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The Correlation of Knowledge Level on Stress Management with Mental Health of Hasanuddin University Students

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ABSTRACT
University students lie in the age range of 19 to 25 years old. These students tend to face various psychological pressures which affect their mental health. One of the daily hassles that can cause stress to them is the thesis. Effective stress management may avoid students suffer from the pressures; thus, they can acclimatize to the stress itself. 54% out of 100 students at Hasanuddin University showed symptoms of stress to the initial data surveyed by the researcher. This research aims to find out whether there is a correlation between the knowledge level of stress management and the mental health of Hasanuddin University students in Makassar. This research is an analytic observational study with a cross-sectional approach. The population in this study were all students of Hasanuddin University class of 2018 (6,303 people in total) with a sample of 376 respondents. This research was held at Hasanuddin University. The data analysis technique used was the Chi-Square Test. The results showed that the knowledge level of stress management of students was mostly at the high level, which was 205 students (54.5%). The mental health state of the students was also in a good state with 203 students (54%) out of 376 students. The chi-square test showed that there was a significant association between the knowledge level of stress management and mental health of Hasanuddin University Makassar students with a *p*-value = 0.000 (<0.05). There is a relationship between the knowledge level of stress management with the mental health of students at Hasanuddin University.

INTRODUCTION

Early adulthood begins when someone reaches the age of 19 to 25 years old. This phase is considered the vulnerable stage to getting into trouble. Internal and external factors like environment, socio-economic, and peer may become the causes. In this phase, there are some challenges such as; individual, social, physical, cultural, etc.[1] At the age of 19 to 25 years old, a person who pursues his/her education will be at the tertiary level as a college/university student.

Despite all the challenges that the students may face, they are expected to improve their potential and have a productive life either physically or psychologically. However, students frequently face a lot of psychological pressures that affect their mental wellness. Half to three-fourths of mental disorders appear during adolescence or young adulthood, and the treatment gap is mainly due to a lack of knowledge, lack of perceived need, and the stigmatization of mental illness.[2] This is in line with research conducted by Suryanto and Nadaregarding the mental health of students at a college x in the academic year of 2019/2020, which showed that 46% of students experienced very bad mental health and 41% had poor mental health. As many as 11% had fairly good mental health and only 2% of students had good mental health. The results of this study can lead us to a conclusion that mental health disorders can directly or indirectly affect a person's health which will ultimately affect their abilities in carrying out their life roles.[3] Disruption of a person's mental health can have an impact on various aspects of life.

When depression lasts a long time and is of moderate or severe intensity, it can become a serious health condition. This can cause the affected person to suffer greatly and be unable to function properly at work, school, or within the family setting. The worst thing of depression is it can lead to suicide. The World Health Organization (WHO) states that depression is the 4th primary cause of disease burden in the world and is predicted to be a major health problem. Data from 2018 stated that nearly 800,000 people died of suicide every year, where suicide ranked second as the cause of death at the age of 15-29 years. This age group is the age at which individuals take various levels of education, one of which is studying at a university and holding a degree as a student.[4]

The period of studying in college is a transitional period for a good person living in adulthood. In addition to the identity obtained, at this time various problems also emerged. This problem can make individuals tense up to experience stress. Stress affects the mental health of students. Research on stress levels in students according to their faculty choices has been carried out in several universities of the world. The prevalence of students globally who experience stress is 38-71%, while in Asia it is 39.6-61.3%. In Indonesia, the prevalence of students who experience stress is 36.7-71.6%.[5] Another study conducted by Zakaria regarding Student Stress Levels When Undergoing a thesis, this study also showed similar results. It was found that thesis is one of the things that becomes a stressor for students who are studying in the final semester at tertiary institutions, the results showed 86.5% of students fall into the moderate stress category.[6] Another study conducted by Bhurtun, et al regarding Changes in Stress Levels and Coping Strategies among Finnish Nursing Students, showed that the stress levels of nursing students increased from time to time in their first year of study to their second year. The main source of stress that occurs in nursing students comes from a lack of professional knowledge and skills.[7]

The results of this study are also in line with research conducted by Putri M & Bachri Y which researched the effectiveness of stress management in reducing adolescent anxiety levels in the new normal period. The study states that stress management activities are effective in reducing adolescent anxiety levels in the new normal period.[8] Proper stress management can help students avoid or be free from the stress they experience. If the stress experienced by students lasts a long time and leads to negative thoughts, then this will hinder their productivities which will lead to the neglect of various matters and responsibilities that should be done properly, thus become out of control. This is in line with the results of research conducted by Sentani, et al, the impact on mental health for students can be related to the academic performance achieved, one of which is successful in working on the thesis.[9] The result of the initial data survey was conducted by the researcher online by distributing questionnaires to 100 Hasanuddin University students. The

questionnaires were distributed to four faculty clusters which included health, science and technology, agro complex, and social and human resources. The results obtained in the survey were 100% of respondents agreeing that knowledge of stress management is important. For 9 questions regarding the symptoms of a person experiencing stress, the result was that the percentage of Hasanuddin University Makassar City students showing symptoms of stress was quite high which was 54%. Based on the background description, it is considered necessary to research the correlation between the knowledge level of stress management and the mental health of Hasanuddin University students.

MATERIAL AND METHOD

The method used in this study is an analytic observational study using a cross-sectional approach. This research was conducted at Hasanuddin University, Makassar City which was conducted in October 2021. The population in this study were all Hasanuddin University students, Makassar City class of 2018 or who were in the 7-8 semester period (6,303 students in total), while the sample in this study is 376 students who were then divided into four clusters; 77 students in the health cluster, 91 students in the agro complex cluster, 93 students in the science and technology cluster, and 115 students in the social and human resources cluster. The sampling technique used is proportional random sampling and used the Slovin formula in determining the sample size.

