI with intervention and control patients. The hope is that cough symptoms can be minimized. Mothers can also care for their children by applying music therapy independently.

METHOD

The research design used in this study was Quasi Experiment with a pretest-posttest with a control group research design, where there were two groups, namely the intervention group and the control group as a comparison group. The population of this study were toddlers with ARI who were hospitalized. The number of samples was calculated using the Federer formula so that the sample for this study was taken based on a population of 36 respondents (intervention and control groups). Inclusion criteria were patients with ARI, patients with toddler and preschool age, and parents of children who were willing to be respondents and did not have the disease complications. Meanwhile, the exclusion criteria were patients under 1-year-old who were not willing to be respondents and patients with hearing loss. The sampling technique used purposive sampling.

The study was conducted at the Banten Hospital for 2 months (March-April 2023). The research instrument consisted of demographic data (identity, gender, age, length of stay, ward environment), music therapy SOPs and a scale for scoring cough adopted from previous researchers [20].

The trial of lullaby music therapy which was given to the intervention group with a duration of 30 minutes was carried out 3 times a day with a music volume of 40 dB. Pre-test and post-test cough intensity scale with a scale for scoring cough for the intervention group and the control group with observation. The duration of the observations of the intervention group and the control group was measured by implementation and it was concluded that it was complete, complete with pauses or incomplete. The control group had no treatment, only observations were made. The observation was only for measuring the child's cough intensity for 30 minutes, then measuring the cough intensity again in the post-test period. Observation events are declared complete, complete with pauses or incomplete. It is necessary to group observation activities considering the many inhibiting factors, namely the administration of drug therapy, the oxygen tube being detached and the child no longer wanting to be observed or given music therapy.

Analysis using the SPSS 21 application for Windows. Data were analyzed by frequency test and correlation test. Numerical data is the score of cough intensity pre and post-test which is done by t-test dependent test. The data normality test was carried out with the Shapiro-Wilk test. The results of normal data distribution P-Value > 0.05 so the correlation test uses the dependent t-test.

This research has gone through an ethical test. The ethical test study has been carried out and declared to have passed ethics with a number: 189/KEPK-TJK/III/2023.

RESULTS

Table 1. Distribution of the Characteristics of Toddlers with ISPA (n = 36).

Variable	Intervention Group	Control Group
	n (%)	n (%)
Age		
1-3 years	11 (61.1%)	14 (77.8%)
3-5 years	7 (38.8%)	4 (22.2%)
Total	18 (100%)	18 (100%)
Gender		
Man	12 (66.7%)	10 (55.6%)
Woman	6 (33.3%)	8 (44.4%)
Total	18 (100%)	18 (100%)
Long sick		
< 3 day	8 (44.4%)	2 (11.1%)
> 3 day	10 (55.6%)	16 (88.9%)
Total	18 (100%)	18 (100%)

Table 1 shows the distribution of the characteristics of respondents in the intervention group, the highest age of the respondent, namely 1-3 years old, was 11 (61.1%), the most sex was male, 12 (66.7%) and the longest illness was > 3 days, totalling 10 (55.6%)). The control group with the most age was 14 (77.8%), the most gender, namely men, was 10 (55.6%), and the highest length of illness was 16 (88.9%).

Table 2 Distribution of Music Therapy Intervention Group and Observation Control Group in Toddlers with ISPA (n = 36).

Giving music therapy intervention group	n (%)
The First Therapy is Given by:	
Complete	17 (94.4%)
Finish with Pause	1 (5.6%)
Total	18 (100%)
The Second Therapy is Given by:	
Complete	17 (94.4%)
Not Finished	1 (5.6%)
Total	18 (100%)
The Third Therapy is Given by:	
Finish	16 (88.9%)
Finish with Pause	2 (11.1%)
Total	18 (100%)
The First Observation of The Control Group Was Carried Out by	
Complete	16 (88.9%)
Finish with Pause	1 (5.6%)
Not Finished	1 (5.6%)
Total	18 (100%)
Observation of The Two Control Groups Was Carried Out by	
Complete	17 (94.4%)
Finish With Pause	1 (5.6%)
Total	18 (100%)
Observation of The Three Control Groups Was Carried Out by	
Complete	17 (94.4%)
Finish With Pause	1 (5.6%)
Total	18 (100%)

Table. 2 shows the provision of music therapy in the intervention group and the control group observation in toddlers with ARI. Most giving of music therapy is given thoroughly in both the first the third therapy. Then the most observations in the control group were carried out thoroughly both in the first the third observation.

Table 3. Effect of Complete Music Therapy in the Intervention Group on Cough Intensity in Toddlers with ISPA (n = 17).

Variable	n	Mean ± SD	p-value	mean difference (CI 95%)
Complete music therapy				
Pre-test 1	17	.64 ± 0.862	.007	.6 (0.204-1.090)
Post-test 1				
Pre-test 2	17	.94 ± 0.712	.001	.9 (0.444-1.438)
Post-test 2				
Pre-test 3	17	1.37 ± 0.619	.000	1.3 (1.045-1.705)
Post-test 3				

Table 3 describes the first to third music therapy given completely to toddlers with ARI. The results of the pre-test and post-test showed a significant relationship (p-value <.05). The mean difference between the first and third treatments ranged from .64 - 1.37. The 95% CI was .204-1.090, the second therapy was 95% CI was 0.444-1.438, and the third therapy was 95% CI was 1.045-1.705.

Table 4. Effect of Control Group Observation on Cough Intensity in Toddlers with ISPA.

Variable	n	Mean ± SD	P-value	Mean difference (CI 95%)
Observasi				
Pre-test 1	16	.18 ± 1.109	.509	.1 (-.403-.778)
Post-test 1				
Pre-test 2	17	.23 ± 0.970	.332	.2 (-.264-.734)
Post-test 2				

		17	-.17 ± 1.237	.565	-.1 (-.812-.459)
Pre-test 3					
Post-test 3					

Table 4 describes the first to third observations given completely to toddlers with ARI. The results of the pre-test and post-test have a significant relationship (p-value> .05). The difference in mean of the first to third therapy ranged from .18 - -.17, and the 95% CI value was -.403-.778, the second therapy was 95% CI was -.264-.734, and the third therapy was 95% CI was -.812-.459.

Table 5. Effect of Music Therapy on Cough Intensity in Toddlers with ISPA (n = 36)

Variable	n	Intervention Group			n	Control group		
		Mean ± SD	*p-value*	Mean Difference (CI 95%)		Mean ± SD	*p-value*	Mean Diffrence (CI 95%)
Pre-test 1 Post-test 1	18	2.56 ± .616	.007	.6 (.188-1.034)	18	4.94 ± .707	.386	.2 (-.305 – .749)
Pre-test 2 Post-test 2	18	2.28 ± .752	.000	.9 (.584-1.305)	18	5.22 ± .808	.331	.2 (-.247 – .691)
Pre-test 3 Post-test 3	18	2.67 ± .485	.000	1.3 (1.038-1.629)	18	5.00 ± .907	.564	-.1 (-.764 – .430)

Table 5 shows a significant difference in the mean score of cough intensity in the intervention group before and after being given music therapy. The pre-test and post-test results showed a significant relationship (p-value <.05%) 95% CI was .188-1.034. In the second act, the 95% CI was .584-1.305 and in the third act, the 95% CI was 1.038.-1.629

DISCUSSION

The results of the current study show that music therapy has an effect on the cough intensity of toddlers with ARI. Previous information that music therapy affects the oxygen saturation of patients with respiratory problems. Music therapy has a short-term positive effect on the problem breathing like coughing and has no side effects long-term and this therapy can also be given to children who are resistant to treatment approaches [21].

Other music therapy such as murotal therapy can be used to restore the baby's breathing function with significant value. This therapy also provides a calming and comforting effect on children. In addition, this therapy is one of the most accessible media to help the healing process of the disease[19].

Sound can reduce stress hormones in children, activate natural endorphins, increase feelings of relaxation, divert attention from fear and can correct abnormal breathing frequencies.

When a child reaches a point of comfort that is felt, it will affect the body's production of endorphins, this will make the body's system improve, and the respiratory rate will also improve. The comfort that is felt will affect the body's production of endorphins, this will improve the body's system, and the respiratory rate will also improve [19,22].

This music therapy has also been shown to show changes in respiratory rate with a significance value of 0.04 (p-value <0.05) which is highly related to the incidence of coughing in children where the sound of music increases vital signs such as respiratory rate in infants and gets a relaxing effect from the sound. In this case, the study mentions a decrease in respiratory frequency so that cough symptoms can be overcome by giving music therapy [23].

Another thing that was informed by previous researchers is that music has an effect on oxygen saturation. Music has a short-term positive effect on respiratory problems in meeting oxygen needs. The lighter the intensity of the cough, the more oxygen the child needs to be fulfilled. This triggers more oxygen saturation in the body's tissues [24]. Music therapy has no effect on children who are resistant to one drug therapy

Changes in cough intensity are reflected by the value of the frequency and

depth of breathing and other vital signs[23]. The occurrence of these changes is the impact of musical stimulus on the vestibulocochlear nerve. Sound waves delivered by music are captured by the coclearis and vestibulocochlear nerves. Then the waves are sent to the thalamus and produce a response, namely frequency following response (FFR). Another effect is that the release of adrenaline hormones is inhibited and releases endorphins in the body. The impact makes the respiratory and heart muscles relax and is automatically controlled. So that people feel better in breathing, decreased cough intensity, and decreased heart rate. These changes are the influence of the relaxing effect of the sound of music that children enjoy. The emergence of these changes is stated that music can control coughing attacks[25].

Likewise, the maximum effect of music can be obtained if the duration of giving music is fulfilled according to the results of previous observations. Based on the results of research that has been done that the first to third music therapy by giving complete music therapy gives the maximum effect on cough intensity.

This is supported by previous information that some of the children will enjoy and listen to music without fully realizing the effects of music that will arise. Music is a healing medium that can produce effects on the mental and physical. Music can mask unpleasant feelings, slow down and balance brain waves, affect feelings, affect heart rate, pulse, respiration and blood pressure, as well as reduce muscle tension and improve body movement and coordination[10,21].

Music can also increase the level of endorphins in the body. The effect of soft music on children's brain development has a positive influence on the maturation process of children's brain development. When a child listens to music, he can regulate his pulse and respiratory rate, and the electrical resistance of the child's skin and blood vessels will change, it has even been proven that the heart rate will adjust to the rhythm he hears, so the child will enjoy the music he is hearing[21].

These results are supported by previous information which says that when children are given music therapy they will get their own experience and pleasure. It is proven that children want and enjoy music therapy to help with the treatment process[26].

But sometimes children also refuse to be given music therapy. Previous studies and information state that children who are sick and hospitalized (hospitalized), are very vulnerable to stress, experience a change in condition from healthy to sick and a boring environment, limited coping mechanisms. Anxiety in children due to hospitalization occurs due to bodily injuries, pain, ward conditions, medical procedures and separation. The childcare room is facilitated with a playroom so that it is even more relaxed accompanied by music[27].

CONCLUSIONS

This study shows that music therapy is effective in reducing cough intensity in toddlers with ARI. Music therapy given thoroughly for a predetermined duration has an effect on cough intensity in toddlers with ARI. This research supports providing education to parents in applying music therapy. The results of the current study are used as a consideration for the hospital to add independent interventions to improve the quality of health services. It is hoped that it can become a source of information for the wider community regarding the effectiveness of music therapy on cough intensity in toddlers by supporting research to develop related topics for further research.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

REFERENCE

1. Kementrian Kesehatan RI. Laporan Nasional Riskesdas 2018. Kementrian Kesehatan RI, Jakarta: Balitbangkes; 2018.
2. Lestari Y, Subardiah I, Haryanti RP. Keperawatan anak I. 1st ed. Redaksi T, editor. Pekalongan; 2022.
3. Suswitha D, Arindari DR, Aini L, Astuti L. Pemanfaatan jahe madu terapi komplementer pada penyakit infeksi saluran pernafasan akut (ISPA) di Desa

Bangun Sari Kecamatan Tanjung Lago. J Malahayati [Internet]. 2022;5(7):2266–74. Available from: https://ejurnalmalahayati.ac.id/index.php/kreativitas/article/view/6329/pdf

4. Mujiati S, Hidayati IR, Atmadani RN. Effect of cough medicine advertisement on electronic media towards self-medication. J Ilm Kesehat Sandi Husada [Internet]. 2022;11(2):113–24. Available from: https://akper-sandikarsa.e-journal.id/JIKSH/article/view/695

5. Smeltzer SC, Bare BG, Hinkle JL, Cheever K. Brunner & Suddarth textbook of medical-surgical nursing. Jakarta: Wolters Kluwer Health; 2018.

6. Ifalahma D, Sulistiyanti A, Arini liss dyah dewi. Pengetahuan ibu tentang pneumonia pada balita di puskesmas Jatinom Klaten. J midwifery Heal Sci [Internet]. 2022;2(2):102–10. Available from: https://ojs.udb.ac.id/index.php/ovum/article/view/2368

7. Imani lisna nur, Lestari K, Mulyaningsih W. Review Artikel: Kajian Farmasi Klinis Penggunaan Obat Batuk "X" Dengan Kandungan Bromheksin HCl Untuk Pengencer Dahak Pada Anak. J Pharm Sci [Internet]. 2023;6(1):315–21. Available from: https://www.researchgate.net/publication/368588834_Kajian_Farmasi_Klinis_Penggunaan_Obat_Batuk_X_Dengan_Kandungan_Bromheksin_HCl_Untuk_Pengencer_Dahak_Pada_Anak

8. Witusik A, Pietras T. Music therapy as a complementary form of therapy for mental disorders. Pol Merkur Lek [Internet]. 2019;47(282):240-243. Available from: https://pubmed.ncbi.nlm.nih.gov/31945027/

9. Segall LE. Music Therapy and Wellness. In: Music therapy : Research and evidence Practice [Internet]. USA: Elsevier Inc. All; 2018. p. 111–24. Available from: https://www.sciencedirect.com/science/article/abs/pii/B9780323485609000085

10. Hawgood S. Health benefits of music therapy [Internet]. 1st ed. London:

Peterson Family Foundation; 2019. Available from: https://petersonfamilyfoundation.org/news/health-benefits-of-music-therapy/

11. Suardana IW, Marthasari NKP, Dewi PIS, Widiarta GB. Aplikasi terapi komplementer bagi tenaga kesehatan [Internet]. Martini M, editor. Bali: media sains indonesia; 2022. Available from: https://www.researchgate.net/publication/362152881_Aplikasi_Terapi_Komplementer_Bagi_Tenaga_Kesehatan

12. Padila, Setiawati, Inayah I, Mediani henny suzana, Suryaningsih C. Emosi dan hubungan antara sebaya pada anak tunalaras usia sekolah antara terapi musik klasik (mozart) dan murrotal (surah ar-rahman). J Keperawatan Silampari [Internet]. 2020;3(2):752–63. Available from: https://journal.ipm2kpe.or.id/index.php/JKS/article/view/1276

13. Loewy J, Goldsmith C, Deshpande S, Sun A, Harris J. Music therapy in pediatric asthma improves pulmonary function while reducing hospitalizations. J Asthma [Internet]. 2021;58(5):674–82. Available from: https://pubmed.ncbi.nlm.nih.gov/31906748/

14. Chakravarty R, Mehta N, Vir D. Effect of Music Therapy on Oxygen Saturation Level: A Literature Review. Harmon J Arts Res Educ [Internet]. 2022;22(1):37–47. Available from: http://dx.doi.org/10.15294/harmonia.v22i1.36232

15. Bratha SDK. Pengaruh terapi musik lullaby terhadap berat badan bayi. J Kesehat Maharatu [Internet]. 2022;3(1):106–15. Available from: https://ojs.stikestengkumaharatu.ac.id/index.php/JKM/article/view/57

16. Kobus S, Buehne AM, Kathemann S, Buescher AK, Lainka E. Effects of music therapy on vital signs in children with chronic disease. Int J Env Res Public Heal [Internet]. 2022;19(11):6544. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9180355/

17. NN. Tuning in: How music may affect your heart. The President and Fellows of Harvard College; 2021 p. 1–4.

18. Ghetti C. The future of medical music therapy for children and adolescents. In: Dileo C, editor. Envisioning the Future of Music Therapy [Internet]. London: Temple University; 2016. p. 1–158. Available from: https://scholarshare.temple.edu/bitstream/handle/20.500.12613/6287/Dileo-Monograph-2016.pdf?sequence=1&isAllowed=y

19. Kristyaningsih P, Rahmawati I. Terapi musik untuk mengembalikan fungsi pernapasan pada bayi. J Ners dan Kebidanan [Internet]. 2019;6(3):263–7. Available from: http://jnk.phb.ac.id/index.php/jnk/article/view/491/0

20. Wang Z, Wang M, Wen S, Xu X. Types and applications of cough-related questionnaires. J Thorac Dis [Internet]. 2019;11(10):4379–4388. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6837954/#:~:text=Cough symptom score (CSS),-In the CSS&text=The CSS is a two,indicating the most severe cough.

21. Sondang E. Penggunaan musik klasik sebagai media dalam meningkatkan kecerdasan emosional terhadap anak usia balita 0-5 tahun. J Teknol dan Pendidik kristiani [Internet]. 2022;3(2):102–22. Available from: https://sttkerussoindonesia.ac.id/e-journal/index.php/redominate/article/view/29

22. Rahman JS, Caldwell S, Jones R, Gedeon T. Brain melody interaction: understanding effects of music on cerebral hemodynamic responses. Multimodal Technol Interact [Internet]. 2022 [cited 1BC Jan 22];6(5):35. Available from: https://www.mdpi.com/2414-4088/6/5/35

23. Naulia RP, Allenidekania, Hayati H. The Effect of music therapy on sleep quality among children with chronic disease. Int J Nurs Heal Serv [Internet]. 2019;2(1):15-20. Available from: https://media.neliti.com/media/publications/277787-the-effect-of-music-therapy-on-sleep-qua-290aa12d.pdf

24. M. A, Raharjo, Suradi S, Aphridasari J. The effect of harmonica exercise on inspiratory capacity, dyspnea, exercise capacity and quality of life of chronic obstructive pulmonary disease patients. J Respirologi Indones [Internet]. 2019;39(1):1–13. Available from: https://www.jurnalrespirologi.org/index.php/jri/article/view/42

25. Limb CJ, Jiam NT. Rhythm processing in cochlear implant-mediated music perception. Ann N Y Acad Sci [Internet]. 2019;145(1)::22-28. Available from: https://pubmed.ncbi.nlm.nih.gov/31168793/

26. Klyve GP, Rolvsjord R. Moments of fun: Narratives of children's experiences of music therapy in mental health care. Nord J Music Ther [Internet]. 2023;32(2):100–20. Available from: https://www.tandfonline.com/doi/full/10.1080/08098131.2022.2055114

27. Novitasari S, Sulaeman S, Purwati NH. Pengaruh terapi musik dan terapi video gameterhadap tingkat nyeri anak usia prasekolahyang dilakukan pemasangan infus. J Telenursing [Internet]. 2019;1(1):168–77. Available from: https://journal.ipm2kpe.or.id/index.php/JOTING/article/view/510

Original Article

Description of Energy Adequacy for Workers at PT. Indotec Tiga Putra Kupang City

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ABSTRACT

The minimum energy requirement for Indonesian people in the 2019 AKG is 2,100 kcal per person per day, so each person must have a minimum energy intake of 2,100 kcal per day. If the food intake is not sufficient for needs, it can result in disruption of the body's immunity, reduced body weight, reduced physical ability, work slowly and even decreased work productivity. This research aims to determine the description of energy adequacy of workers at PT. Indotec Tiga Putra Kupang City 2022. This type of research is quantitative research using a descriptive approach. This research used a total sampling of 24 workers. The research instruments used were 2x24 hour food recall, 2x24 hour physical activity recall, microtoise and digital scales, food photo books and nutrisurvey applications. The results showed that respondents with light physical activity (83.3%), adequate intake of breakfast (54.2%) and dinner (70.8%), lunch intake (62.5%), morning snack and afternoon (66.7%) which is less. The level of energy adequacy is in the poor category (58.3%). The results of this study also show an average energy expenditure of 3,521.6 kcal and energy income of 2,691.4 kcal. It is recommended that workers consume food sources of energy in sufficient quantities/portions.

Keywords: Energy, Physical Activity, Workers

INTRODUCTION

The success of construction development projects cannot be separated from the important role of companies that provide consulting services. Consulting companies have the task of overseeing clients at the initial stage of the project, namely planning and design and at the construction stage by supervising the project as it progresses[1]. The success of a consulting company is seen through the results of the company's performance. To achieve this success, a company must have quality workers who have good health conditions by paying attention to the nutrition of its workers[2].

Nutrition is one of the important aspects of occupational health which plays a role in increasing work productivity[2]. One way to fulfill the nutrition needed by the body is energy. Energy for the body is needed to help the process of growth and development, maintain body immunity, maintain body health and help in carrying out daily activities[3].

The minimum energy requirement for Indonesian people in the 2019 AKG is 2,100 kcal per person per day, so each person must have a minimum energy intake of 2,100 kcal per day. Badan Pusat Statistik (BPS) noted that the average per capita consumption per day of calories is above the standard of adequate daily consumption based on the nutritional adequacy figures that have been determined. The average daily per capita calorie consumption of the Indonesian population in March 2021 was

2,143.21 kcal[4].

Male workers in the age groups 16-18 years, 19-29 years and 30-49 years have an energy requirement of 2650 kcal[5]. The energy needs of workers differ from one another. Therefore, the energy intake consumed is adjusted to the worker's energy needs. If food intake exceeds requirements, it will be stored in the body as energy reserves in the form of fat and if this continues for a long time it will cause excess body weight and increase the risk of obesity. On the other hand, if the food intake is not sufficient for needs, it can result in impaired body immunity, reduced body weight, reduced physical abilities, working slowly and even decreasing work productivity[3].

This is supported by research conducted by Astuti (2017) showing that there is a relationship between energy intake and work productivity where workers who have good energy intake (76.9%) have high productivity while workers with poor energy intake (54.2%) has low productivity[6].

PT. Indotec Tiga Putra is a company that operates in the consulting services sector. The number of employees in the company is 24 people who have responsibilities according to their respective fields. Employees at PT. Indotec Tiga Putra is divided into workers who serve as planning consultants and workers who serve as supervisory consultants.

The company's experience in obtaining project work is classified into engineering supervision and architectural supervision with a total of 108 work packages received which are divided into engineering supervision with a total of 74 work packages carried out and 34 architectural supervision packages. The company's extensive experience has resulted in many companies accepting work packages which will require their workers to work optimally and require sufficient energy to work well.

Based on interviews that have been conducted, working hours start at 09.00-17.00 WITA and usually workers also do their work outside working hours (overtime) starting at 19.00-23.00 WITA. Of the 12 workers who were interviewed, most workers took time to eat breakfast, lunch and dinner. However, workers do not consume snacks.

During work, some workers feel tired, dizzy, have body aches, and have difficulty concentrating. The symptoms experienced by workers can be categorized as symptoms of mild protein energy deficiency (PEM). The clinical symptoms of PEM are mild, namely decreased activity and concentration and mild anemia. Lack of protein in daily food consumption is one of the factors in a person experiencing anemia which can have effects such as feeling dizzy, tired and having difficulty concentrating well[7].

This research aims to determine the description of energy adequacy of workers at PT. Indotec Tiga Putra Kupang City.

METHOD

This research is quantitative research using a descriptive approach. This research was conducted at PT. Indotec Tiga Putra Kupang City which is located on Jl. Sepadan RT/RW 010/003 Kayu Putih Village, Kec. Oebobo, Kupang City, East Nusa Tenggara and the research was conducted in June 2022. This research used a total sampling technique where the population and sample size were the same, namely 24 workers at PT. Indotec Tiga Putra Kupang City. The research instruments used were 2x24 hour food recall, 2x24 hour physical activity recall, microtoise and digital scales, food photo books and nutrisurvey applications.

The physical activity variable was measured using a 2x24 hour physical activity recall form which was categorized as light if $1.4 \leq PAL \leq 1.69$, moderate if $1.7 \leq PAL \leq 1.99$, and heavy if $2 \leq PAL \leq 2.430$. Body weight was measured using a digital scale and height was measured using a microtoise.

Food intake for breakfast and dinner is categorized as sufficient if you consume 20% of the total calories in a day and is categorized as insufficient if you consume <20% of the total calories in a day. Food intake for lunch is categorized as sufficient if you consume 30% of the total calories. in a day and is categorized as insufficient if you consume <30% of the total calories in a day. Meanwhile, food intake for morning and afternoon snacks is categorized as sufficient if you consume 10% of the total calories in a day and categorized as insufficient if you consume <10% of the total calories in a day.

Meanwhile, energy adequacy is measured using a 2x24 hour food recall form to determine the type and amount of food consumed which is categorized as more if > 110% of the RDA, good if 80-110% of the RDA, and less if < 80% of the RDA[8] and photo

book food to convert household measurements to grams. Data obtained through the 2x24 hour food recall form is then processed using the nutrisurvey application.

Data analysis in this research uses univariate analysis to describe the phenomena studied which are then presented in table form with narrative. This research has passed ethical review with code No: 2022161 – KEPK issued by the Health Research Ethics Commission, Faculty of Public Health, Nusa Cendana University.

RESULTS

Based on table 1, it is known that the majority of respondents are 30-49 years old, 62.5%. Almost all respondents were male, 83.3%. Body size consisting of height, most respondents had a height in the range of 160-169 cm as much as 54.2% and a body weight ≥ 70 kg as much as 45.8%. Table 2 shows that the frequency distribution of physical activity carried out by workers at PT. Indotec Tiga Putra Kupang City mostly carries out physical activity in the light category as much as 83.3%.

Table 1. Distribution of Research Respondent Characteristics

Respondent Characteristics	n	%
Age		
19-29 Years old	4	16.7
30-49 Years old	15	62.5
50-64 Years old	5	20.8
Gender		
Man	20	83.3
Women	4	16.7
Body Size		
Hight		
170-179 cm	5	20.8
160-169 cm	13	54.2
150-159 cm	6	25
< 150 cm	0	0
Weight		
≥ 70 kg	11	45.8
60-69 kg	8	33.3
50-59 kg	2	8.3
40-49 kg	3	12.5

Source : Primary Data, 2022

Table 2. Frequency Distribution of Physical Activity

Phsical Acticity	n	%
Light	20	83.3
Currently	4	16.7

Source : Primary Data, 2022

Table 3 shows that 54.2% of respondents consumed sufficient breakfast intake and 45.8% consumed insufficient breakfast intake. As many as 33.3% consumed sufficient morning and afternoon snacks and 66.7% consumed insufficient morning and afternoon snacks. As many as 37.5% consumed sufficient lunch intake and as many as 62.5% consumed insufficient lunch intake. As many as 70.8% consumed sufficient dinner intake and as many as 29.2% consumed insufficient dinner intake.

Table 3. Frequency Distribution of Food Intake

Food Supply	Enought		Not Enought	
	n	%	n	%
Breakfast	13	54.2	11	45.8
Morning Interlude	8	33.3	16	66.7
Have Lunch	9	37.5	15	62.5
Afternoon Interlude	8	33.3	16	66.7
Dinner	17	70.8	7	29.2

Source : Primary Data, 2022

Table 4 shows that the frequency of energy adequacy among workers at PT. Indotec Tiga Putra is in the deficient category at 58.3%.

Table 4. Frequency Distribution of Energy Adequacy

Energy Adequacy	n	%
More, if > 110% RDA	1	4.2
Good, if 80-110% of RDA	9	37.5
Insufficient, if < 80% RDA	14	58.3

Source : Primary Data, 2022

Table 5. Distribution of Average Energy Expenditure, Intake and Adequacy

Energy	Mean
Energy Expenditure (kcal)	3,521.6 kkal
Intake (kcal)	2,691.4 kkal
Adequacy Rate (%)	75.8 %

Source : Primary Data, 2022

Table 5 shows that the average energy expenditure, energy intake and energy adequacy level are 3,521.6 kcal, 2,691.4 kcal and 75.8%.

DISCUSSION

Overview of Physical Activity in Workers at PT. Indotec Tiga Putra Kupang City

According to WHO (2010) in Sri

(2011) all body movements carried out and expended energy are called physical activity[9]. A person's activities by sitting still or sleeping are included in physical activity. The activities carried out have different activity factors from one another, called the physical activity ratio (PAR)[10].

The research results show that the workers at PT. The majority of Indotec Tiga Putra have light physical activity. Most of the activities carried out by workers are sedentary activities. Sedentary activities are activities with minimal body movement[11]. Sedentary activities include lying, sleeping, standing, working on a computer, writing, reading, watching TV, chatting, playing on a cellphone, etc. They also do sports activities such as sports without using equipment, for example sit ups, pull ups and push ups, running, playing tennis, soccer and playing golf.

In this research, what differentiates workers who have light activity and moderate activity is the PAR value of the activity and the duration of carrying out an activity in accordance with Irianto's (2015) statement that the energy expended depends on the time/duration and intensity of work[12] and also the statement from Titi and Roosita (2022) that the higher the PAR value, the greater the activities carried out[10].

Workers who have light activity carry out activities for a shorter duration compared to workers who have moderate activity. Likewise, the PAR value for workers with light physical activity is lower than that of workers who have moderate activity. For example, workers who carry out sports activities without equipment with a PAR value according to FAO/WHO/UNU (2001) namely 5.44[13] and are carried out for a duration of 30 minutes have a different PAL value to workers who carry out sports without equipment for a duration of 1 hour so that they can affect the level of physical activity.

The results of this research are in line with research conducted by Pasaribu (2020) which was carried out in the administration section of USU Hospital which showed that respondents with light physical activity (83.3%) were greater than respondents who had moderate physical activity (16.7%). The activities carried out by respondents are mostly sedentary activities[14].

Overview of Food Intake Among Workers at PT Indotec Tiga Putra in Kupang City

Food intake is everything that is consumed, whether in the form of drinks or in the form of food[15].

1.   Breakfast

Breakfast or eating and drinking in the morning is an activity carried out to consume food and drink in the morning with the aim of meeting daily nutritional needs for maintaining a healthy body and carrying out activities actively[16]. Breakfast is also needed as fuel so that energy needs can be met throughout the day[17].

The research results showed that the majority of workers had sufficient breakfast intake, 13 people (54.2%). This data shows that the majority of workers have met 20% of their total energy needs in a day, in accordance with the statement by Nurramadhani, (2020) that breakfast is an activity of consuming food and drink that fulfills 20-25% of calories. of total energy needs in a day[16]. This is also in accordance with recommendations from the Indonesian Ministry of Health which recommends that the composition of food for breakfast be 20% a day[18].

Breakfast provides carbohydrates which are important for the body because they can increase blood sugar levels. Normal blood sugar levels in the body can increase enthusiasm and enthusiasm for work and also increase concentration in carrying out daily activities[14]. This is also related to their work demands which involve spending more time in front of laptops/computers so they need to think and concentrate well. The breakfast habit is also included in the PUGS (General Message on Balanced Nutrition) created by the Ministry of Health in 2002, namely in the 8th message which states "Make breakfast a habit to maintain physical endurance and increase work productivity" [17].

Most of the workers who have sufficient breakfast intake are married and every morning food is provided by their wives before leaving for work. The food provided is also varied and not monotonous, making it interesting to consume. Consuming a varied breakfast can maintain and maintain body fitness and increase productivity at work[16]. The types of food consumed include white rice, corn rice, potato cakes, fried eggs, fried tempeh, fried tofu, spinach, kale, chicken soup, long bean vegetables, fruits such as bananas, apples and

watermelon while the types of drinks consumed they consume water, tea and coffee. Workers who have less breakfast intake are because they do not eat heavy food at breakfast but rather often consume small amounts of light food such as cakes, bread or they only consume tea and coffee before going to work.

2. Snacks (Morning and Afternoon)

Snacks are foods that are needed to help eliminate hunger and provide additional energy to carry out activities[19].

The research results showed that 16 people (66.7%) consumed insufficient morning and afternoon snacks. This data shows that the majority of workers have not met their morning and afternoon snack intake based on the recommendation of the Indonesian Ministry of Health, namely 10% of their total daily energy needs[18]. This is because the office location is far from food stalls/places so that workers are lazy to leave their rooms to buy food and they prefer to eat at the same time at lunch time. The majority of workers also consume water more often during break times than consuming snacks such as lemper, spring rolls, dumplings, chips, chitato and so on.

3. Have Lunch

Lunch is food consumed in the middle of the day at 12.00-13.00. The activities carried out by workers start in the morning until the afternoon. Therefore, they need sufficient energy to be able to replenish the energy that has been used since the morning so that workers can carry out their activities well.

The research results showed that the majority of workers had insufficient lunch intake, as many as 15 people (62.5%). This data shows that the majority of workers have not met 30% of their total energy needs in a day based on recommendations from the Indonesian Ministry of Health[18].

During break time at 12.00-13.00, workers use the break time for lunch. Organizing lunches that are not provided by the office means that workers have to buy food from food stalls/eating places around the office. At lunch, they usually just eat in moderation without paying attention to the food intake they will consume so that the calories they consume are not sufficient for the recommended amount of 30% so the results of this study found that 15 workers (62.5%) had lunch intake that was less than 30%.

4. Dinner

Dinner is from 7 pm to 8 pm. At dinner, consumption of foods that are high in calories should be reduced. This is because at night our body only releases a little energy unlike in the morning and during the day and the body's metabolic processes slow down at night[20]. Dinner is also needed to contribute energy during sleep because when we sleep our body continues to carry out its metabolic functions.

The research results showed that the majority of workers had sufficient dinner intake, 17 people (70.8%). This data shows that the majority of workers have met 20% of their total energy needs in a day in accordance with recommendations from the Indonesian Ministry of Health which recommends that the composition of food for dinner be 20% in a day[13]. Workers with sufficient dinner intake have a good meal time, namely between 18.00-20.00. This is because after working from morning to evening the body needs additional energy to replace the energy that was expended in the morning. Therefore workers will feel hungry more quickly.

Consuming food at night is not recommended if it is past 8 pm. The digestive phase in the body occurs from 12 noon to 8 pm, during which time if you consume a lot of calories it is not a problem because the body's digestive phase is still running. On the other hand, if you consume food after 8 pm, when the food absorption phase occurs and the digestive system becomes slow, it will cause fat accumulation, especially in the stomach area[21].

Overview of Energy Adequacy for Workers at PT. Indotec Tiga Putra Kupang City

One component of the body that has an important role in life is energy. Energy that enters the body is obtained through daily food consumption, namely at breakfast, lunch, dinner and snacks. One person's energy needs differ from one another. Energy needs are used for basal metabolism and are needed to carry out body functions such as digesting, processing and absorbing food, as well as for moving, walking, working and other activities [22, 23]. The largest energy use in the body is generally used for basal metabolic processes[24].

The energy adequacy figure recommended by the AKG in the 2019 Minister of Health Regulation has been adjusted according to age group, gender, body weig ht, namely men in the age group 19-29 years, 30-

49 years, 50-64 years have an energy adequacy of 2650 kcal, 2550 kcal and 2150 kcal. Meanwhile, women in the age groups 19-29 years, 30-49 years, 50-64 years have energy requirements of 2250 kcal, 2150 kcal and 1800 kcal. Energy for physical activity is calculated using a physical activity factor that has been adjusted for each age group, namely the 4-64 year age group has a physical activity factor of 1.26.

The research results show that the majority of workers have a low level of energy sufficiency, 14 people (58.3%). This data shows that the majority of workers at PT. Indotec Tiga Putra does not have a good energy balance. Good energy balance occurs when the energy needed is the same as the energy intake consumed[15].

The dominant lack of energy adequacy is caused by them skipping meals at breakfast time and during the day they tend to eat small amounts/portions. This is in accordance with the statement by Adriani and Wirjatmadi (2012) that insufficient energy adequacy is caused by the energy intake consumed from food. source of power/energy producer in quantities less than requirements[25]. Organizing lunches that are not provided by the office is also one of the reasons why the majority of workers have insufficient energy. The demands of their work also require them to sit down to make plans and reports, making them too busy completing them so that sometimes they forget and have no appetite. This causes some workers to sometimes feel dizzy, tired and unenthusiastic when working.

According to Astuti (2017) humans who have less energy intake will experience bad impacts such as reduced body endurance, carrying out activities without enthusiasm/weakness and weak thinking power due to the lack of nutrients received. body so that less energy is produced[6]. Lack of energy intake from sufficient energy requirements will also result in energy reserves in the body stored in the muscles being used and if it lasts for a long time it can result in weight loss which can affect nutritional statu[26].

Workers with adequate energy, they eat at main meal times, namely breakfast, lunch and dinner, consuming sufficient amounts of food according to their needs, even though snacks are not fully sufficient because the function of snacks is to eliminate hunger before the main meal. and as an energy enhancer for the body[19]. On the other hand, greater energy adequacy is due to the consumption of food sources of energy in large quantities which makes the incoming energy intake exceed the individual's energy needs so that unused energy will be stored in the form of fat. Excess energy is also caused by minimal activity. If this continues, the energy stored in the form of fat will accumulate over time, which can result in weight gain or obesity and will increase the risk of suffering from obesity.

The results of this research are in line with research by Rahmawati et al., (2019) which was conducted on 75 employees of Pandeglang District Hospital where almost all of the research subjects had a low level of energy adequacy (48%) because energy consumption intake was in the low category, namely 1500 kcal/day[27].

A Comparative Overview of Energy Expenditure and Energy Entry Among Workers at PT Indotec Tiga Putra in Kupang City.

One factor that can increase energy needs/energy expenditure is physical activity[28]. The heavier the activity, the greater the energy requirement needed to replace the energy expended during the activity[29].

Average energy expenditure of workers at PT. Indotec Tiga Putra Kupang City amounted to 3,521.6 kcal while energy income from food consumption amounted to 2,691.4 kcal. This data shows that workers' energy expenditure is greater than workers' energy intake consumed from food.

This greater energy expenditure is due to the majority of workers at PT. Indotec Tiga Putra Kupang City has a height in the range of 160-169 cm with a body weight ≥ 70kg where a person's larger body size indicates greater energy expenditure also because they have larger internal organs[30].

Apart from that, the majority of workers also carry out physical activity in the light category because they spend more time in the office sitting working on planning and monitoring reports. They also usually spend time after work doing a little sports activity. Even though the physical activity they do is in the light category, the work they do by relying on their brains to think hard in making creative plans and completing monitoring reports can drain a lot of energy. This is in accordance with research conducted by Raichle et al (2001) who found that although the brain only represents

2% of a person's total body weight, the brain uses 20% of the body's energy[31]. This indicates that a person is able to expend 320 kcal just by doing thinking activities. Meanwhile, energy intake from consumption of food intake is not commensurate with the energy expenditure of workers' physical activity due to the consumption of food sources of energy in small quantities/portions and not paying attention to the nutrients that will be consumed.

Energy expenditure that is greater than energy intake will cause the energy in the body to become unbalanced. This can cause a lack of energy which can result in a person becoming thin[32]. Energy in the body is said to be balanced if the amount of energy entering the body obtained from food intake is close to (±10%) the amount of energy released by the body in the form of activities carried out.

Pengeluaran energi yang lebih besar dibandingkan pemasukan energi akan menyebabkan energi dalam tubuh menjadi tidak seimbang. Hal ini dapat menyebabkan kekurangan energi yang dapat mengakibatkan seseorang menjadi kurus[32]. Energi dalam tubuh dikatakan seimbang jika jumlah energi yang masuk dalam tubuh yang diperoleh dari asupan makanan mendekati (±10%) jumlah energi yang dikeluarkan tubuh berupa aktivitas yang dilakukan.

CONCLUSIONS

From the results of this research, it can be concluded that the majority of workers at PT. Indotec Tiga Putra Kupang City tends to have characteristics of age 30-49 years, male gender, height 160-169 cm, and weight ≥ 70 kg. Most workers' physical activity is classified as light activity. Although most workers have sufficient dinner intake, the findings show that there is a lack of energy intake in the majority of workers, with average energy expenditure exceeding energy intake.

These findings highlight the importance of paying attention to workers' diets, especially morning and afternoon snacks, as well as lunch. Conditions of insufficient energy intake can have a negative impact on worker welfare and productivity. Therefore, steps are needed to increase awareness and healthy eating behavior in this work environment.

REFERENCES

1. Indriani MN, Widnyana INS, Laintarawan IP. Analisis Peran Konsultan Perencana dan Konsultan Pengawas Terhadap Keberhasilan Proyek. Widya Tek. 2019;13(02):47–66.
2. Ariati NN. Gizi Dan Produktifitas Kerja. J Skala Husada [Internet]. 2013;10(2):214–8. Available from: http://www.poltekkes-denpasar.ac.id/files/JSH/V10N2/Ni Nengah Ariati1 JSH V10N2.pdf
3. Stitaprajna A, Aslam M. Hubungan Status gizi dan Asupan energi dengan Produktivitas kerja pada pekerja PT. Propack kreasi mandiri cikarang. J Nutr. 2020;22(2):86–93.
4. BPS. Konsumsi Kalori dan Protein Pennduduk Indonesia dan Provinsi; 2021.
5. Kemenkes RI. Angka Kecukupan Gizi Mayarakat Indonesia. 2019; 65(879). Available from: http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No__28_Th_2019_ttg_Angka_Kecukupan_Gizi_Yang_Dianjurkan_Untuk_Masyarakat_Indonesia.pdf
6. Astuti P. Hubungan Asupan Energi, Asupan Protein dan Status Gizi Dengan Produktifitas Kerja Pada Tenaga Kerja Wanita Bagian Finishing 3 PT Hanil Indonesia Nepen Teras Boyolali. Universitas Muhammadiyah Surakarta; 2017.
7. Wahyuni Y. Hubungan Pola Makan Terhadap Kejadian Anemia Pada Ibu Hamil Di Puskesmas Kecamatan Pulo Gadung Jakarta Timur. Fak Keperawatan Dan Kebidanan Univ Binawan [Internet]. 2019;1–129. Available from: http://repository.binawan.ac.id/779/1/Keperawatan-2019-Yeni wahyuni-repo.pdf

8. Marlina KS. Hubungan Konsumsi Pangan dan Aktivitas Fisik Ddengan Indeks Massa Tubuh Para Pekerja di PT. Asuransi Jasa Indonesia (PERSERO) Kantor Cabang Medan. Universitas Sumatera Utara; 2019.

9. Nisa, O. S., & Jatmiko, A. W. (2019). Hubungan Antara Tingkat Aktivitas Fisik dengan Fungsi Kognitif Pada Lanjut Usia. *Jurnal Berita Ilmu Keperawatan*, 12(2), 59-64.

10. Kerisnawati T, Roosita K. Konsumsi Pangan, Aktivitas Fisik, Status Gizi dan Produktivitas Kerja Pemetik Teh di Kabupaten Kepahiang Bengkulu pada Masa Pandemi Covid-19. Jurnal Ilmu Gizi dan Dietetik. 2022 Jun 13;1(1):65-73.

11. Mandriyarini R, Sulchan M, Nisaa C. Sedentary Lifestyle Sebagai Faktor Risiko Kejadian Obesitas Pada Remaja Sma Stunted Di Kota Semarang. J Nutr Coll. 2017;6(2):149–55.

12. Irianto T. Sistem Energi Dalam Olahraga Tri Irianto. 2015.

13. FAO/WHO/UNU. Human Energy Requirements. WHO Technical Report Series. Geneva: World Health Organization. 2001;724. Available from: https://www.fao.org/3/y5686e/y5686e.pdf

14. Pasaribu SS. Hubungan Pengetahuan Gizi, Aktivitas Fisik dan Konsumsi Pangan Dengan Rasio Lingkar Pinggang Pinggul Karyawan Bagian Administrasi Di Rumah Sakit USU [Internet]. Skripsi. Universitas Sumatera Utara; 2020. Available from: https://repositori.usu.ac.id/bitstream/handle/123456789/24814/151000527.pdf?sequence=1&isAllowed=y

15. Fauzan MA, Nurmalasari Y, Anggunan A. Hubungan Status Gizi dengan Prestasi Belajar. Jurnal Ilmiah Kesehatan Sandi Husada. 2021 Jun 30;10(1):105-11.

16. Nurramadhani M. Gambaran Asupan Sarapan dan Tingkat Konsentrasi Belajar Pada Siswa Boarding School di SMA Negeri 5 Gowa [Internet]. Universitas Hasanuddin; 2020. Available from: http://repository.unhas.ac.id/id/eprint/852/

17. Pertiwi I, Sandjaja WS. Hubungan Sarapan, Kecukupan Energi dan Protein terhadap Status Gizi Remaja Usia 16-18 Tahun di Provinsi Lampung (Analisa Data Sekunder RISKESDAS 2010). Nutr Diaita [Internet]. 2014;6(1):24. Available from: https://ejurnal.esaunggul.ac.id/index.php/Nutrire/article/view/1261/1153

18. Farhati UL, Wahyuningsih AS. Pengaruh Intervensi Gizi Kerja melalui Pemberian Makanan Tambahan terhadap Produktivitas Kerja pada Pekerja Bagian Packing. HIGEIA (Journal of Public Health Research and Development). 2021 Dec 11;5(4):544-55.

19. Manaraja ALP. Pengaruh Pendidikan Gizi Tentang Pengolahan Makanan Selingan Busur Terhadap Perilaku Gizi Ibu Anak Paud Miftahul Husna Serdang Bedagai [Internet]. Vol. 11, Analytical Biochemistry. 2018. Available from: http://link.springer.com/10.1007/978-3-319-59379-1%0Ahttp://dx.doi.org/10.1016/B978-0-12-420070-8.00002-7%0Ahttp://dx.doi.org/10.1016/j.ab.2015.03.024%0Ahttps://doi.org/10.1080/07352689.2018.1441103%0Ahttp://www.chile.bmw-motorrad.cl/sync/showroom/lam/es/

20. Firmanurochim W, Romadhon YA, Mahmuda INN, Dasuki MS. Hubungan Kebiasaan Makan Malam dan Tingkat Stress dengan Kejadian Obesitas Pada Remaja Putri. Univ Muhammadiyah Surakarta. 2021;290–8.

21. Angka Kebutuhan Gizi. Buletin Anak Gizi [Internet]. 2013. p. 8. Available from: https://akg.fkm.ui.ac.id/wp-content/uploads/2014/12/BAGI-2013-2.pdf

22. Tawakal FA. Gambaran Tingkat Pengetahuan Gizi, Asupan Energi dan Protein Ibu Hamil Kurang Energi Kronik (KEK) di Wilayah Kerja Puskesmas Konda Kecamatan Konda Kabupaten Konawe Selatan. Politeknik Kesehatan Kendari; 2021.

23. Hartriyanti Y, Suyoto PST, Sabrini IA, Wigati M. Gizi Kerja. Dewi, editor. UGM PRESS; 2020.

24. Almatsier S. Prinsip Dasar Ilmu Gizi. Gramedia Pustaka Utama. Jakarta. 2004

25. Adriani dan Wirjatmadi. Peranan Gizi dalam Siklus Kehidupan. Kencana Prenada Media Group. Jakarta. 2012.

26. Utami HD, Kamsiah, Siregar A. Hubungan Pola Makan, Tingkat Kecukupan Energi, dan Protein dengan Status Gizi pada Remaja. J Kesehat [Internet]. 2020;11(2):32. Available from: http://ejurnal.poltekkes-tjk.ac.id/index.php/JK

27. Rahmawati SD, Ghifari N, Fitriani A. Hubungan Tingkat Kecukupan Energi dan Zat Gizi Makro, Tingkat Aktivitas Fisik Dengan Tingkat Kebugaran Karyawan RSUD Pandeglang. 2019;4(2):65–73.

28. Izhar MD. Hubungan Antara Konsumsi Junk Food, Aktivitas Fisik Dengan Status Gizi Siswa Sma Negeri 1 Jambi. *J Formil (Forum Ilmiah) Kesmas Respati*. 2020;5(1):1.

29. Hadza RQ. Kebutuhan Energi Dalam Tubuh. OsfIo [Internet]. 2021; Available from: https://osf.io/preprints/ad2b6/

30. Fitrianingrum, D., Wardhani, S. A., Mushthafiyah, N., Mulyawati, S. D., Larasati, W., Nurshavira, A. A., ... & Mardiana, M. (2021). Analisis Pengaruh Stres Kerja, Tingkat Aktivitas Fisik, dan Iklim Kerja terhadap Asupan Energi Karyawan Kantor. Nutrizione: Nutrition Research and Development Journal, 1(1), 16-23.

31. Raichle ME, Macleod AM, Snyder AZ, Powers WJ, Gusnard DA, Shulman GL. A default mode of brain function. 2001;98(2):676–82.

32. Yosephin B. Tuntunan Praktis Menghitung Kebutuhan Gizi [Internet]. Perpustakaan Tenas Effendy Kota Pekanbaru. 2018. 202p p. Available from: https://pustaka.pekanbaru.go.id/inlislite3/opac/detail-opac?id=28395

Article Review

Recovery From Covid-19 Is A Valuable Experience: A Systematic Review

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ABSTRACT

COVID-19 is a global health problem that affects the physiological and psychological of patients even though they have passed through an acute period. The recovery process from COVID-19 is also still limited. This study aims to examine the physiological and psychological health problems of COVID-19 survivors. Methods: A systematic search was conducted through five databases (Proquest, Science Direct, Web of Science, PubMed, and Scopus) using qualitative research criteria with interviews and limited article searches from January 2020 to January 2022. The data search used the keywords recovery, rehabilitation, experience, COVID-19 or coronavirus, qualitative. Dissemination and review of the use of the JBI Guidelines to assess research quality. Systematic analysis using the Prisma checklist guide. Title, abstract, full text, and methodology used to access the location. Researchers perform data tabulation and narrative analysis of the findings. Results: Seven studies met the inclusion criteria. The results of the study are divided into two themes in the recovery of COVID-19. Factors that affect physiological (n=2), psychological (n=3) and affect both (n=2). An average of 176 participants from all studies discussed physiological and psychological factors in COVID-19 recovery. Results: Physiological problems in the form of fatigue, shortness of breath, sleep disturbances, decreased appetite, and cough. Psychological problems in the form of fear, depression, anxiety, and stress. Conclusion: Survivors of COVID-19 have different physiological and psychological health problems in recovery or rehabilitation, so they are need support from other people or health workers and a good environment for a prosperous life.

Keywords : Covid-19, Physiological, Psychological, Recovery.

INTRODUCTION

Coronavirus Disease 2019 (COVID-19) is an infectious disease that has spread throughout the world. On March 11, 2020, WHO declared COVID-19 to be pandemic because of its very fast spread throughout the country[1]. Based on research on COVID-19 and post-COVID-19 patients, it shows that they experience physical and psychological disorders[2,3]. Fatigue, shortness of breath, and cognitive dysfunction are three symptoms that are often complained of. 89% of respondents said that doing excessive physical activity showed symptoms of malaise after activity[4]. 96.2% of post COVID-19 patients experience psychological disorders so that interventions are needed to improve their well-being[2].

The number of COVID-19 cases in the world increased 5% on January 17-23 2022. The number of new cases reported exceeded 21 million cases which is the highest weekly number of cases since the start of the pandemic[5]. In Indonesia, there were 18,891 (0.44%) active cases in the last week of January 2022 with the number of positive cases increasing by 2,925 cases. Social distancing has been implemented by the Indonesian government to reduce the spread of the virus. However, there are still many people who come out of the red zone which causes the virus to spread to other areas[6].

The effect of respiratory problems from Coronavirus 2 (SARS-CoV 2) is different for

each individual ranging from showing no symptoms despite of infected to experiencing respiratory failure and even multiorgan failure[7]. Findings from MRI examination showed that 70% of "low risk" COVID-19 positive patients showed one or more organ damage within 4 months of initial symptoms[8]. In a recent study, fatigue, shortness of breath, and cognitive dysfunction were characterized as the three symptoms of COVID-19 that make people weak. As many as 89% of the survey of respondents reported that excessive physical and mental activity causes malaise after doing activities[4]. Exercise and physical activity as the rehabilitation of post COVID-19 patients are still being carried out because there are several neurological, cardiac, musculoskeletal and respiratory symptoms that can interfere with the patient's activities[9].

Psychological distress can affect the severity and recurrence of respiratory tract infections[10]. Patients who experience stress in their lives can affect the activity of the hypothalamus, pituitary, adrenals and also the autonomic nervous system[11]. Elevated levels of stress hormones can interfere with the inflammatory response by suppressing the hormonal and cellular immune systems and altering the balance of proinflammatory cytokines[12]. Therefore, in addition to paying attention to the physical complaints, the patient's psychological factors also need to be considered to improve the welfare of the patient's welfare.

The clinical and treatment characteristics of COVID-19 patients have been studied extensively, but knowledge regarding the recovery process from COVID-19 is still limited. Physiological and psychological problems are health problems that are often felt by survivors. An understanding the recovery process of COVID-19 patients is necessary to plan post treatment follow-up and prevent new health problems from occurring in the community[13]. However, there are still limited research articles that examine the physiological and psychological health problems of COVID-19 survivors in the general population in Indonesia.

This study aims to explore the physiological and psychological experiences of patients after recovering from COVID-19.

METHOD

A systematic review was carried out comprehensively and synthesized from studies relevant to the health problem of COVID-19 patients from physiological and psychological factors. Dissemination and the Joanna Briggs Institute Guidline for assessing research quality. Evaluation of the Systematic Review using the PRISMA checklist, all items were recorded and included when reporting and analyzing a systematic review[14].

Search strategy

The databases used in the search process are Proquest, Science Direct, Web of Science, Pubmed and Scopus. Database search was conducted in January 2020-January 2022 to review relevant studies. The PICOS format was used to formulate research questions (table 1). The boundaries of the questions reviewed were defined through the development of inclusion and exclusion criteria using the PICOS format. Studies were included for review if they met the following inclusion criteria: (a) all types of qualitative research conducted during the COVID-19 pandemic; (b) Researching the physiological and or physiological health problem of post COVID-19 patients.

The search strategy is carried out by trying to find suitable keywords to improve the quality of research and consulting with lecturers and other researchers in a systematic review strategy. The literature search used five keyword groups based on Medical Subject Heading (MesH) and combined using Boolean OR. The search strategy set is recovery, rehabilitation, experience, COVID-19 or coronavirus, qualitative. The search results were limited to qualitative designs and reviews using English.

Study Options

The search was conducted through five databases and found 413 publications (figure 1), obtained 9 duplicate publications and removed from the results, and obtained 404 publications. Researchers assessed and filtered titles (n=404), obtained abstracts (n=22) and full text (n=7) from each publication that did not meet the inclusion criteria (table 1). We found seven full text articles to qualify for a systematic review. During the literature screening process, the researcher provided a general definition of the

reasons for the exclusion criteria, namely the type of research was irrelevant and there was no explanation of the recovery experience affecting the physiological and psychological effects of post COVID-19 patients and the gray literature.

Assessment of Study Quality and Risk of Bias

JBI's critical assessment for qualitative studies was used to analyze the methodological quality and risk of bias of each study (n=7). The list to examine the study has several assessment criteria, given a score of "yes", "no", "unclear", or "not applicable". Criteria with a score of "yes" are given a score of one point and in the sum after each assessment item is filled in and the score for each study is calculated. Critical assessment is carried out by researchers to assess studies that meet the requirements. The critical rating limit agreed upon by the two researchers was 50% for the study to be included in the review. There were seven studies that achieved a score of more than 50% and were ready for data synthesis.

Data extraction and analysis

Relevant data extracted included author, year, country, research objectives, research design, sample size, sampling method, participant description, data collection process, interview results and research conclusions. Conducting a qualitative review aims to dig up information on patient experiences post COVID-19 physiologically and psychologically so that information or themes can be obtained to synthesize data in a systematic review.

RESULTS

Study Characteristics

Seven articles were found from five databases, there were 86 journals from Proquest, 105 journals from Science Direct, 154 journals from Web of Science, 59 journals from PubMed and 9 journals from Scopus that met the inclusion criteria (table 1). The results of the study are divided into two themes in the recovery of COVID-19. Factors that affect physiological (n=2), psychological (n=3) and affect both (n=2). An average of 176 participants from all studies discussed physiological and psychological factors in COVID-19 recovery. Studies according to this systematic review were conducted in China with 3 studies[13,15,16], in the UK with 3 studies[17–19] and in Iran with 1 study[20].

Data collection used a qualitative design with various interview techniques, ranging from 18 to 74 years of age. The majority of interviews were conducted using telephone and video calls (using the wechat application, zoom), there were also interviews conducted directly at the hospital. Interviews were conducted for 40 to 60 minutes.

Physiological Problem
Physical symptoms

Physiological health problems by COVID-19 survivors are very diverse because they depend on the health status of each individual. Some respondents had complaints of health problems there are fatigue, shortness of breath, sleep disturbances, decreased appetite, chest pain and cough[13,20]. Decreased strength in carrying out physical activities greatly interferes with work. Feeling tired and excessively tired so that he adjusts to doing small jobs such as sweeping, gardening, taking care of children and shopping so that he can do activities well[18,19].

Guidance for Rehabilitation

Some respondents complained that they did not know how to contact health care staff to find out how their physical condition was after COVID-19 and how to improve their health status[13,17,18]. There is no effective treatment to return the physical condition to normal[15]. Various activities were carried out to improve their physical condition, such as going to the park, jogging and doing yoga independently without guidance from health workers. Running, cycling, walking uphill and swimming are activities that are still not actively carried out in increasing physical strength, although there are some respondents who carry out these activities but not maximally[19].

Psychological Problem

Afraid

The spread of wrong information makes respondents afraid to leave the house, they are afraid that they will be re-infected or will infect a loved family member. Therefore they hope to get information from health care staff who have experience about COVID-19 disease and have authoritative information rather than information from the internet[13,17]. Some respondents are afraid of death if they are repeatedly infected with COVID-19 because of poor health care outcomes[16,20]. Not all respondents received support from health workers so that some of them carried out a series of self-examinations because they were afraid of their current health condition. They are also worried and afraid to dir if there are symptoms that suddenly appear when they were in a place far from health services[17].

Depression

They have infected COVID-19 despite not doing outside activities compared to people who often leave the house makes patients angry, sad and feel unfair about the situation. This is also the case for some patients who have lost loved ones to their loved ones because of their illness[13].

Anxiety

Anxiety will have further impacts from COVID-19, including decreased physical strength, uncertain prognosis, fear of family members being infected, and the negative stigma obtained from other people[13,16,20].

Stress

The stigmatization of the people around is one of the actions that the survivors think about. Because they are considered as carriers of viruses that can infect anyone[15,16]. Fear of re-infection which makes survivors stressed in carrying out activities[20]. Respondents who returned to work experienced a decreased ability to concentrate on doing work and were unable to do work as quickly as before being exposed to COVID-19[18,19].

Tabel 1. PICOS Format of Research

| Criteria	Inclusion	Exclusion
Population	Post COVID-19 patients or experiencing long COVID-19 symptoms after being discharged from the hospital	Not diagnosed with COVID-19 or still undergoing treatment at the hospital
Intervention	Intervention of physiological factors and psychological factors	There is no intervention of physiological factors and psychological factors
Comparators	No comparison	No comparison
Outcomes	Analysis of physiological factors and psychological factors post COVID-19	Does not explain the analysis of physiological factors and psychological factors post COVID-19
Study design and publication type	Qualitative design, semi-structured interviews, interpersonal interviews	Other interviews
Publication years	1 January 2000 – 31 January 2020	Post 31 January 2022
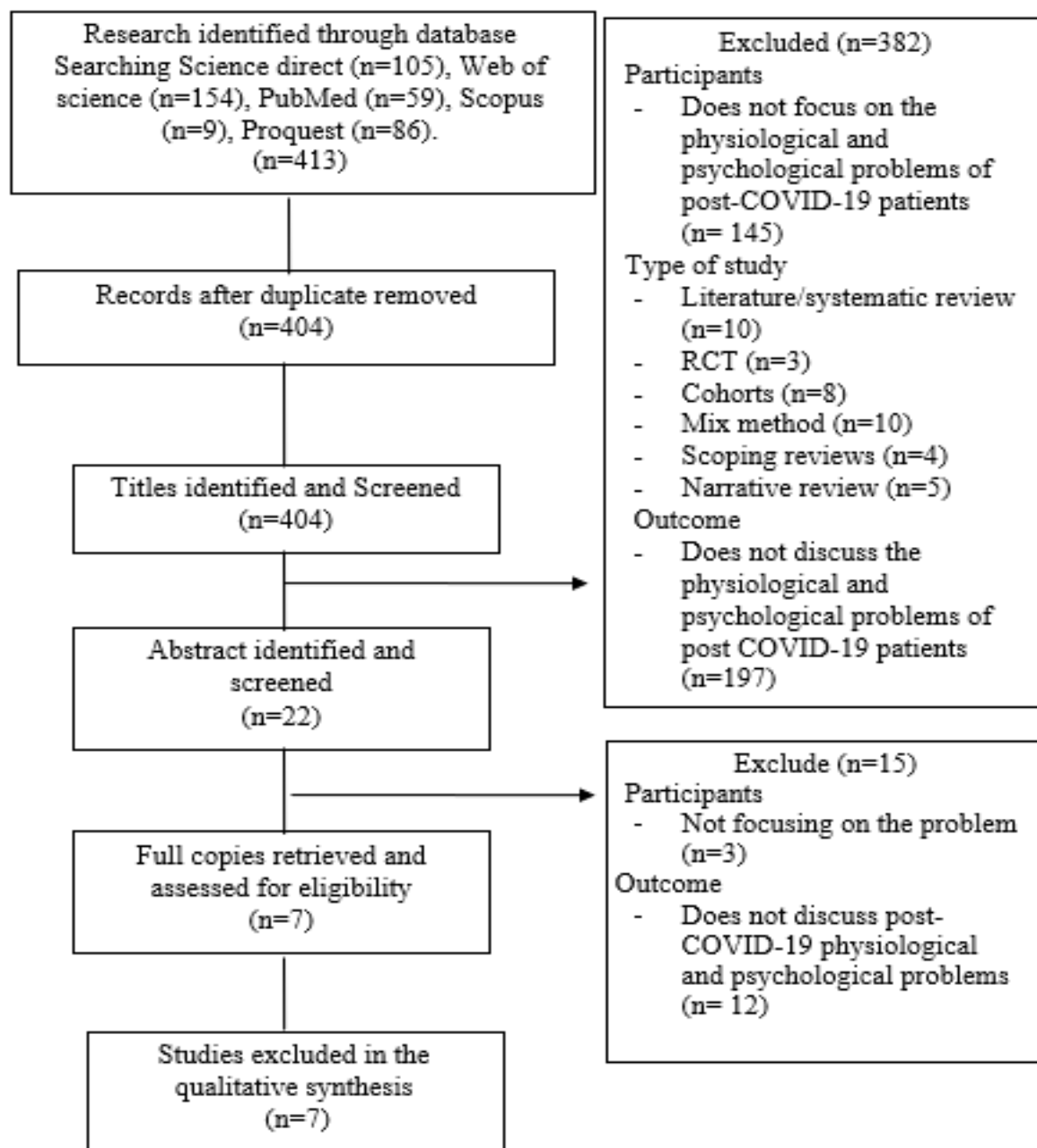
Figure 1. Flow Chart Of Literature Search Adopted From PRISMA 2009 Flow Diagram

DISCUSSION

Complaints after recovering from COVID-19 have an impact on several patient's health problems. Physiological problems are about the state of the body or physical and psychological problems are about mental status[13,18]. The long-standing physical and psychological impacts of COVID-19 are intertwined. The inability of the body physically will create unexpected emotional implications such as decreased self-

esteem, frustration and guilt for not being able to meet daily needs which will eventually trigger stress[18].

Physiological problems experienced by post-COVID-19 patients have some remaining physical symptoms including fatigue, shortness of breath, sleep disturbances, decreased appetite, chest pain and cough[13]. A person's inability to maintain an ADLs as it was before COVID-19 is a problem for some survivors. The uncertainty of physical recovery makes

some survivors unable to perform ADL activities consistently. Adaptation in carrying out ADL activities gradually is one way for survivors to carry out activities as before. Support from other people, including family and a supportive environment, are needed to recover they physical condition[13,18]. Rehabilitation by professional health workers or medical personnel can also be carried out because there they can discuss the difficulties they faced so that there are ways of handling post-COVID-19 health recovery. Doing sports starting from walking, running, cycling can be a further alternative in improving the physical quality of COVID-19 survivors because there are no specific recommendations on activities or sports for individuals who are recovering from COVID-19[19]. Diet is also an alternative to increase endurance so that with balanced nutrition it is expected to meet the body's needs after illness[16,18,19].

In the recovery phase, there are some clients who immediately return to their usual activities such as returning to work, but they still have concerns about their status as survivors because of the negative health prognosis and community response to the survivors[16]. Concerns about the prognosis of the disease, the transmission that can occur to other family members are some of the psychological problems experienced by patients after COVID-19. They are afraid and worried about the recurrence of the COVID-19 disease they suffer and also the permanent organ damage caused by the disease, moreover there is too much information about the COVID-19 disease which ultimately makes the survivors of COVID-19 become stressed, anxious. even depression[13]. The level of knowledge can also allow them to get right and wrong information, so that fear and anxiety can be minimized[21]. Family and friends can be important sources of social support to help COVID-19 survivors cope with the anxiety they are still experiencing[19].

Building a holistic nursing model is one of the efforts to overcome the physical and physiological problems of COVID-19 survivors[19]. The presenting symptoms, severity, frequency and duration of COVID-19 present new challenges, requiring spesific recommendations regarding the individual's health status and the need for medical care by specialists[18]. A limitation of this review is the potential for publication bias. Gray literature searches was not conducted and published only, review articles in English were included only. Another limitation related to methodological accuracy among the included studies is that the qualitative study were conducted by interview, whereas observations were not included. Identification studies were not carried out in all countries, but only in three major countries. Aspects related to the specific context should be reconsidered during interventions planning in culturally meaningful interviews.

CONCLUSION

The transition to recovery after COVID-19 will go through physiological and psychological problems. Physiological problems include fatigue, shortness of breath, sleep disturbances, decreased appetite, chest pain and cough. Psychological problems include fear, depression, anxiety, and stress where people will gradually accept the details of new situations about the changes taking place. Based on the experience of COVID-19 survivors, they must have good coping and adaptive responses. Recovery or rehabilitation requires support from other people or health workers and a good environment for a prosperous life. Further research is highly recommended to understand the phenomenon so as to improve intervention strategies among post-COVID-19 people

CONFLICTS OF INTEREST
The authors report no conflict of interest whatsoever.

REFERENCE

1. WHO. WHO/Europe | Coronavirus disease (COVID-19) outbreak - WHO announces COVID-19 outbreak a pandemic [Internet]. 2020 [cited 2022 Jan 30]. Available from: https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/3/who-announces-covid-19-outbreak-a-pandemic

2. Bo HX, Li W, Yang Y, Wang Y, Zhang Q, Cheung T, et al. Posttraumatic stress

symptoms and attitude toward crisis mental health services among clinically stable patients with COVID-19 in China. Psychol Med [Internet]. 2021 Apr 1 [cited 2022 Mar 30];51(6):1052–3. Available from: https://www.cambridge.org/core/journals/psychological-medicine/article/posttraumatic-stress-symptoms-and-attitude-toward-crisis-mental-health-services-among-clinically-stable-patients-with-covid19-in-china/32D66826C54EB1A96C008089C0DE500E

3. Ambelu A, Birhanu Z, Yitayih Y, Kebede Y, Mecha M, Abafita J, et al. Psychological distress during the COVID-19 pandemic in Ethiopia: an online cross-sectional study to identify the need for equal attention of intervention. Ann Gen Psychiatry [Internet]. 2021 Dec 1 [cited 2022 Mar 30];20(1):1–10. Available from: https://link.springer.com/articles/10.1186/s12991-021-00344-4

4. Davis HE, Assaf GS, McCorkell L, Wei H, Low RJ, Re'em Y, et al. Characterizing Long COVID in an International Cohort: 7 Months of Symptoms and Their Impact. medRxiv [Internet]. 2021 Apr 5 [cited 2022 Mar 31];2020.12.24.20248802. Available from: https://www.medrxiv.org/content/10.1101/2020.12.24.20248802v3

5. WHO. Weekly epidemiological update on COVID-19 - 25 January 2022 [Internet]. 2022 [cited 2022 Jan 30]. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---25-january-2022

6. Kemenkes RI. Infeksi Emerging Kementerian Kesehatan RI [Internet]. 2020 [cited 2022 Mar 31]. Available from: https://covid19.kemkes.go.id/protokol-covid-19/kmk-no-hk-01-07-menkes-413-2020-ttg-pedoman-pencegahan-dan-pengendalian-covid-19

7. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. BMJ [Internet]. 2020 May 22 [cited 2022 Mar 31];369. Available from: https://www.bmj.com/content/369/bmj.m1985

8. Dennis A, Wamil M, Kapur S, Alberts J, Badley AD, Decker GA, et al. Multi-organ impairment in low-risk individuals with long COVID. medRxiv [Internet]. 2020 Oct 16 [cited 2022 Mar 31];2020.10.14.20212555. Available from: https://www.medrxiv.org/content/10.1101/2020.10.14.20212555v1

9. Brown DA, O'Brien KK. Conceptualising Long COVID as an episodic health condition. BMJ Glob Heal [Internet]. 2021 Sep 1 [cited 2022 Mar 31];6(9):e007004. Available from: https://gh.bmj.com/content/6/9/e007004

10. Liu S, Yang L, Zhang C, Xiang YT, Liu Z, Hu S, et al. Online mental health services in China during the COVID-19 outbreak. The Lancet Psychiatry [Internet]. 2020 Apr 1 [cited 2022 Mar 31];7(4):e17–8. Available from: http://www.thelancet.com/article/S2215036620300778/fulltext

11. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020 Feb 15;395(10223):497–506.

12. Cohen S, Janicki-Deverts D, Doyle WJ, Miller GE, Frank E, Rabin BS, et al. Chronic stress, glucocorticoid receptor resistance, inflammation, and disease risk. Proc Natl Acad Sci U S A [Internet]. 2012 Apr 17 [cited 2022 Mar 31];109(16):5995–9. Available from: www.pnas.org/cgi/doi/10.1073/pnas.1118355109

13. Guo M, Kong M, Shi W, Wang M, Yang H. Listening to COVID-19 survivors: what they need after early discharge from hospital - a qualitative study. Int J Qual Stud Health Well-being [Internet]. 2022;17(1). Available from: https://doi.org/10.1080/17482631.2022.2030001

14. Oikarainen A, Mikkonen K, Kenny A, Tomietto M, Tuomikoski AM, Meriläinen M, et al. Educational

interventions designed to develop nurses' cultural competence: A systematic review. Int J Nurs Stud. 2019 Oct 1;98:75–86.

15. Pei HY, Wu QP, Xie Y, Deng J, Jiang LM, Gan XQ. A Qualitative Investigation of the Psychological Experiences of COVID-19 Patients Receiving Inpatient Care in Isolation. Clin Nurs Res. 2021;30(7):1113–20.

16. Huang F, Wei-Ti C, Sun W, Zhang L, Lu H. Public Health Nursing - 2021 - Huang - Chinese infection-control strategies for COVID-19 prevention A qualitative study (1).pdf. 2021.

17. Kingstone T, Taylor AK, O'Donnell CA, Atherton H, Blane DN, Chew-Graham CA. Finding the 'right' GP: a qualitative study of the experiences of people with long-COVID. BJGP Open [Internet]. 2020;4(5):1–12. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-85097810971&doi=10.3399%2Fbjgpopen20X101143&partnerID=40&md5=3ca4d7623c5e026ebdbf0c68f5a41671

18. Humphreys H, Kilby L, Kudiersky N, Copeland R. Long COVID and the role of physical activity: a qualitative study. BMJ Open. 2021;11(3).

19. Shelley J, Hudson J, Mackintosh KA, Saynor ZL, Duckers J, Lewis KE, et al. "I Live a Kind of Shadow Life": Individual Experiences of COVID-19 Recovery and the Impact on Physical Activity Levels. Int J Environ Res Public Health. 2021;18(21).

20. Toulabi T, Pour FJ, Veiskramian A, Heydari H. Exploring COVID-19 patients' experiences of psychological distress during the disease course: a qualitative study. BMC Psychiatry. 2021;21(1).

21. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. Psychiatry Res. 2020 Jun 1;288:112954.

Article Review

Correlation between Oral Contraceptive Use and the Incidence of Cervical Cancer

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ABSTRACT

Cervical cancer is a malignant tumor that develops in the cervix and is the second most common type of cancer experienced by women in the world. Causes of cervical cancer include HPV infection, use of oral contraceptives, age of marriage, parity and exposure to cigarette smoke. This study aims to determine the correlation between oral contraceptive use and the incidence of cervical cancer. This literature study research involved secondary data derived from the Google Scholar, Research Gate and Science Direct databases. The keywords applied in the study were oral contraceptives, birth control pills AND cervical cancer. The journals involved were searched for similarities, dissimilarities and compared to one another. As mentioned in 11 journals, long-term use of oral contraceptives of ≥5 years could increase the risk of cervical cancer. Furthermore, three journals stated the grade of cervical precancerous lesions of CIN 2/3 as the risk factor of cervical cancer, and two journals stated the grade of cervical cancer of stage 2/2+ as the risk factor of cervical cancer. Based on the chi-square test results, 4 journals presented a significance value (p-value) of <0.05, which indicated a correlation between oral contraceptives and the incidence of cervical cancer. 9 other journals found the highest OR value = 9.11 and the lowest OR = 1.50 which meant that women who used Oral contraceptives were 9 times more at risk of developing cervical cancer. Oral contraceptive use was associated with cervical cancer based on the duration of use of more than 5 years and led to a risk of causing CIN 2/3 among women. There were other factors that could affect the incidence of cervical cancer, namely age of marriage, parity and exposure to cigarette smoke.

Keywords : Oral Contraceptive, Birth Control Pills, Cervical Cancer.

INTRODUCTION

Congenital Rubella Syndrome (CRS) is a Cervical cancer malignant tumor that develops in the cervix (the lowest part of the uterus near the top of the vagina). Cervical cancer is the second most common type of cancer experienced by women in the world. This cancer often affects women aged 35 to 55 years, but some research evidence explains that cervical cancer can also affect women in the age range of 20 to 30 years. Causes of cervical cancer include low socio-economic factors, use of oral contraceptives (with negative or positive HPV), family history of cervical cancer, impaired immunity, and several other risk factors [1].

Based on the exposure to information and health data reported in Indonesia's Health Profile in 2016, there were 36,306,662 active contraceptive users (74.80%), and 8,280,823 were oral contraceptive users (22.81%)[2]. Based on population and family planning information in 2017, there were 12.2% of oral contraceptive users[3]. Oral contraceptives have several advantages, namely easy to use, don't need a visit to a health facility, and they are almost 100% effective if consumed regularly at the same time. In addition, fertility can also return soon after the use of oral contraceptives is stopped[4].

The basis of combined oral contraceptives is to mimic natural processes in the body. Estrogen and progesterone which are

normally produced by the ovaries will be replaced by oral contraceptives. Ovarian hormone production will be suppressed by oral contraceptives so that releasing factor in the brain is also suppressed which ultimately prevent ovulation to occur [5].

There are two types of oral contraceptives, some contain progestin and some contain a combination of estrogen and progestin[6]. Mucus viscosity tends to activate carcinogenic agents and also HPV which is the dominant factor in the incidence of cervical cancer in women[7].

Of the 3636 respondents, 27% were current users of hormonal contraception for 10 years or more. Among 886 cases and 3636 controls, 94% and 92% had used the combined pills or the mini pills, respectively[8]. Hormonal steroids (such as those in Oral Contraceptives) have been shown to activate the genomic elements of the HPV type 16 virus and the virus can cause cervical cancer. Another study revealed that the majority of 35 women (80%) used oral contraceptives which had been shown to increase the cumulative incidence of invasive cervical cancer at the age of 50 years from 7.3 to 8.3 per 1000 in developing countries[9].

There were 159,800 deaths in Asia due to cervical cancer. Cervical cancer can attack women aged 20-29 years, but the peak of cervical cancer cases occurs when women are aged 55-64 years, and will decrease in women aged over 65 years. One study explained that one in five women in India was diagnosed with cervical cancer. India is one of the countries with the most cervical cancer patients [10].

Regions considered to have high risk according to Age Standardized Rate (ASRs) with more than 30 cases per 100,000 population are East Africa (42.7%), Melanesia (33.3%), South Africa (31.5%) and Africa Middle (30.6%)[11]. Ethinylestradiol of 30-35 micrograms plus levonorgestrel are thought to increase the risk of the incidence of cervical cancer [12].

Every year, there is an increase cases of cervical cancer in Indonesia. In 2021, 41 new cases and 20 deaths due to cervical cancer were found [13]. A study conducted by Musfirah (2019) found that as many as 49 respondents (71.1%) used oral contraceptives for >5 years and suffered from cervical cancer, of which 37 respondents (54.4%) were not diagnosed with cervical cancer[14]. On the other hand, 19 respondents (27.9%) used oral contraceptives

for <5 years and suffered from cervical cancer, of which 31 respondents were not diagnosed with cervical cancer (45.6%).

Family planning acceptors must be equipped with knowledge about efficiency and effectiveness, consumption rules, benefits, side effects and duration of contraceptive use to minimize complications in the future, such as the incidence of cervical cancer when consuming oral contraceptive pills for a long time. In addition, there is a need for intervention and support from the government to reduce the prevalence or prevent the incidence of cervical cancer, such as maturing the age of marriage. Another way that is expected to reduce the incidence of cervical cancer in women is the provision of socialization by healthcare workers regarding the prevalence of cervical cancer both in Indonesia and the world, risk factors, causes and prevention of cervical cancer as well as specific recommendation for married women to take VIA examinations at least once every 3 years to support government programs in efforts to reduce the prevalence of cervical cancer among women.

This study aims to determine the correlation between oral contraceptive use and the incidence of cervical cancer.

METHOD

The study currently conducted was a literature or literature review study with a traditional review design. This study involved secondary data selected through predetermined criteria so that the journals obtained were aligned with the topic to be studied. The literature used consisted of articles and journals published in the last 5 years with a minimum number of 5 national journals and 10 international journals. The journals were accessed through the Google Scholar, Research Gate and Science Direct databases. The researchers further summarize the articles in accordance with the established criteria. Researchers looked for similarities, dissimilarities, and compared the journals regarding the characteristics of oral contraceptive users based on the duration of oral contraceptive use; age of marriage; parity; exposure to cigarette smoke, and the level of cervical cancer started from the normal cervix (non-cancer); precancerous lesions/atypia/dysplasia and cervical cancer, year of publication, population, sample,

variables, study design, study results and database. Furthermore, an analysis was carried out according to the inclusion criteria that had been set by the researchers using the exposition method, so that there was a suitability with the topic of "Correlation between Oral Contraceptive Use and Incidence of Cervical Cancer".

The keywords applied in searching national journals were oral contraceptives, birth control pills AND cervical cancer. Meanwhile, keywords in searching international journals are oral contraceptives, contraceptive pills AND cervical cancer.

RESULTS

Researchers found 15 journals from several databases that met the inclusion criteria for this literature study. All journals involved in this literature study used original research with several study designs. Most journals had a sample size of >100 respondents. National journals obtained by researchers were conducted in several sites such as Surakarta, Medan, Riau, Jakarta and Makassar. Meanwhile, international journals selected by researchers were conducted in Australia, Bangladesh, Egypt, Turkey, Ethiopia, the Netherlands, Denmark and Cameroon. Of all journals that met the inclusion criteria, there were 7 journals with the same objective as set by the researchers.

Table 1. Study Characteristics.

No	Study Design	n	(%)
1	Retrospective Cohort	5	33.3
2	Descriptive Qualitative	1	6.7
3	Cross sectional	3	20
4	Case control	6	40
	Total	15	100

No	Year	n	(%)
1	2018	3	20
2	2019	1	6.7
3	2020	7	46.7
4	2021	4	26.7
	Total	15	100

Based on table 1, the most widely used study design in both national and international journals was case control in 6 journals (40%). Regarding the year of journal publication, both national journals and international journals were most widely published in 2020 so that out

of the 15 journals obtained, 7 journals (46.7%) were published in 2020.

Table 2. Cervical Cancer Grades.

No	Cervical Cancer Grade		n	(%)
1	Normal Cervix		-	
2	Precancerous Lesion	CIN 1	1	6.7
		CIN 2/3	3	20
		Not explained	3	20
3	Cervical Cancer	Stage1	-	
		Stage 2/2+	2	13.3
		Not explained	7	46.7

Based on table 2 regarding the level of cervical cancer, as many as 1 journal (6.7%) stated that oral contraceptives could increase the risk of cervical precancerous lesion of CIN 1, 3 journals (20%) stated that oral contraceptives could increase the risk of cervical precancerous lesion of CIN 2/3, and 3 journals (20) %) did not describe the level of precancerous lesion. In addition, as many as 2 journals (13.3%) stated the grade of cervical cancer of stage 2/2+ and 7 journals (46.7%) did not state the grade of cervical cancer.

Table 3. Characteristics of Oral Contraceptive Users.

No	Characteristic of User		n	(%)
1	Length of Use of Oral Contraceptive	< 4 years	-	
		≥4 years	1	6.7
		<5 years	3	20
		≥5 years	11	73.3
2	Age of Marriage	<20 years	7	46.7
		≥ 20 years	-	
3	Parity	< 3	-	
		≥ 3	7	46.7
4	Cigarette Smoke Exposure	Exposed	4	26.7
		Not Exposed	2	13.3

Based on table 3 regarding, the characteristics of oral contraceptive users, the duration of oral contraceptive use of ≥5 years was stated in 11 national and international journals (73.3%). In addition, a total of 7 journals (46.7%) stated the age of marriage of <20 years, 7 other journals stated a parity of ≥3, and 4 journals (26.7%) stated that oral contraceptive users were exposed to cigarette smoke.

DISCUSSION

Characteristics of Oral Contraceptive Users as Risk Factors for Cervical Cancer. Cervical cancer is a type of cancer that often affects women started with the development of precancerous lesions on the cervix [14]. The dominant factor for cervical cancer is HPV (Human Papilloma Virus) infection, followed by other risk factors and the exact etiology of cervical cancer is unknown. Oral contraceptive use for a long time is considered a risk factor for cervical cancer among women.

A study conducted by Khatun et al. (2018) proved that the users of oral contraceptives for >5 years had a higher risk for developing cervical cancer than non-users. Each contraceptive method definitely has side effects for the body [15], Therefore, it is not recommended to use any type of contraception for a long time. In this study, the relative risk value of oral contraceptives did not explain the increased risk of cervical cancer. Based on WHO report, the use of oral contraceptives had a relative risk of 1.19 times higher than normal and would increase in line with the duration of use [15].

In a study conducted by Musfirah (2019), it was explained that by including combined oral contraceptives in the body, the levels of estrogen and progesterone hormones in the body will be higher. Progesterone in the body will make cervical mucus thicker which makes it difficult for sperm to enter through the cervix. This way of working makes women sensitive to HPV, causing inflammation of the genitalia and this can cause cervical cancer. The balance of estrogen in the body will be disrupted if a woman uses long-term hormonal contraception so that abnormal cells can develop rapidly [14].

Besides the duration of oral contraceptive use, the risk factors for increasing the incidence of cervical cancer can be determined from the age of marriage. A woman who who has been married before the age of 20 is considered at risk. A such age, cervical mucosal cells are still immature and sensitive with stimuli/foreign substances, including chemicals contained in sperm cells. If there is continuous stimulation, cervical mucous cells can develop into malignant cancer cells.

The similar finding was expressed in the study conducted by in Arfailasufandi et al. (2019), which showed that women who engaged in sexual activity at the age of <20 years had a 5.44 times higher risk of experiencing cervical cancer (OR=5.44, $p<0.001$)[16]. Likewise a study conducted by Santoso (2021), it was explained that of 43 mothers with cancer with the age of marriage of ≤20 years, a total of 29 people (67.4%) had cervical cancer. Meanwhile, out of 21 women with an age of marriage of >20 years, 8 (38.1%) had cervical[17].

Age of marriage of <20 years is also considered a trigger factor for cervical cancer. Marriage when the age is not ideal can have an adverse effect on both the mother and the baby. In addition, sexual intercourse when the anatomical cells are still immature can increase the chances of the development of cervical cancer. The age recommended by the BKKBN as the ideal age to marry is at least 21 years for women and at least 25 years for men.

The younger the age of marriage, the higher the parity. Parity is a woman's ability to give birth normally. Too frequent parity can lead to health problems for a woman. Reproductive health problems will increase along with high parity. This is also explained through the study conducted by Arfailasufandi et al. (2019) that women who had given birth to 3 or more children were 3.94 times more likely to experience cervical cancer[16]. Trauma associated with vaginal delivery can increase the likelihood of HPV infection[18].The baby passes through the cervix in normal delivery and allows a little damage to the cervical epithelial tissue so that it can cause abnormal cell changes[19]. This indicates that the risk of cervical cancer increases with the increasing number of children born. Repeated spontaneous births increase the risk of trauma to the birth canal and make it easier for HPV to infect the cervix.

In addition to the three factors mentioned above, high exposure to cigarette smoke is also associated with a higher risk of HPV infection. One of the risk factors that cause cervical intraepithelial neoplasia (CIN) is active smoking with one pack of cigarettes or more per day. Meanwhile, passive smokers with lifetime exposure of more than 20 packs of cigarettes per year had a 7.2 times higher risk of HPV infection (OR=7.2). Nicotine contained in cigarettes is suspected as an ingredient that activates carcinogenic agents. The nicotine in cigarettes will enter the cervical mucus and then stimulate cervical mucous cells by covering the cervix so that the immune system decreases and

further triggers the development of abnormal cells.

Healthcare workers can provide education to the public so that they consider the benefits or advantages of using oral contraceptives more than the risks. It must be clarified that cervical cancer is multifactorial (it can be caused by several risk factors). It is not only caused by one factor, one of which is the use of oral contraceptives. To minimize the prevalence of cervical cancer, healthcare workers should suggest women to replace the use of oral contraceptives if they have been using oral contraceptives for ≥ 5 years.

Cervical Cancer Grades. In a study conducted by Attya et al. (2020), 117 patients (86%) had negative results for intra-epithelial lesions, while 19 patients (14%) had positive results for intraepithelial lesions[20]. Ten of them (7.4%) were diagnosed with ASCUS, 5 (3.7%) were diagnosed with LSIL, 3 (2.2%) were diagnosed with HSIL and only 1 person (0.7%) was diagnosed with SCC. 10 people were in the atypia stage, which meant that there were changes in uterine cells which could be due to inflammation or a viral infection and a PAP smear examination must be repeated to diagnose whether these abnormal cells were the beginning of cervical cancer. The next diagnosis showed that 5 people were diagnosed with LSIL/CIN level 1, 3 people were diagnosed with HSIL (CIN 2/3) and 1 person was diagnosed with SCC or invasive cervical cancer.

The high-risk HPV infection was more common among COC users, and that COCs altered the susceptibility or immune response to HPV infection which would potentially improve the diagnosis of CIN 2+ after long-term use of COC. In a recent study conducted by Xu et al. (2018), COC use was shown to increase the risk of CIN II and III [7]. Results of a study conducted by Loopik et al. (2020) showed an increase in CIN III increases among COC users. CIN2 and CIN3 are the high-grade cancer precursors that are more likely to develop into invasive cancer.

Generally, only a small proportion of HPV infections develop into grade 2CIN after 3 years of invasion. A small proportion of grade 3 CIN can turn into invasive cervical cancer after 5 years of invasion and only a small proportion of grade 3 CIN can turn into invasive cancer after 30 years of invasion.

If a precancerous lesion turns into invasive cancer, the division of the grades is different from the precancerous lesions grades. The stages of cervical cancer are aligned with the classification of The International Federation of Gynecology and Obstetrics (FIGO), namely stage 0 which is called carcinoma in situ, stage 1 where the carcinoma develops in the cervical area only, stage 2 where tumor expands outside the uterus but do not affect pelvic wall or reach the lower 1/3 of the vagina, stage 3 where tumor expands to the pelvic wall or reaches the lower 1/3 of the vagina and stage 4 where tumor expands to the bladder or rectum mucosa and/or beyond the small pelvis[21].

Based on the FIGO classification, 22.8% of women were in stage IIIB followed by 18.4% in stage IVA at the time of diagnosis. In line with this, a study conducted by Zidi et al in Utomo et al. (2020) found that the use of oral contraceptives was 1.86 times more likely to increase the risk of suffering from stage III or IV cervical cancer[21].

Prevention efforts that can be made by healthcare workers are conducting counseling regarding risk factors, causes and preventive efforts of cervical cancer and also providing assistance to women, especially married women, to carry out early detection of cervical cancer on a regular basis through Acetic Acid Visual Inspection (IVA), pap smears or biopsies and colposcopy as necessary.

Correlation between Oral Contraceptives and the Incidence of Cervical Cancer. Oral contraceptives make women more sensitive to HPV and this may disrupt the balance of estrogen in the body. When persistent inflammation occurs in the genitalia due to estrogen imbalance caused by long-term use of oral contraceptives, normal cells will develop into abnormal ones[14]. Long-term use of oral contraceptives for more than 5 years is believed to increase a woman's risk of developing cervical cancer by 1.5-2.5 times. Natural hormone secretion in the body will be disturbed when oral contraceptives enter the body. The progesterone content in oral contraceptives will thicken cervical mucus, making it difficult for sperm to enter through the cervix[22].

Correlation between the use of oral contraceptives and the incidence of cervical cancer since oral contraceptives were believed to make the body experience a deficiency of folic acid, making it easier for mutagens to entry

and estrogen is thought to be one of the factors that accelerate HPV DNA duplication. The use of hormonal contraceptives including oral contraceptives could reduce levels of nutrients in the body (Vitamins C, B12, B6, B2, folic acid and zinc) which play a role in the immune system. It was reported that as many as 67% of cervical cancer patients had at least one abnormal vitamin level, while the other 33% experienced multiple abnormal nutrition levels.

According to Arfailasufandi et al. (2019), intraepithelial lesions that occur in oral contraceptive acceptors can be caused by HPV due to consumption of oral contraceptives[16]. The high-risk HPV infection was more common in COC users, and it was shown that COCs altered the susceptibility or immune response to HPV infection. Women with CIN3 and women with CIN2 who lost fertility function in Denmark were always treated with conisation to prevent the development of the lesions[23]. WHO does not recommend stopping the use of oral contraceptives even though several studies have mentioned oral contraceptives as a risk factor for cervical cancer because the effectiveness of their use is more beneficial than the risks.

The speed of development of cancer invasion is different from one case to another. Even though the tumor has spread to one organ, there is still a possibility that a patient has no symptoms. There are no definite symptoms in early stage cancer. The symptoms that often occur are characterized by quite a lot of vaginal discharge and sometimes accompanied by blood spots. Symptoms are increasingly evident as the cancer cells develop, such as bleeding that is more frequent, more volume and lasts a long time. Sometimes, vaginal mucus that smells bad is also found due to infection and tissue necrosis. If cervical cancer reaches an advanced stage, other symptoms may be found, such as pain in the hips or legs[24].

Cervical cancer certainly has an impact on the lives of patients and their families, and also affects the government's health budget because the government must provide adequate facilities for the treatment of cervical cancer patients. Counseling efforts to prevent and screen cervical cancer must be increased and considered by every authorized party. Cervical cancer screening is needed to recognize the symptoms that occur, to prevent it from progressing to an advanced stage and to treat it quickly and precisely. VIA examination is the program that has been introduced by the government as an effort to early detect cervical cancer. Such examination needs to be performed at least once every 3 years.

CONCLUSION

Based on the characteristics of oral contraceptive users, most of them had duration of oral contraceptive use of ≥5 years, age of marriage of <20 years, parity of ≥3, and exposure to cigarette smoke. The grade of precancerous lesions that might arise due to long-term use of oral contraceptives was CIN 2/3. If not treated immediately, precancerous lesions will develop into cervical cancer. The majority of women diagnosed with stage 2/2+ cervical cancer was due to lack of knowledge about cervical cancer screening. Oral contraceptives were correlated with cervical cancer based on the length of use of more than 5 years, the risk of CIN 2/3 among women. Furthermore, there were other factors that could affect the incidence of cervical cancer, namely age of marriage, parity and exposure to cigarette smoke. The study findings can be used as a reference for the public to encourage them to consult with healthcare workers before using contraceptives, especially oral contraceptives to reduce side effects that can be caused. Future researchers are recommended to evaluate the most risky factors of cervical cancer.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. Februanti S. Asuhan Keperawatan Pada Pasien Kanker Serviks: Terintegrasi Dengan Standar Diagnosis Keperawatan Indonesia (SDKI), Standar Luaran Keperawatan Indonesia (SLKI), Dan Standar Intervensi Keperawatan Indonesia (SIKI) PPNI. Deepublish; 2019.
2. Kementerian Kesehatan Republik Indonesia. Profil kesehatan Indonesia Tahun 2016. Jakarta: Kementerian Kesehatan Republik Indonesia, 2016.
3. Raidanti D, Wahidin. Efek Kb Suntik 3 Bulan (DMPA) Terhadap Berat Badan. Literasi Nusantara; 2021.
4. Putra ON, Faizah AK, Sari AK. Analysis Of Factors Related To Knowledge Of Oral Contraceptives At

Several Pharmacies In East Surabaya. 2021;12(1):11.

5. Hartanto H. Keluarga Berencana dan Kontrasepsi. In Pustaka Sinar Harapan; 2015.

6. Sulistiya DP, Pramono D, Nurdiati D. Faktor-faktor yang Berhubungan dengan Kejadian Kanker Serviks di Rumah Sakit Sardjito Yogyakarta. BKM. 2017;33(3):125–30.

7. Kusmiyati Y, Prasistyami A, Wahyuningsih HP, Widyasih H, Adnani QES. Duration of Hormonal Contraception and Risk of Cervical Cancer. Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal) [Internet]. 2019 Aug 1 [cited 2022 May 19];14(1). Available from: https://www.journal.fkm.ui.ac.id/kesmas/article/view/2713

8. Xu H, Egger S, Velentzis LS, O'Connell DL, Banks E, Brown JD, et al. Hormonal contraceptive use and smoking as risk factors for high-grade cervical intraepithelial neoplasia in unvaccinated women aged 30–44 years: A case-control study in New South Wales, Australia - ScienceDirect [Internet]. 2018 [cited 2022 May 19]. Available from: https://www.sciencedirect.com/science/article/abs/pii/S1877782118302339

9. Saleem A, Bekele A, Fitzpatrick MB, Mahmoud EA, Lin AW, Velasco HE, et al. Knowledge And Awareness Of Cervical Cancer In South Western Ethiopia Is Lacking: A Descriptive Analysis. Plos One. 2019;14(11).

10. Department of Cytology & Gynaecological Pathology, Postgraduate Institute of Medical Education. Guidelines for Cervical Cancer Screening Programme. Chandigarh, India; 2018.

11. Darusman LK, Irmanida. Domestikasi Buah Merah. PT Penerbit IPB Press; 2019. 92 p.

12. Iversen L, Fielding S, Lidegaard O, Hannaford PC. Contemporary Hormonal Contraception And Cervical Cancer In Women Of Reproductive Age - Iversen - 2021 - International Journal of Cancer. 2021;149(4).

13. Dewi IGAAN, Sawitri AAS, Mahayati NMD, Lindayani IKL. Faktor Risiko Lesi Prakanker Leher Rahim (Serviks). Penerbit Qiara Media; 2021. 63 p.

14. Musfirah M. Faktor Risiko Kejadian Kanker Serviks Di RSUP Dr. Wahidin Sudirohusodo Makassar. jkesmas. 2019 Jun 14;4(1):1.

15. Khatun SF, Khatun S, Hossain AKMF, Nahar K. Prolonged Use Of Oral Contraceptive Pill, A Co-Factor For The Development Of Cervical Cancer. Bangabandhu Sheikh Mujib Medical Univ J. 2018 Sep 1;11(3):222.

16. Arfailasufandi R, Mudigdo A, Faculty of Medicine, Universitas Sebelas Maret, Sudiyanto A, Faculty of Medicine, Universitas Sebelas Maret. The Effect of Obesity, Oral Contraceptive and Passive Smoking on the Risk of Cervical Cancer. J EPIDEMIOL PUBLIC HEALT. 2019;4(3):189–97.

17. Getinet M, Taye M, Ayinalem A, Gitie M. Precancerous Lesions of the Cervix and Associated Factors among Women of East Gojjam, Northwest Ethiopia, 2020. Cancer Manag Res. 2021 Dec 29;13:9401–10.

18. Santoso EB. Hubungan Usia Pertama Menikah Dengan Kejadian Kanker Serviks Di Poli Kandungan RSUD X. 2021;

19. Mawaddah S, Susanti ID. View of Hubungan Paritas,Usia Perkawinan Dengan Resiko Lesi Prakanker Serviks Pada Pasangan Usia Subur Di Kelurahan Petuk Bukit [Internet]. 2020 [cited 2022 Mar 7]. Available from: http://www.ejournalbidan.poltekkes-kaltim.ac.id/ojs/index.php/midwifery/article/view/136/87

20. Attya AM, Ali AE, AbdelSalam HS, Abdelwahab MM. Frequency of Cervical Intra-epithelial Neoplasia in Oral Contraceptive Pills Users in Zagazig University Hospitals. Zagazig University Medical Journal. 2020 Jul 1;26(4):590-7.

21. Utomo F, Afandi A, Rivai SB. Korelasi Durasi Penggunaan Kontrasepsi Oral Dan Stadium Kanker Serviks Di Rsud Arifin Achmad Provinsi Riau. Collaborative Medical Journal (CMJ). 2020 Jan 21;3(1):24–31.

22. Mustikarani IK. Hubungan Lama

Penggunaan Alat Kontrasepsi Oral (Pil Kb) Dan Intrauterine Device (Iud) Terhadap Resiko Kanker Serviks Di Puskesmas Ngoresan Surakarta. Jurnal Keperawatan Malang. 2020 Dec 30;5(2):72–9.

23. Skorstengaard M, Lynge E, Napolitano G, Blaakær J, Bor P. Risk Of Precancerous Cervical Lesions In Women Using A Hormone-Containing Intrauterine Device And Other Contraceptives: A Register-Based Cohort Study From Denmark. Human Reproduction. 2021 Jun 18;36(7):1796–807.

24. Idris IM, Angka RN, Christina S, Sumbayak EM. Aktivitas Seksual Usia Dini dan Paritas Tinggi Meningkatkan Risiko Kanker Serviks. Jurnal Kedokteran Meditek. 2021 Sep 30;27(3):306–16.

Article Review

Literature Review: Environmental Risk Factors of Leptospirosis in Indonesia

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ABSTRACT

Leptospirosis is a zoonotic disease which becomes a health problem in several regions in Indonesia. In 2020, there were 1,170 cases of Leptospirosis with a CFR of 9.1% spread across 8 Provinces. This study aims to determine the environmental factors that influence the incidence of leptospirosis in Indonesia. The method applied here was literature review through the Google Scholar, Pubmed and GARUDA databases which examined the environmental factors of leptospirosis in Indonesia. This was a case control study with cross sectional design with a range of published journal publications from 2016–2022. The number of samples in this study were 11 articles. The results of the study indicated that there were several environmental risk factors for the incidence of leptospirosis in Indonesia, namely the presence of standing water around the house, the poor maintained condition of ditches, the existence of trash bins that did not meet the requirements, the distance between the house and the open drain and the presence of rats inside and outside the house, and 7 articles found the presence of rats as the most dominant influential factor. Communities in leptospirosis endemic areas are expected to be more concerned with the condition of the surrounding environment and always maintain the cleanliness of their houses to prevent rats breeding as a medium for the spread of leptospirosis.

Keywords : Risk Factor, Environmental Factor, Leptospirosis.

INTRODUCTION

Leptospirosis is a zoonotic disease which becomes a health problem in several regions in Indonesia[1]. This disease is caused by a spiral-shaped pathogenic leptospira bacterium which is transmitted directly and indirectly from animals to humans[2]. Leptospirosis in Indonesia is spread by rats which release the bacteria through urine into the environment. Humans are infected through injured skin or mucous membranes[3]. Mild leptospirosis is estimated to account for 90% of all cases of leptospirosis in the community with symptoms of fever, headache and muscle aches (myalgia). The remaining 10% are severe leptospirosis accompanied by symptoms of kidney failure, jaundice and bleeding[1,] and also a high fever, calve muscle aches and brown urine[4,5].

In 2020, the Ministry of Health reported 1,170 cases of Leptospirosis with 106 deaths (CFR of 9.1%) spread across 8 Provinces. Provinces that reported leptospirosis were DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, Maluku, South Sulawesi and North Kalimantan[6]. Furthermore, in 2021, there was a decrease in cases of 734 cases, but an increase in the CFR of 11.4% with the largest contributors of Central Java and East Java Provinces[7].

The influential factors of the occurrence of a disease are the host, agent, and environment. In addition to the high population of rats (rodents), the transmission of leptospirosis is also influenced by the quality of the physical environment, such as untreated ditches, lots of standing water, flood-prone and areas, slums and unmanaged surrounding garbage[1].

Prevention of leptospirosis cases can be

performed by knowing and controlling potential environmental risk factors so that leptospirosis risk factors to reduce the high case fatality rate/CFR and the number of cases (morbidity rate) so as to improve the community health status. This study aims to determine the environmental risk factors that may influence the incidence of leptospirosis in Indonesia.

METHOD

The method applied here was literature review through Google Scholar, Pubmed and GARUDA darabases which examined the environmental factors of leptospirosis in Indonesia. This was a case control study with cross sectional design with a range of published journal publications from 2016–2022 to obtain the latest information and relevant contents of the articles as well as the empirical data which indicated environmental risk factors od leptospirosis in Indonesia. The data sources were scientific publication journals searched by using the keywords of leptospirosis, risk factors for leptospirosis and environmental factors for leptospirosis.

Article selection began with article skimming followed by reviewing the abstract that was considered appropriate to the topic under study. There were 72 articles obtained. Furthermore, screening was carried out according to the inclusion criteria and there were 11 articles that met the predetermined criteria and study variables.
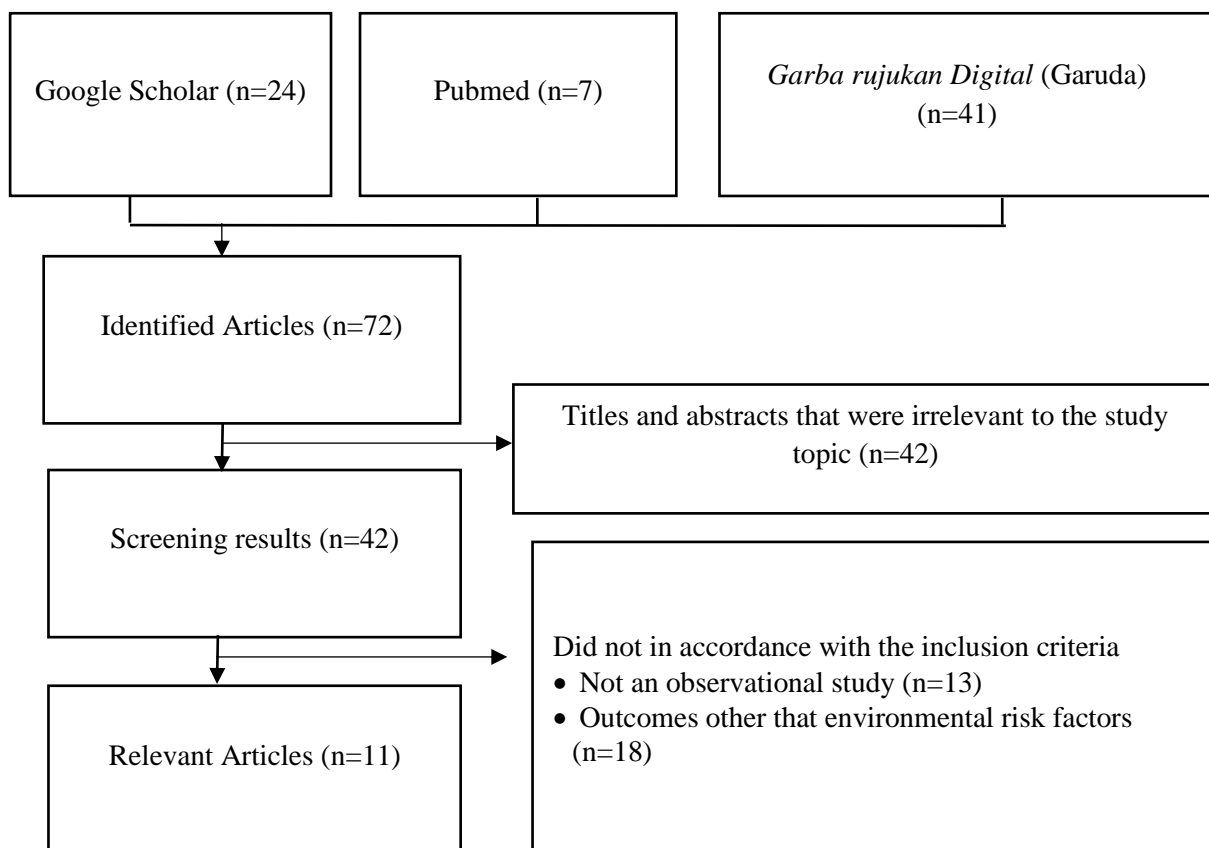
Figure 1. Article Selection Flowchart

RESULTS

A summary of the results of previous studies on environmental risk factors for the incidence of leptospirosis in Indonesia is described in table 1. The risk factor included the presence of standing water, the condition of the ditches, the presence of rats, the presence of pets, flooded areas, the presence of garbage, the distance between the house and open drain, housing condition and poor physical condition of the house.

Table 1. Variables and Results of Previous Studies related to Environmental Risk Factors for Leptospirosis in Indonesia.

Writer	Design	Variable	Findings
Nurulia Unggul P.R, Budiyono, Nurjazuli 2016[8]	Case control	The presence of rats, condition of the ditches and the presence of standing water.	The results showed that there was a relationship between the presence of standing water (OR=3.273 95% CI=1.008 to 10.621) as the risk factor for leptospirosis in the city of Semarang.
Ghinaa Maniiah, Mursid Raharjo, Nikie Astori na 2016[9]	Case control	The presence of standing water, condition of ditches, the presence of rats and pet ownership, activity in water.	Bivariate analysis showed a relationship between standing water (p=0.040, OR=3.385), ditch condition (p=0.014, OR=4.875), and the presence of rats (p=0.002, OR=1.705) with the level of leptospira bacteria. Laboratory results showed that among 62 water samples examined, 38 (61.29%) was positive for leptospira bacteria content, most of which came from bathing water.
Novie Ariani, Tri Yunus Miko Wahyono 2020[10]	Cross sectional	The presence of rats in the house, pets, livestock pets and floods in the last 2 weeks.	The results of the study showed that the influential factors for the incidence of leptospirosis in 2 districts wherein sentinel leptospirosis surveillance was conducted in Banten Province in 2017 – 2019 were the presence of rats (POR 4.08 95% CI: 1.738 – 9.566) and the presence of pets (POR 2.24 95% CI: 1.418 –5,827)
Hajar Camelia Dewi, Ririh Yudhastuti 2019[11]	Case control	The presence of standing water, condition of ditch, history of floods and the presence of vegetation.	There was a relationship between the presence of standing water (p=0.001 and OR=22) and the condition of ditch (p=0.053 and OR=0.2050).
Patria Sari Dewi, Setyo Sri Rahardjo, Bisma Murti 2020[12]	Case control	The physical condition of the house, environmental condition, settlements, the presence of rats, the presence of cows, areas bordering rivers, flooded areas.	The risk of leptospirosis directly increased in the presence of rats (b=7.34; 95% CI= 4.44 to 10.24; p <0.001), and in flooded areas (b=8.99; 95% CI= 5.02 to 12, 96; p<0.001). The risk of leptospirosis is indirectly influenced by the presence of rats, the presence of livestock, flooded areas, as well as housing condition and poor physical condition of the house.
Arief Nugroho, Wiwik Trapsilowati, Bernadus Yuliadi, Siska Indriyani 2018[13]	Cross sectional	Vegetation around the house and the presence of rats.	Statistically, there was no relationship between vegetation and the presence of rats with the incidence of leptospirosis. However, the trap success finding (9.37% outside the home and 18.65% inside the home) at the study site could be be a potential risk of leptospirosis.

Writer	Design	Variable	Findings
Beby Prima Amaliyah, Syamsuar, Erniwati Ibrahim 2018[14]	Cross sectional	Flood, the existence of trash bins, the condition of the ditches/SPAL and the presence of rats inside/outside the house.	The description of environmental factors in the study area showed that 100% of respondents experienced flooding around the respondent's house every year, 30% had garbage scattered around/inside the house, 70.6% had ditches with unsmooth flow, and 78.3% of respondents said that there were rats in or around their houses.
Marek Samekto, Suharyo Hadisaputro, Mateus Sakundarno Adi, Suhartono, Bagoes Widjanarko 2019[15]	Case control	The presence of standing water around the house, the presence of garbage near the house, characteristics of the permeability of the house, condition of the ditches, the presence of rats,	Variables that influenced the incidence of leptospirosis were impermeable house to rats (OR=3.14; 95% CI=1.16 – 8.47), and the presence of rats in and around the house (OR=3.66; 95% CI=1.67 – 12.28)..
Maya Sofiyani, Ruben Dharmawan, Bhisma Murti 2018[16]	Case control	Residential environmental condition, house condition, the presence of rats/livestock, and history of rain/floods.	The results showed that there were relationships between the physical condition of the house (b= -1.92; 95% CI= -3.08 to -0.77; p=0.001), the condition of the residential environment (b= -2.35; 95% CI= -3.48 to -1.23; p<0.001) and the presence of rats/livestock (b= -1.41; 95% CI= -2.15 to -0.67; p<0.001) with the incidence of leptospirosis.
Defryana Rakebsa, Citra Indriani, Widagdo Sri Nugroho 2018[17]	Case control	The distance between the house and the open drain, the piles of garbage in the house, the presence of livestock and the presence of rats in the house.	Multivariate analysis showed that the distance between the house and the open drain (OR: 2.96, 95% CI; 1.22 – 7.14) and the presence of garbage in the house (OR: 2.03, 95% CI: 1.14 – 3 , 62) were associated with the incidence of leptospirosis.
Ragil Andriani, Dyah Mahendrasari Sukendra 2020[18]	Cross sectional	The distance between the house and the ditch, the presence of ponds, the presence of garbage around the house and the presence of standing water.	The results showed that the distance between the house and the ditch (p=0.0007) and the presence of standing water (p=0.0004) were associated with the incidence of leptospirosis.

DISCUSSION

The Presence of Standing Water

The presence of standing water can result in the incidence of leptospirosis. This is due to contamination through the urine of infected animals. So, if the standing water is not contaminated by the urine of rats infected with leptospira bacteria, then it may not cause leptospirosis[2]. A previous study conducted in the city of Semarang showed that people who had standing water around the house had 3.273 times higher risk of contracting leptospirosis compared to respondents who did not have standing water around the house[8]. This was reinforced by the presence of leptospirosis bacteria in 38 positive water samples or around 61.29% taken from the houses of case and control respondents[9].

A study conducted in the Gresik District area showed that 12 respondents in the case group (80%) and 3 respondents in the control group (20%) had standing water around the house. Therefore, those respondents would have 22 times higher risk of getting leptospirosis than those who had no standing water[11]. In another study located in the work area of Bonang Community Health Center, which was an endemic area, there was a significant relationship between the presence of standing water and the incidence of leptospirosis (p=0.004, RP=2.857)[18]. The presence of standing water around the house can be a source of indirect transmission of Leptospirosis bacteria if the water is contaminated with infected animal urine[19].

The presence of standing water is one of the factors that supports the transmission of leptospirosis, especially in Indonesia. This is supported because the country of Indonesia is a tropical country with moderate temperature and climate and the pH level of the water and soil is in a neutral condition. Such condition allows the leptospira bacteria to survive and live in standing water that has been contaminated with rat urine[20].

Indonesian people often walk outside their homes without using footwear in their daily lives. And those like crossing standing water will be more likely to be exposed to leptospirosis[21].

Condition of Ditch

The good and poor conditions of a ditch can be seen from the construction and the condition of the water flow in the ditch. Such condition will certainly put the community at risk if the tidal water which is contaminated with leptospirosis bacteria[9]. A good ditch refers to a ditch with closed and smooth flow of water with no rats that can enter and leave the house[22]. Based on the results of a study conducted in the city of Semarang, there was a relationship between the condition of ditch and the incidence of leptospirosis with p=0.014 (<0.05) and OR=4.875. Such finding indicated that respondents who had poor ditch condition had 4.875 times higher risk than respondents who had good ditch condition[9].

Similar finding was also revealed in a study conducted in the Work Area of Tempe CHC in Wajo District, that most of residents had ditches but the existing ditches did not meet the criteria. Garbage was found 35.3% of

ditches, 70.6% of ditches had unsmooth water flow, and rats were found in 15.7% of ditches around the respondent's houses[14].

The results of another study conducted in the Gresik District area showed that there was a relationship between the condition of ditch and the incidence of leptospirosis with p=0.053 and OR=0.025. Based on the results of field observations in both the case group and the control group, most of the respondents' ditches were open, clogged and the distance from the house was <2 meters. Such condition was due to the houses were close one another and the position of the ditch was higher than the house, so that when it rains, the water in the ditch overflowed and flooded the surrounding houses [11].

The poor condition of the ditches with the presence of puddles allows leptospira bacteria to grow and develop due to the presence of water contaminated with rat urine. People who clean ditches without wearing footwear will certainly be more likely to be exposed to leptospirosis, especially if they have uncovered wounds.

The Presence of Trash Can

Trash cans are one of the places that rats like because they are a source of food for rats, especially open and non-watertight trash cans. However, if the trash can is tightly closed and watertight, then rats cannot enter and look for food in it, so that the house and the environment will be free from the presence of rats[23].

A previous study conducted in the Work Area of the Tempe CHC in Wajo District showed that in addition to the presence of trash bins, the type of trash can also influenced the incidence of leptospirosis[14]. The existence of piles of garbage from food scraps placed in open trash cans would also provide an opportunity to invite the presence of rats in the house[17].

Uncovered trash can is a source of food for rats to survive, so that rat breeding will increase to continue to live and develop.

Distance between the House and Open Drain

The distance between the house and open drain is one of the environmental risk factors for the incidence of leptospirosis. This is supported by the presence of rats as a reservoir for leptospira bacteria, so they have the opportunity to move a wide range of 200 meters in search of food. However, if it is difficult to

get food, rats can move even further, namely 700 meters to 1000 meters to get food[24]. A study conducted in the work area of the Bonang I CHC showed that respondents who had a distance from their house to a ditch by ≤ 700 meters had 2,690 times higher risk of experiencing leptospirosis than respondents who had a distance from their house to a ditch by >700 meters[18]. This is also supported by a study conducted in Yogyakarta City and Bantul District which found that distance between the house and open drain had a significant relationship with the incidence of leptospirosis (OR=2.96 95% CI=1.22 – 7.14)[17]. The distance between the house and open drain lead to a higher potential presence of rats so that rat urine can be spread more widely.

The Presence of Rats

Based on the 11 articles reviewed, there were 7 articles which stated that the presence of rats was proven to be significantly associated with the incidence of leptospirosis. A study conducted in the city of Semarang showed that respondents who had rats in the house were 6.234 times more likely to be exposed to leptospirosis than respondents who did not have rats in the house[9]. Another study conducted in Tangerang District showed that trap success inside the house was 18.65% and outside the house was 9.37%. Poor maintained environmental and sanitation conditions and unsmooth flow of sewage water were the supporting factor for rats to breed and nest so that they were related to high trap success[13].

The presence of rats around the house was also influenced by the dense and dirty environmental conditions and distance to rivers and rice fields as breeding grounds for rats[14]. This was also reinforced by the result of a study conducted in Klaten District, thatthe presence of rats was found to increase the risk of leptospirosis through unfavorable living condition and housing condition that did not meet the requirements[16].

A similar study was also conducted in Pati District which showed that the presence of rats in and around the house led to 4.51 times higher risk than the absence of rats inside or outside the house for the incidence of leptospirosis[15]. A study conducted in 2 sentinel surveillance districts, namely Tangerang District and Serang District, also showed that the presence of rats was the most dominant risk factor for leptospirosis (p=0.001 OR=4.08 95%

CI=1.738-9.566)[10].

The presence of rats inside and outside the house can be seen from rat droppings, rat footprints, rat bite marks and rat nests and excavations [12]. Leptospirosis in Indonesia is primarily spread by rats which release the bacteria via urine into the environment. Reservoirs that are resistant to infection with leprospira bacteria are the brown rat (*R.norvegicus*) and the garden/field rat (*R.exulans*) which can be a source of infection to humans and animals. Meanwhile, rats that are sensitive to infection with leptospira bacteria are Asian house rats (*R.tanezumi*) and brown rats (*R.norvegiccus*)[1].

In everyday life, rat control can be carried out using non-chemical method by using traps and chemical method by using poisoned bait[25].

CONCLUSION

Based on the 11 articles reviewed, it was revealed several environmental risk factors for the incidence of leptospirosis in Indonesia, namely the presence of standing water around the house, the poor maintained condition of the ditches, the existence of trash bins that did not meet the requirements, the distance between the house and open drain and the presence of rats inside and outside the house, and 7 articles found the presence of rats as the most dominant influential factor. Communities in leptospirosis endemic areas are expected to be more concerned with the condition of the surrounding environment and always maintain the cleanliness of their houses to prevent rats breeding as a medium for the spread of leptospirosis. In addition, there should be collaboration by all parties, both from the government sectorprivate sector, religious leaders and all levels of society to commit to leptospirosis prevention in Indonesia.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCE

1. Kementerian Kesehatan Republik Indonesia. Petunjuk Teknis Pengendalian Leptospirosis. Direktorat Jenderal Pencegah dan Pengendali Penyakit. 2017;
2. WHO. Human Leptospirosis: Guidance

for Diagnosis, Surveilance and Control. WHO, 2003.

3. Masriadi. Epidemiologi Penyakit Menular [Internet]. Depok: Rajawali Pers; 2017. 95 p. Available from: https://www.google.co.id/books/edition/Epidemiologi_Penyakit_Menular_Rajawali_P/D-gdEAAAQBAJ?hl=id&gbpv=1

4. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonsesia Nomor 1501/MENKES/PER/X/2010. Jenis Penyakit Menular Tertentu yang Dapat Menimbulkan Wabah dan Upaya Penanggulangan [Internet]. 2010;1–30. Available from: https://infeksiemerging.kemkes.go.id/download/PERMENKES_1501_2010_JENIS_PENYAKIT_MENULAR_POTENSIAL_WABAH_DAN_UPAYA_PENANGGULANGAN.pdf

5. Chin J, Editor MPH. Manual Menular. Man Pemberantasan Penyakit Menular [Internet]. 2006;666. Available from: http://nyomankandun.tripod.com/sitebuildercontent/sitebuilderfiles/manual_p2m.pdf

6. Kemenkes RI. Profil Kesehatan Indonesia Tahun 2020. Kementerian Kesehatan Republik Indonesia, 2021.

7. Kemenkes RI. Profil Kesehatan Indonesia Tahun 2021. Kementerian Kesehatan Republik Indonesia, 2022.

8. Ragil NU, Budiyono B, Nurjazuli N. Faktor Lingkungan dan Perilaku Kejadian Leptospirosis di Kota Semarang. Jurnal Kesehatan Masyarakat. 2016 Mar 2;4(1):407-16.

9. Maniiah G, Raharjo M, Astorina N. Faktor Lingkungan Yang Berhubungan Dengan Kejadian Leptospirosis Di Kota Semarang. J Kesehat Masy. 2016;4(3):792–9.

10. Ariani N, Yunis T, Wahyono M. Faktor – Faktor yang Mempengaruhi Kejadian Leptospirosis di 2 Kabupaten Lokasi Surveilans Sentinel Leptospirosis Provinsi Banten tahun 2017 – 2019. J Epidemiogi Kesehat Indones. 2020;

11. Dewi Hajar Camelia, Yudhastuti Ririh. Faktor Risiko Kejadian Leptospirosis di Wilayah Kabupate Gresik (tahun 2017-2018). J Keperawatan Muhammadiyah. 2019;8(1):51.

12. Dewi PS, Rahardjo SS, Murti B. Analysis of Environmental Risk Factors on the Leptospirosis Disease in Klaten, Central Java, Indonesia. J Epidemiol Public Heal. 2020;5(2):158–67.

13. Nugroho A, Trapsilowati W, Yuliadi B, Indriyani S. Faktor Lingkungan Biotik Dalam Kejadian Luar Biasa Leptospirosis Di Kabupaten Tangerang, Banten, Indonesia. Vektora J Vektor dan Reserv Penyakit. 2018;10(2):91–6.

14. Amaliyah BP, Syamsuar, Ibrahim E. Gambaran Faktor Lingkungan Suspek Leptospirosis di Wilayah Kerja Puskesmas Tempe Kabupaten Wajo. 2018;11.

15. Samekto M, Hadisaputro S, Adi MS, Suhartono S, Widjanarko B. Faktor-Faktor yang Berpengaruh terhadap Kejadian Leptospirosis (Studi Kasus Kontrol di Kabupaten Pati). J Epidemiol Kesehat Komunitas. 2019;4(1):27.

16. Sofiyani M, Dharmawan R, Murti B. Risk Factors of Leptospirosis in Klaten, Central Java. J Epidemiol Public Heal. 2018;03(01):11–24.

17. Rakebsa D, Indriani C, Sri Nugroho W. Epidemiologi leptospirosis di Yogyakarta dan Bantul. Ber Kedokt Masy. 2018;34(4):153–8.

18. Andriani R, Sukendra DM. Faktor Lingkungan dan Perilaku Pencegahan dengan Kejadian Leptospirosis di Daerah Endemis. Higeia J Public Heal Res Dev. 2020;4(3):471–82.

19. Pertiwi SMB, Setiani O, Nurjazuli N. Faktor Lingkungan Yang Berkaitan Dengan Kejadian Leptospirosis di Kabupaten Pati Jawa Tengah. J Kesehat Lingkung Indones [Internet]. 2014 [cited 2022 Mar 3];13(2):51–7. Available from: https://ejournal.undip.ac.id/index.php/jkli/article/view/10026

20. Djunaidi D. Kapita Selekta Penyakit Infeksi. Malang: Universitas Muhammadiyah Malang; 2007.

21. Rusmini. Bahaya Leptospirosis. 1st ed. Handayani S, editor. Yogyakarta: Gosyen Publishing; 2011.

22. Nursitasari HA. The Analysis of Residents' Behavior, The Condition of Ratproofing Houses and Their Effects on the Incidence of Leptospirosis Cases in Ponorogo Regency. J Kesehat

Lingkung. 2019;11(3):198.

23. Sulistiyawatin IA, Siyam N. Faktor Lingkungan dan Peran Pengendalian Puskesmas terhadap Praktik. HIGIA J PUBLIC Heal Res Dev. 2020;4(Special 3):561–73.

24. Ludfi S. Pengantar Rodentologi Kesehatan Masyarakat. Bagian Epidemiol dan Penyakit Trop Fak Kesehat Masy Univ Diponegoro. 2009;

25. Direktorat Jenderal Pengenalian Penyakit dan Penyehatan Lingkungan KR. Pedoman Pengendalian Tikus dan Mencit. Jakarta; 2015. 54.

Article Review

The Use of Smartphone for Bipolar Disorder Patients: A Systematic Review

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ABSTRACT

Bipolar is a mood disorder characterized by extreme swings between feelings of happiness and sadness. Based on WHO data, around 60 million people experience bipolar disorder. Bipolar disorder causes functional, psychosocial functioning, quality of life impairments and even the risk of suicide. The large number of smartphone users and the increasing computing power of mobile devices can be used as a reference in using smartphones for bipolar disorder. This systematic review aims to determine the use of smartphones for patients with bipolar disorder. The systematic review method was applied to search articles in electronic databases such as PubMed, Science Direct, and SpringerLink published in 2017-2021. The keywords used in the search were "smartphone", "bipolar disorder" using the Boolean "AND". Articles reviewed were those which met several inclusion criteria such as relevant to the study objective, written in English, not an article review, and free full text. An analysis towards 16 relevant articles found that the use of smartphones for patients with bipolar disorder was intended to measure and monitor signs and symptoms, as a medium for psychotherapy, and to increase adherence to medication. This can be a reference for healthcare workers in carrying out monitoring and management programs for bipolar disorder.

Keywords : Smartphone, Bipolar, Mental Disorder.

INTRODUCTION

Bipolar disorder is a mood disorder characterized by extreme swings between feelings of happiness and sadness. Because of these changes, bipolar disorder is also called manic-depressive, in which the patient suffers from periods of depression but also suffers from periods of mania (excitement or irritability, excessive energy, lack of sleep, fast speech, feeling very up, poor judgment and impulsivity)[1].

Bipolar disorder occurs in many countries in the world. Based on the WHO report, there are around 60 million people affected by bipolar disorder[2]. Individuals with bipolar show symptoms of mania, where they behave impulsively, feel invincible and often engage in risky activities such as suicide[3]. In addition, neurocognitive dysfunction and depressive symptoms in bipolar disorder can lead to functional impairment[4,5]. In addition to functional impairment, bipolar disorder also have a serious impact on psychosocial functioning and quality of life[6,7]. Therefore, innovations are required in the management of such disorder.

The rapid development of technology is also followed by technological developments in the health sector, one of which is regarding mental health. Various technologies such as smartphones have been successfully adopted in the context of mental health[8]. There is a rapid growth of Smartphone users in Indonesia. Based on data derived from the Ministry of Communication and Information, 89% of Indonesia's population uses smartphones[9].

There are sensors embedded in

smartphones so that they can collect a large amount of objective information to identify behavioral patterns of symptoms as well as physiological signs. Such advantage leads to the potential to provide new insights about mental disorders [10]. In addition, there are means to collect various sensor data on smartphones, so as to be able to capture disease-related behavioral information[11].

The large number of smartphone users and the increasing computing power of mobile devices can be used as a reference in using smartphones for the mental health sector, especially for bipolar disorder. This systematic review aims to determine the use of smartphones for patients with bipolar disorder.

METHOD

This article writing applied literature review method through electronic searches on several databases such as PubMed, Science Direct, and SpringerLink which were published in 2017-2021. The keywords used in the search

were "smartphone", "bipolar disorder" using the booleand "AND". The keywords used in the search were "smartphone", "bipolar disorder" using the Boolean "AND". Articles reviewed were those which met several inclusion criteria such as relevant to the study objective, written in English, not an article review, and free full text.

Article identification was performed using the PRISMA guidelines with the following steps: (1) determined the research topics to be reviewed, (2) determined research questions, (3) determined keywords for the article search process, (4) searched for articles with predefined keywords in the selected databases, (5) identified multiple articles from the databases, (6) screened relevant articles based on titles and abstracts, (7) screened full text articles using inclusion criteria (8) determined the articles to be analyzed. Figure 1 presents the search flowchart.
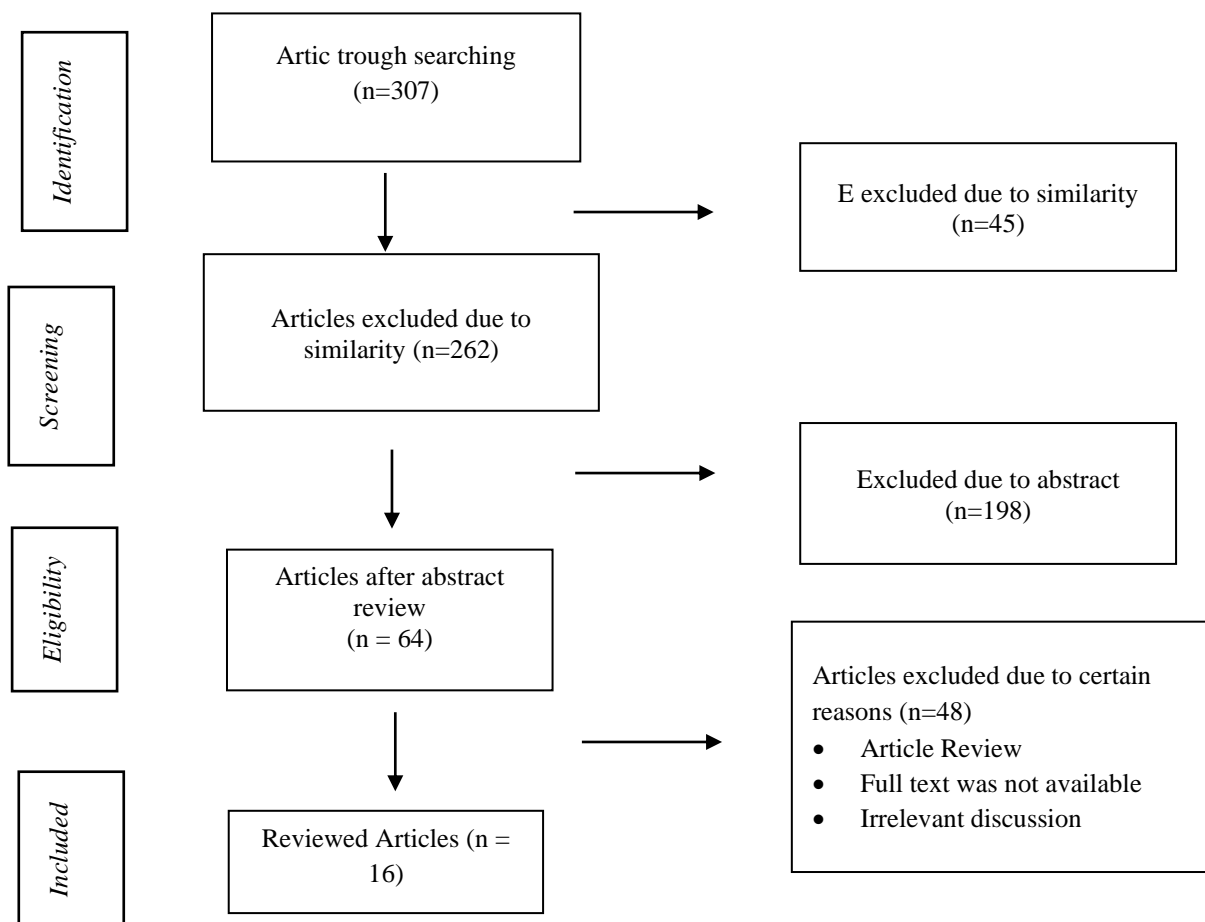

Figure 1. Article Search Flowchart

RESULTS

The database search results obtained 307 articles which were further selected. The selection results obtained 16 relevant articles for further analysis. The results of the analysis are described in table 1.

Table 1. Reviewed Articles

Writer/Year	Study Objective	Study Design/Samples	Findings
Anand et al, (2019)[12]	To determine smartphone-based daily and weekly mood assessment, especially among patients who took antidepressants.	Periodic mood monitoring study where respondents could record their mood daily or weekly using a smartphone application (n = 40).	Mood assessment using a smartphone could show mood instability in bipolar disorder.
Gideon et al, (2019)[13]	To determine the mood based on an anomaly detection framework called "TemNorm".	Longitudinal study on 51 types of bipolar disorder I and II using the PRIORI dataset which is a collection of natural conversations on smartphones.	TempNorm could detect ongoing mood disorder ratings.
Maurin et al, (2020)[14]	To determine the difference in the level of adherence between patients who used BIPOLIFE® game and patients with regular treatment.	RCT by comparing the use of BIPOLIFE® game (n = 20) vs. rgular treatment (n = 21).	The level of adherence of patients who used BIPOLIFE® was higher than that of patients who got regular treatment.
Fellendorf et al, (2019)[15]	To sssess the validity of the "UP!" to detect mood fluctuations and episodes of illness compared to clinical psychiatric interviews, validated questionnaires, and fitness trackers, and to evaluate user acceptance of the app.	Development of "UP!" app for Android smartphones, by collecting daily and continuous mood data on movement, exercise, sleep duration, and digital communication intensity via GPS and sensors among individuals with bipolar (n=24) and control (n=24) of healthy individuals without mental impairment.	Behavior pattern recognition via smartphones could provide innovative technological toos for the early detection of episodes of bipolar disorder.
Dargel et al, (2020)[16]	To determine the difference between mood data that were clinically assessed and mood/behavior data collected automatically using the "Toi Même" application among patients with bipolar disorder and to assess the feasibility of the application.	An open-label, nonrandomized trial among 93 respondents (31 depressive, 31 euthymic, and 31 hypomanic) diagnosed with type I/II bipolar disorder.	The Toi Même app could assess Bipolar Disease Activity.
Mühlbauer et al, (2018)[17]	To assess the effectiveness of smartphone-based feedback loops for detecting signs of affective episodes in bipolar disorder.	Randomized controlled single-blind trial (n=120).	Smartphone-based feedback loops could detect signs of an affective episode.
Carr et al, (2020)[18]	To predict depression levels using acceleration data recorded from smartphones among individuals with bipolar disorder.	Collected acceleration data corresponding to depression scores among 52 participants over 37 weeks	Features derived from smartphone accelerometers could provide objective signs of depression

Ryan et al, (2020)[19]	To assess the feasibility and usefulness of smartphones for viewing daily fluctuations in mood in bipolar disorder.	26 individuals with bipolar disorder and 12 individuals as controls were given a smartphone with a specially made application to complete questions about mood for 28 days. The app automatically and secretly collected phone usage data.	Compliance levels and positive experiences were reported when completing mood questions using a smartphone
Faurhot-Jepsen et al, (2021)[20]	To investigate voice features collected during phone calls as a marker of affective states in bipolar disorder by combining voice features and smartphone data about auto-generated behavioral activity.	Data were collected from 28 outpatients with bipolar disorder daily for 12 weeks.	Voice features collected using a smartphone could be used as an objective sign of bipolar disorder. Combination of voice features and smartphone data regarding behavioral activity and self-monitored electronic data could improve the accuracy, sensitivity, and specificity of affective state.
Faurhot-Jepsen et al, (2017)[21]	To determine the effectiveness of smartphone-based monitoring and treatment system in reducing readmission rates and duration compared to standard intervention.	Randomized controlled, single-blind parallel-group design. (n=400) which involved 200 patients with unipolar disorder and 200 patients with bipolar disorder	Smartphone-based monitoring systems was proven to be effective in reducing readmission rates and duration.
Wenze et al, (2017)[22]	To evaluate the feasibility and acceptability of smartphone-based interventions in improving adherence to bipolar disorder treatment.	Eight participants completed 4 one-on-one individual therapy sessions over the course of a month, followed by 60 days of twice-daily Ecological Momentary Intervention (EMI) sessions.	Respondents showed good adherence to the intervention, including adherence to face-to-face and smartphone-facilitated sections. *smartphone.*
Pozza et al, (2020)[23]	To compare the level of adherence to antipsychotics between psycho-education provided through the Bipolar mobile application (Bip.App) and the standard psycho-education and a combination of both.	RCT	Combination of standard group psycho-education and smartphone-based psycho-education was a better choice to improve the process of monitoring and self-management of patients, thereby increasing adherence to treatment.
Fellendorf et al, (2021)[24]	To assess the acceptance for UP! application and to validate sleep wake times assessed with the UP! Application.	UP! App was used by 22 individuals with bipolar disorder and 23 controls. Respondents recorded the time they woke up using the UP! for 3 weeks.	UP App! Could be used to accurately measure changes in sleep duration.

Melbye et al, (2021)[25]	To validate automated data on smartphones which described physical, social activities and phone use among young patients with newly diagnosed bipolar disorder.	A total of 40 young patients with newly diagnosed bipolar disorder and 21 patients in the control group aged 15–25 years were assessed for daily smartphone automated data for 3-779 days.	Automatically generated data on physical and social activities and phone use reflected certain symptoms.
Jonathan et al, (2021)[26]	To develope a user-centric LiveWell application, a smartphone-based self-management intervention for bipolar disorder.	Hands-on trials of smartphone application in design sessions, usability test, and pilot study of smartphone-based self-management intervention for bipolar disorder.	LiveWell consisted of a daily self-monitoring tool. This app went through several revisions during the user-centric development process.
Busk et al, (2020)[27]	To test the feasibility of a mood score prediction application based on self-assessments collected daily from patients through a smartphone-based system.	RCT (n=84)	Self-assessment method through a smartphone-based system could predict mood for several days with low error compared to general basic method.

DISCUSSION

Various smartphone applications that have been developed showed that there were creative information technology-based innovations that were useful for patients with bipolar disorder. Each of these applications had useful features such as measuring and monitoring signs and symptoms, as a medium for psychotherapy, and increasing adherence to medication.

Measuring and Monitoring Signs and Symptoms

The heterogeneity of symptoms of bipolar disorder makes it difficult to predict the course of the disease. As a result, patients often lack knowledge and are often unaware of the mood swings that lead to relapses[28]. To prevent this, accurate information about the timing of the affective phase transition must be made available to patients and healthcare professionals. This information can enable service providers to intervene as soon as symptoms appear.

Information from the patient's daily life can help provide earlier and more reliable predictions of the affective phase transition that will occur in bipolar disorder[17.] Smartphones are easy-to-use and low-cost devices that can be used to assess information in patients' daily environment[13]. In addition, there is great interest among patients with mental health problems in monitoring symptoms through mobile applications[26].

Applications on smartphones could record and process behavior related to accelerometers, global positioning systems (GPS), exercise, physical activity, sleep, work and leisure time, phone calls, and digital communications[15,18,20,24,25]. Interpretation and statistical analysis of data could be carried out by the application system, so that it might lead to more personalized diagnoses and interventions[29].

As a Medium for Psychotherapy

Psychotherapy is the first-line intervention to prevent relapse in bipolar disorder[30]. However, there are several obstacles to the success of therapy. One of the main problems is the nature of face-to-face therapy which requires the patient and therapist to be at the same time. It requires a strong commitment to such care making it difficult for many patients, especially since therapy is given over a long period of time (eg, 4-6 months) and sessions take place at fixed dates and times (eg, once a week, lasting 1 hour)[31]. Such characteristics of therapy caused the high dropout rate. In addition, to implement certain intervention programs, there should be specialized therapists and there was a gap between supply and demand[32], and hence in many health systems, the provision of

such care was limited[31].

Information and communication technology is an opportunity to develop smartphone-based psychotherapy. This technology can overcome some of the limitations of face-to-face care. Smartphone-based psychotherapy is easily accessible and the time for therapy can be adjusted according to the needs and availability of each user[23]. In addition, such intervention programs offer the possibility of patient self-monitoring with two-way feedback between the patient and the healthcare provider[26].

Smartphone-based psychotherapy in the form of learning sessions contained multimedia content such as video tutorials, presentations, audio, and pdf documents as well as psychotherapy exercises that could be performed anytime and anywhere[23,26]. In addition, smartphone-based psycho-education provided a way to remotely monitor patient status by enabling the collection of physiological/biometric parameter data so that patients could be actively involved in the treatment process[23].

Improving Adherence to Medication

A previous study showed that half of patients with bipolar disorder did not take their medication as prescribed[(33)]. Low level of adherence increase the risk of mood swings, cognitive impairment, depressive sequelae, suicide, as well as increased use of health care and poor quality of life[33,34].

Several things that hinder patient non-adherence to treatment were costs and accessibility of health care[35]. One potential strategy to increase adherence to and also increase the accessibility of treatment is intervention using a smartphone. Several previous studies revealed that applications on smartphones such as BIPOLIFE® and EMI could improve adherence to medication and attitudes toward treatment[14,22].

Applications on smartphones could increase adherence through psychoeducational messages and also through observation on the consequences of changes in mood and energy in the form of avatars. Some patients reported that such features helped them realize the importance of the quality of life and adherence to medication in the management of bipolar disorder [14,22].

CONCLUSION

Smartphones could be used for bipolar disorder patients for certain functions such as measuring and monitoring signs and symptoms, as a medium for psychotherapy, and increasing adherence to medication. This can be a reference for healthcare workers in carrying out monitoring and management programs for bipolar disorder.

CONFLICTS OF INTEREST
The authors declare no conflict of interest.

REFERENCE

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, (DSM-5). 5th ed. American Psychiatric Publishing; 2013.
2. World Health Organization. Mental disorders [Internet]. 2019 [cited 2020 Sep 27]. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-disorders
3. Beyer JL, Weisler RH. Suicide Behaviors in Bipolar Disorder: A Review and Update for the Clinician. Psychiatr Clin North Am [Internet]. 2016;39(1):111–23. Available from: http://dx.doi.org/10.1016/j.psc.2015.09.002
4. Henry BL, Minassian A, Perry W. Everyday functional ability across different phases of bipolar disorder. Psychiatry Res [Internet]. 2013;210(3):850–6. Available from: http://dx.doi.org/10.1016/j.psychres.2013.04.006
5. Jiménez-López E, Sánchez-Morla EM, Aparicio AI, López-Villarreal A, Martínez-Vizcaíno V, Rodriguez-Jimenez R, et al. Psychosocial functioning in patients with psychotic and non-psychotic bipolar I disorder. A comparative study with individuals with schizophrenia. J Affect Disord [Internet]. 2018;229(December 2017):177–85. Available from: https://doi.org/10.1016/j.jad.2017.12.094
6. Anaya C, Torrent C, Caballero FF, Vieta E, Bonnin C del M, Ayuso-Mateos JL, et al. Cognitive reserve in

bipolar disorder: Relation to cognition, psychosocial functioning and quality of life. Acta Psychiatr Scand. 2016;133(5):386–98.

7. Sylvia LG, Montana RE, Deckersbach T, Thase ME, Tohen M, Reilly-Harrington N, et al. Poor quality of life and functioning in bipolar disorder. Int J Bipolar Disord [Internet]. 2017;5(1):10. Available from: http://journalbipolardisorders.springeropen.com/articles/10.1186/s40345-017-0078-4

8. Torous J, Friedman R, Keshavan M. Smartphone ownership and interest in mobile applications to monitor symptoms of mental health conditions. JMIR mHealth uHealth. 2014;2(1).

9. Kementerian Komunikasi dan Informatika. 89% Penduduk Indonesia Gunakan Smartphone [Internet]. 2021 [cited 2021 Apr 6]. Available from: https://mediaindonesia.com/humaniora/389057/kemenkominfo-89-penduduk-indonesia-gunakan-smartphone

10. Jørgensen P M, N O, D G, M R, G T. Acta Psychiatr Scand - 2014 - Munk-J rgensen - Fifty years development and future perspectives of psychiatric register.pdf. Acta Psychiatr Scand. 2014;130:87–98.

11. Palmier-Claus JE, Rogers A, Ainsworth J, Machin M, Barrowclough C, Laverty L, et al. Integrating mobile-phone based assessment for psychosis into people's everyday lives and clinical care: A qualitative study. BMC Psychiatry [Internet]. 2013;13(1):1. Available from: BMC Psychiatry

12. Anand V, Hu B, Anand A. Smartphone Monitoring of Mood Instability in Young Depressed Patients: A Latent-class Analyses. AMIA . Annu Symp proceedings AMIA Symp. 2019;2019:220–7.

13. Gideon J, Matton K, Anderau S, McInnis MG, Provost EM. When to Intervene: Detecting Abnormal Mood using Everyday Smartphone Conversations. 2019; Available from: http://arxiv.org/abs/1909.11248

14. Maurin KD, Girod C, Consolini J Lou, Belzeaux R, Etain B, Cochet B, et al. Use of a serious game to strengthen medication adherence in euthymic patients with bipolar disorder following a psychoeducational programme: A randomized controlled trial. J Affect Disord [Internet]. 2020;262(September 2019):182–8. Available from: https://doi.org/10.1016/j.jad.2019.10.008

15. Fellendorf FT, Hamm C, Platzer M, Pendl C, Gruber R, Weiss M, et al. Self-Monitoring and Self-Efficacy Increase with a Smartphone Application: A Technical Approach to Treating Bipolar Disorder?-Study Protocol for a Clinical Validation Trial. J Psychiatry Psychiatr Disord. 2019;03(03):137–48.

16. Dargél AA, Mosconi E, Masson M, Plaze M, Taieb F, von Platen C, et al. Toi Même, a mobile health platform for measuring bipolar illness activity: Protocol for a feasibility study. JMIR Res Protoc. 2020;9(8).

17. Mühlbauer E, Bauer M, Ebner-Priemer U, Ritter P, Hill H, Beier F, et al. Effectiveness of smartphone-based ambulatory assessment (SBAA-BD) including a predicting system for upcoming episodes in the long-term treatment of patients with bipolar disorders: Study protocol for a randomized controlled single-blind trial 11 Medical a. BMC Psychiatry. 2018;18(1):1–9.

18. Carr O, Andreotti F, Saunders KEA, Palmius N, Goodwin GM, De Vos M. Monitoring Depression in Bipolar Disorder using Circadian Measures from Smartphone Accelerometers. 2020;1:1–8. Available from: http://arxiv.org/abs/2007.02064

19. Ryan KA, Babu P, Easter R, Saunders E, Lee AJ, Klasnja P, et al. A smartphone app to monitor mood symptoms in bipolar disorder: Development and usability study. JMIR Ment Heal. 2020;7(9).

20. Faurholt-Jepsen M, Rohani DA, Busk J, Vinberg M, Bardram JE, Kessing LV. Voice analyses using smartphone-based data in patients with bipolar disorder, unaffected relatives and healthy control individuals, and during different affective states. Int J Bipolar

Disord [Internet]. 2021;9(1). Available from: https://doi.org/10.1186/s40345-021-00243-3

21. Faurholt-Jepsen M, Frost M, Martiny K, Tuxen N, Rosenberg N, Busk J, et al. Reducing the rate and duration of Re- ADMISsions among patients with unipolar disorder and bipolar disorder using smartphone-based monitoring and treatment - the RADMIS trials: Study protocol for two randomized controlled trials. Trials. 2017;18(1):1–13.

22. Wenze SJ, Armey MF, Weinstock LM, Gaudianao BA, Miller IW. An Open Trial of a Smartphone-Assisted, Adjunctive Intervention to Improve Treatment Adherence in Bipolar Disorder. J Psychiatr Pr. 2017;22(6):492–504.

23. Pozza A, Coluccia A, Gualtieri G, Ferretti F. Enhancing adherence to antipsychotic treatment for bipolar disorders. Comparison of mobile app-based psychoeducation, group psychoeducation, and the combination of both: protocol of a three-arm single-blinded parallel-group multi-centre randomised trial. Clin Ter. 2020;171(2):e7–93.

24. Fellendorf FT, Hamm C, Dalkner N, Platzer M, Sattler MC, Bengesser SA, et al. Monitoring Sleep Changes via a Smartphone App in Bipolar Disorder: Practical Issues and Validation of a Potential Diagnostic Tool. Front Psychiatry. 2021;12(March).

25. Melbye S, Stanislaus S, Vinberg M, Frost M, Bardram JE, Kessing LV, et al. Automatically Generated Smartphone Data in Young Patients With Newly Diagnosed Bipolar Disorder and Healthy Controls. Front Psychiatry. 2021;12(August).

26. Jonathan GK, Dopke CA, Michaels T, Bank A, Martin CR, Adhikari K, et al. A smartphone-based self-management intervention for bipolar disorder (livewell): User-centered development approach. JMIR Ment Heal. 2021;8(4):1–22.

27. Busk J, Faurholt-Jepsen M, Frost M, Bardram JE, Kessing LV, Winther O. Forecasting Mood in Bipolar Disorder from Smartphone Self-assessments: Hierarchical Bayesian approach. JMIR mHealth uHealth. 2020;8(4):1–14.

28. Depp C, Harmell AL, Savla GN, Mausbach BT, Jeste D V., Palmer BW. A prospective study of the trajectories of clinical insight, affective symptoms, and cognitive ability in bipolar disorder. J Affect Disord [Internet]. 2014;23(1):1–7. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3624763/pdf/nihms412728.pdf

29. Faurholt-Jepsen M, Frost M, Vinberg M, Christensen EM, Bardram JE, Kessing LV. Smartphone data as objective measures of bipolar disorder symptoms. Psychiatry Res [Internet]. 2014;217(1–2):124–7. Available from: http://dx.doi.org/10.1016/j.psychres.2014.03.009

30. González-Ortega I, Ugarte A, Ruiz de Azúa S, Núñez N, Zubia M, Ponce S, et al. Online psycho-education to the treatment of bipolar disorder: Protocol of a randomized controlled trial. BMC Psychiatry [Internet]. 2016;16(1):1–8. Available from: http://dx.doi.org/10.1186/s12888-016-1159-0

31. Reinares M, Sánchez-Moreno J, Fountoulakis KN. Psychosocial interventions in bipolar disorder: What, for whom, and when. J Affect Disord [Internet]. 2014;156:46–55. Available from: http://dx.doi.org/10.1016/j.jad.2013.12.017

32. Gibson S, Brand SL, Burt S, Boden ZVR, Benson O. Understanding treatment non-adherence in schizophrenia and bipolar disorder: A survey of what service users do and why. BMC Psychiatry. 2013;13.

33. Leclerc E, Mansur RB, Brietzke E. Determinants of adherence to treatment in bipolar disorder: A comprehensive review. J Affect Disord. 2013;149(1–3):247–52.

34. Sparding T, Silander K, Pålsson E, Östlind J, Sellgren C, Ekman CJ, et al. Cognitive functioning in clinically stable patients with bipolar disorder I and II. PLoS One. 2015;10(1):1–13.

35. Sajatovic M, Davis MS, Cassidy KA, Nestor J, Sams J, Fuentes-Casiano E.

A technology-enabled adherence enhancement system for people with bipolar disorder: Results from a feasibility and patient acceptance analysis. Patient Prefer Adherence. 2015;9:753–8.

Case Study

Ultrasound of Abdomen in Dengue Hemorrhagic Fever: Case Study

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ABSTRACT

The objective of study to evaluate technical scanning and Image result of dengue haemorragic fever (DHF) on abdominal ultrasound examination. The Methods was a case study Presentation from 3 patients, and observations were taken from March 2022 to July 2022 at the RSUD Cengkareng Jakarta. Using a 3.5 MHz frequency convex transducer, take longitudinal and transverse shots with the supine patient position. Scanning focuses on the peritoneal cavity to evaluate the presence of plasma fluid that fills the peritoneal cavities. The results showed that the abdominal ultrasound examination procedure with clinical DHF was well done with patient preparation not eating fibrous at least 4 hours, drinking 3-4 glasses of water and holding urination about 2 hours to fill the bladder. The results show that there is fluid in the peritoneal cavity.

Keywords : Dengue Haemorragic Fever, Abdomen Ultrasonography, Peritoneal Cavity Fluid.

INTRODUCTION

Dengue hemorrhagic fever (DHF) is an infectious disease caused by the dengue virus including the Flavivirus genus of the Flaviviridae family with viral serotypes namely DEN-1, DEN-2, DEN-3, DEN-4 [1–4] which can result in a spectrum of clinical manifestations that vary between the mildest, dengue fever dengue virus (DD), DHF and dengue fever accompanied by scarring or dengue shock syndrome (DSS), transmitted by Aedes aegypti and Ae mosquitoes. Infected Albopictus [5–7]. The incidence of DHF, due to multiple causes, means that the emergence of pain due to various interacting factors, including agents (dengue virus), vulnerable (human) hosts and the environment that allows the growth and proliferation of Aedes mosquitoes [8–10] . Besides that, it is also influenced by predisposing factors including population density and mobility, housing quality, distance between homes, education, employment, life attitudes, age groups, ethnicities, vulnerability to diseases, and others [11,12].

In the first degree the patient experiences symptoms such as fever accompanied by other clinical symptoms, without spontaneous bleeding, high body temperature with a cycle of 2-7 days, positive tourniquet laboratory test, thrombocytopenia, hemoconcentration. When there is an increase to degree II, the patient experiences the same symptoms as first degree symptoms, but is added by the presence of spontaneous symptoms such as petechiae, ecchymosis, melena, bleeding in the gums. In grade III the patient experiences symptoms of circulatory failure such as a weak and fast pulse with a size (> 120x / min) narrow pulse pressure with a size (≤ 120 mm Hg), blood pressure decreases with size (120/80 120/100120 / 110 90 / 70 80/70 80/0 0/0). At the last degree, that is, the degree of the pulse is not palpable, blood pressure is

irregular (heart rate $\geq$ 140x / min) the upper limbs and lower limbs are felt cold, sweaty and the skin looks blue.

According to records with clinical DHF at the Cengkareng Regional General Hospital in Jakarta, abdominal ultrasound examinations within a period of one to two months were recorded in around 2-4 patients. An interesting DHF case related to abnormalities in several organs in the abdomen is the discovery of fluid in the peritoneal cavity.

Basically, an ultrasound examination can strengthen the suspicion of the disease if previously accompanied by laboratory tests, to determine whether or not there is a decrease in the number of platelets and leukocytes in the blood. Therefore the main role of ultrasound on examination with clinical DHF is here, as an important addition to adding clinical and laboratory effectiveness in diagnosing dengue fever and to predict the severity of the disease by linking imaging features with platelet counts (13). According to previous research, if it shows an albumin level of <3.5 g / dL, the subjects were positive for dengue fever (DHF) and DHF and had a plasma leak.

Compared with laboratory results and levels, the ultrasound (USG) modalities are very sensitive and specific in visualizing plasma leakage in the form of pleural effusion and / or ascites. Plasma leakage is identified by the presence of pleural effusion and / or ascites with thrombocytopenia[14,15].Ultrasound examinations are performed using 3.5 MHz and 5 MHz frequency transducers (16,17). Ultrasound examination of the abdomen is done after 6 hours of fasting to allow for better distension of the gallbladder. In order to be evaluated properly the presence or absence of thickening of the gallbladder wall, which is a definite finding in all positive cases of dengue fever [14,18–21].

Abdominal ultrasonography in all subjects was investigated by using 3MHz – 5MHz convex type transducers. Of the 100 research subjects, USG results found the following results: 61.89% had gallbladder walls and bladder wall thickening, 39.44% had ascites, and 61.89% had pleural effusion [22]. The objective of study to evaluate technical scanning and Image result of dengue haemorragic fever (DHF) on abdominal ultrasound examination.

METHOD

This study was case study presentation from 3 patients with clinical indications of DHF from March 2022 to July 2022 at the Cengkareng Regional General Hospital in Jakarta. By conducting an inspection using an aircraft ultrasound Philips HD 15 Pure Wave brand. Transducers used by convex types with a frequency of 3.5 MHz. The technique of moving the transducer is carried out with 4 techniques, namely Pressing, Breathing / Valsalva, Sweeping and Maneuvering.

For the three samples, the same procedure was carried out, namely with the preparation of fasting patients a maximum of 4 hours by holding urination. The position of the research subject is supine on the bed with both hands above the head, the skening is performed with longitudinal and transverse pieces throughout the abdominal organs. For the three samples attaching the number of laboratories in the form of the latest platelets. By looking at the general condition of the three patients the symptoms were different. the first research subjects aged 19 years diagnosed with DHF with 119 thousand / µL platelet counts came with complaints of shortness of breath, nausea, dizziness, and pain in the joints, especially the lower limbs. The research subjects were examined with supine position on the bed. Skening results obtained in the form of fluid collections in the subhepatic and intrapelvis area and in the liver organs. The second study subjects aged 21 years diagnosed clinically with DHF platelet count 110 thousand / µL came with complaints of dizziness, nausea and pain joints of lower and upper limbs. Skening results obtained in the form of a picture of minimalfluid collecion at Cul De Sac. patients who are 45 years old with a clinical diagnosis of DHF with a platelet count of 105 thousand / µL come with complaints of shortness of breath, dizziness and pain in the joints of the lower limbs. The results of skening are obtained in the form of extra pleural effusion.

RESULTS

Based on observations made during observations at the Cengkareng Jakarta General Hospital For patients with Dengue Haemorragic Fever indications an examination was carried out in the entire abdominal organs, but more

focused on areas susceptible to abnormalities such as the Hepatorenal, Spleenorenal, Cul de sac and biological organs. bile.

The following are the pathology results obtained from the three samples with clinical dengue haemorragic fever. The ultrasound results in clinical DHF are shown in Figures 1, 2, 3 and Figure 4.
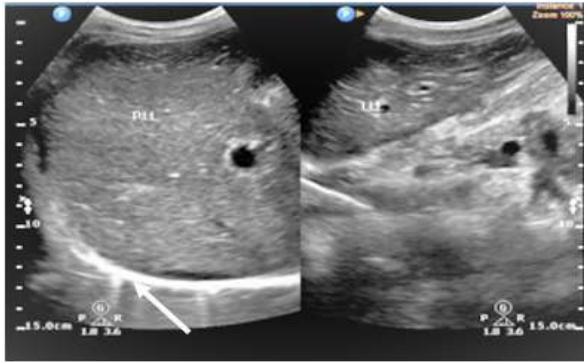

Figure 1. The patient's first ultrasound results with indications of Acites Pleural Dextra.
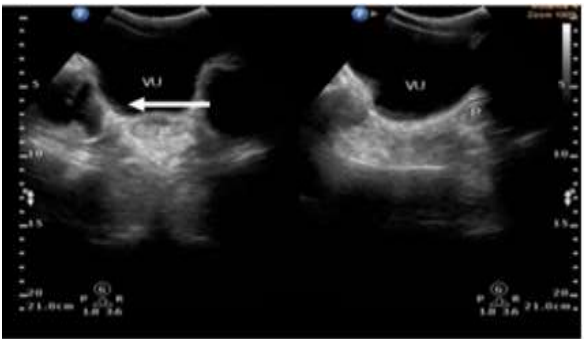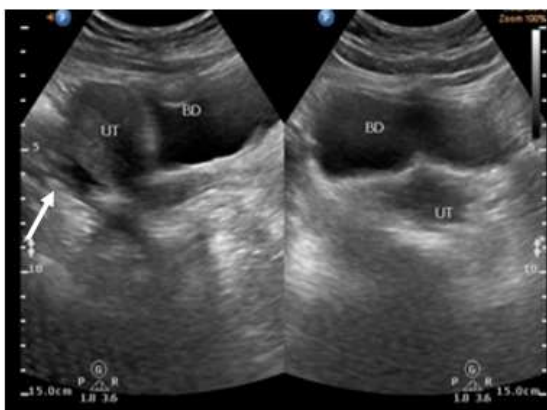

Figure 2. First patient USG results with indications of subhepatic and intra pelvis fluid collection.

In the first patient on the results of the longitudinal skening shown in Figure 1 on the liver, a mirror image was shown firmly on the posterior image, a homogeneous parenchymal

texture with an increase in echo with a hyperekhoic appearance, the anterior wall in the liver was not bounded with anechoic edge.

Figure 3. The patient's second ultrasound with a minimum fluid collection at Cul De Sac.

The vascular system does not widen. Then on other organs The results of the bladder sketch shown in Figure 2 show a picture of a fully filled bladder with anechoic images with a regular wall, showing images of anechoic in subhepatic and intra pelvis. no picture of acoustic shadowing, no picture of an enlarged bladder.

In the second patient on the results of bladder scanning shown in Figure 3, there is a picture of a jar that is not too full, a regular wall, and anechoic picture on the cul de sac. no picture of Acoustic shadowing, no picture of an enlarged bladder.

In the third patient on the results of the longitudinal scanning in the liver shown in Figure 4, an anechoic picture outside the diaphragm was seen, an increase in echogenicity in the form of a hyperechoic image, the structure of the liver parenchyma appeared homogeneous with port veins and branches as a regular, tubular structure. There is no visible widening of the vascular system nodule.
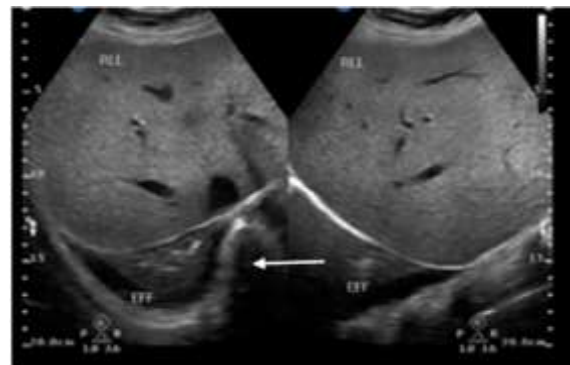

Figure 4. The ultrasound results of research subjects 3 with a description of dextra pleural effusion.

DISCUSSION

The ultrasound procedure performed is correct, the results of abdominal ultrasound in clinical DHF are not only subjects with platelets below 100 thousand / µL who

experience plasma seepage depending on the antibody of the study subjects, but in the study subjects with platelet counts above 100 thousand / µL also allows for plasma seepage in the peritonel cavity. Therefore abdominal ultrasound examination in the entire organ carefully and must attach the latest laboratory results to strengthen the diagnosis of DHF

Based on observations made during the observation at Cengkareng General Hospital Jakarta, for patients with indications of Dengue Hemorrhagic Fever, examination of all abdominal organs is carried out, but more focused on areas that are prone to abnormalities such as Hepatorenal, Spleenorenal, Cul de sac and Biological. The pathological results were obtained from the three samples with clinical dengue hemorrhagic fever. Ultrasound results in clinical DHF are shown in Figures 1, 2, 3, and 4. In the first patient on the longitudinal scan results shown in Figure 1 of the liver, the mirror image is clearly shown on the posterior image, parenchymal texture is homogeneous with increased echo with a hyperechoic appearance , the anterior wall of the liver is not bounded by the anechoic rim. no Acoustic shadowing images, no enlarged bladder images. In the second patient, the results of the bladder scan are shown in Figure 3, there is a not too full jar, a regular wall, and an anechoic appearance on the cul de sac. no Acoustic shadowing images, no enlarged bladder images. In the third patient, the results of a longitudinal scan of the liver seen in Figure 4 show an anekonic appearance outside the diaphragm, increased echogenicity in the form of a hyperechoic appearance, the structure of the liver parenchyma looks homogeneous with port veins and branches as ordinary tubular structures.trengthen the diagnosis of DHF.

CONCLUSION

The ultrasound procedure that was carried out was correct. The results of abdominal ultrasound in clinical DHF were not only in subjects with platelets below 100 thousand/µL who experienced plasma seepage depending on the study subject's antibodies but in study subjects with platelet counts above 100 thousand/µL it was also possible for seepage to occur. plasma in the peritoneal cavity.

CONFLICTS OF INTEREST
The authors affirm no conflict of interest in this study.

REFERENCE

1. WHO. Handbook for clinical management of dengue. Geneva: WHO. 2012.
2. Tjioenata MM, Lukas S, Stefani D, Widjaja P. Analysis of The Sirs Model Of The Spread of Dengue Hemorrhagic Fever Using Runge-Kutta Method and Genetic Algorithm. J Inf Syst Dev. 2023;8(1):43–7.
3. Mariko R, Darwin E, Yanwirasti Y, Hadinegoro SR. The difference of sve-cadherin levels between dengue hemorrhagic fever patients with shock and without shock. Open Access Maced J Med Sci. 2019;7(14):2277–81.
4. Jamil Z, Farooq U, Kazmi S. Dengue Hemorrhagic Fever. J Akhtar Saeed Med Dent Coll. 2022;04(02):87–9.
5. Supartha IW. Pengendalian Terpadu Vektor Virus Demam Berdarah Dengue , Aedes aegypti (Linn .) dan Aedes albopictus (Skuse)(Diptera : Culicidae). Pertem Ilm Univ Udayana. 2008;(September):3–6.
6. Setiawan AR, Fadila SZ, Sucipto TH, Fauziyah S, Madaniyah S, Dewi EC, et al. Detection of homozygous wildtype V1016V using allele-specific polymerase chain reaction in Aedes albopictus. Biodiversitas. 2023;24(1):62–7.
7. Martini M, Armen Z, Nissa K, Retno H, Sri Y, Atik M, et al. Entomological Status Based on Vector Density Index and Transovarial Infection on Aedes Sp. Mosquito in Meteseh Village, Semarang City. E3S Web Conf. 2020;202.
8. Kasjono H KH. Intisari Epidemiologi. Mitra Cendikia Press, editor. Jakarta; 2008.
9. Batool K, Alam I, Liu P, Shu Z, Zhao S, Yang W, et al. Recombinant Mosquito Densovirus with Bti Toxins Significantly

Improves Pathogenicity against Aedes albopictus. Toxins (Basel). 2022;14(2):1–15.

10. Wilke ABB, Vasquez C, Carvajal A, Moreno M, Fuller DO, Cardenas G, et al. Urbanization favors the proliferation of Aedes aegypti and Culex quinquefasciatus in urban areas of Miami-Dade County, Florida. Sci Rep [Internet]. 2021;11(1):1–12. Available from: https://doi.org/10.1038/s41598-021-02061-0

11. Sari CIN. Pengaruh Lingkungan Terhadap Perkembangan Penyakit Malaria Dan Demam Berdarah Dengue. IPB, editor. Bogor; 2005.

12. Oroh MY, Pinontoan OR, Tuda JBS. Faktor Lingkungan, Manusia dan Pelayanan Kesehatan yang Berhubungan dengan Kejadian Demam Berdarah Dengue. Indones J Public Heal Community Med. 2020;1(3):35–46.

13. Santhosh VR, Patil PG, Srinath MG, Kumar A, Jain A, Archana M. Sonography in the diagnosis and assessment of dengue Fever. J Clin Imaging Sci. 2014;4(1):14.

14. Moras E, Achappa B, Murlimanju B V., Raj GMN, Holla R, Madi D, et al. Early diagnostic markers in predicting the severity of dengue disease. 3 Biotech [Internet]. 2022;12(10):1–9. Available from: https://doi.org/10.1007/s13205-022-03334-9

15. Pathak B, Chakravarty A, Krishnan A. High viral load positively correlates with thrombocytopenia and elevated haematocrit in dengue infected paediatric patients. J Infect Public Health [Internet]. 2021;14(11):1701–7. Available from: https://doi.org/10.1016/j.jiph.2021.10.002

16. Singh DK. Assessment of Gall Bladder. 2023;424–7.

17. Abdelmofeed A, Awaad M, Atef F. Role of Ultrasonoraphy in Gall bladder Dyskinsia as a cause of Functional Dyspepsia Symptoms. Benha Med J. 2021;0(0):0–0.

18. Pratomo IP, Yunus F, Pulmonologi D, Respirasi K, Kedokteran F, Indonesia U. Anatomi dan Fisiologi Pleura. Contin Med Educ. 2013;40(6):407–12.

19. Sudarsih, Kesawa;Setia Budi W. Analisis Keseragaman Citra Pada Pesawat Ultrasonografi. 2014;17(1):33–8.

20. Kurniawan A, Rahmat, Kartapraja RD. Journal of Innovation Research and Knowledge. J Innov Res Knowl. 2023;2(11):4315–24.

21. Gleeson T, Pagnarith Y, Habsreng E, Lindsay R, Hill M, Sanseverino A, et al. Dengue Management in Triage using Ultrasound in children from Cambodia: a prospective cohort study. Lancet Reg Heal - West Pacific [Internet]. 2022;19:100371. Available from: https://doi.org/10.1016/j.lanwpc.2021.100371

22. Nida Sha , Rehana Mushtaq FB. Pakistan biomedical journal. 2021;(c):37–40.