Data collection was carried out online using a Google form which was distributed to respondents via WhatsApp messages. The research was approved by the Ethics Committee of the Public Health Faculty at Hasanuddin University. The ethical approval number was 7130/UN4.14.1/TP.01.02/2021. The collected data were analyzed univariately and bivariate using the SPSS 25 application using the chi-square test to see the correlation between the dependent and independent variables. The results were then presented in the form of a frequency distribution table and narrative as a form of interpretation in discussing the results.

RESULTS

Based on the results shown in Table 1, majority of the respondents in this research were 21 years old with 64,1% or 241 students out of the age range of 19-25 years. Meanwhile, student who was 25 years old was the least of the respondents with 0.3%. As for the faculty cluster, most respondents came from the social and human resources cluster, namely 115 people (30.6%), while the fewest came from the health cluster, namely 77 people (20.5%).

Table 2 showed the responses to the stress management knowledge statements. Majority of the respondents choose SS (Strongly Agree) for the question item “Believing that God Almighty will help His people in facing problems and trials” with 287 respondents (76.3%). For S (Agree) option, 257 respondents (68.4%) agreed most with the statement “Seeing the problem from the positive side. For the answer to the TS statement (Disagree), respondents answered the most in the statement item "Reducing efforts in solving problems" which was 247 people (65.7%), while for the answer to the STS statement (Strongly Disagree), respondents answered the most in the item "Taking illegal drugs when facing problems" which was 319 people (84.8%).

Table 1. Characteristics of Respondents

Characteristics	n = 376	%
Age		
19	11	2.90
20	82	21.80
21	241	64.10
22	35	9.30
23	6	1.60
25	1	0.30
Sex		
Male	83	22.10
Female	293	77.90
Faculty Cluster		
Health Cluster	77	20.50
Agrocomplex Cluster	91	24.20
Science and Technology Cluster	93	24.70
Social and Human Resources Cluster	115	30.60

Source: Primary Data, 2021

Table 2. Frequency Distribution of Answers to Respondents Stress Management Knowledge Statements

Statement	SS		S		TS		STS		Total	
	n	%	n	%	n	%	n	%	n	%
Perform an activity to solve a problem	143	38	216	57.4	16	4.3	1	0.3	376	100
Take initial steps to resolve issue	173	46	198	52.7	4	1.1	1	0.3	376	100
Communicate the problem with the person involved	166	44.1	185	49.2	24	6.4	1	0.3	376	100
Formulate a plan before taking action	192	51.1	179	47.6	5	1.3	0	0	376	100
Analyze the positive impact of the plan that has been prepared before taking action	164	43.6	198	52.7	14	3.7	0	0	376	100
Analyze the negative impact of the plan that has been prepared before taking action	168	44.7	191	50.8	15	4	2	0.5	376	100
Make a full effort to carry out the plan I have made	146	38.8	221	58.8	8	2.1	1	0.3	376	100
Optimistic about the plan I have made	129	34.3	218	58	28	7.4	1	0.3	376	100
Postpone other activities to concentrate more on the problem	35	9.3	146	38.8	180	47.9	15	4	376	100
Choose to concentrate on a problem	51	13.6	200	53.2	120	31.9	5	1.3	376	100
Putting aside activities that I consider less important	76	20.2	214	56.9	83	22.1	3	0.8	376	100
Waiting for the right opportunity to carry out activities in overcoming problems	79	21	213	56.6	79	21	5	1.3	376	100
Refrain from doing harmful things	164	43.6	189	50.3	21	5.6	2	0.5	376	100
Be careful in making decisions	134	35.6	199	52.9	41	10.9	2	0.5	376	100
Patience in dealing with problems	169	44.9	176	46.8	27	7.2	4	1.1	376	100
Receive feedback from others on my issue	140	37.2	224	59.6	12	3.2	0	0	376	100
Ask others for help every time there is a problem	50	13.3	185	49.2	126	33.5	15	4	376	100
Consider advice from others for me to use in resolving problems	117	31.1	246	65.4	11	2.9	2	5	376	100
Not accepting the help of others	5	1.3	33	8.8	240	63.8	98	26.1	376	100
Looking at the problem from the positive side	85	22.6	257	68.4	30	8	4	1.1	376	100
Believing that there will be wisdom behind every problem	226	60.1	142	37.8	6	1.6	2	0.5	376	100
Be clear-headed on the problem at hand	140	37.2	203	54	30	8	3	0.8	376	100
Think of problems as lessons, not as obstacles	167	44.4	187	49.7	21	5.6	1	0.3	376	100
Believing that the problem must exist	199	52.9	174	46.3	3	0.8	0	0	376	100
Believing that problems are a process of maturation	212	56.4	157	41.8	6	1.6	1	0.3	376	100
Recognize that problems are not easy to change	72	19.1	197	52.4	95	25.3	12	3.2	376	100
Surrender to God Almighty every time there is a problem	220	58.5	130	34.6	22	5.9	4	1.1	376	100
Ask God Almighty for guidance on the problem at hand	269	71.5	101	26.9	5	1.3	1	0.3	376	100
Submit the results to God Almighty for the efforts that have been made	271	72.1	96	25.5	6	1.6	3	0.8	376	100

Table 2. Frequency Distribution of Answers to Respondents Stress Management Knowledge Statements

Statement	SS		S		TS		STS		Total	
	n	%	n	%	n	%	n	%	n	%
Believing that God Almighty will help His people in facing problems and trials	287	76.3	84	22.3	4	1.1	1	0.3	376	100
Assume that the problem does not exist	156	41.5	198	52.7	13	3.5	9	2.4	376	100
Assuming that problem does not affect my life	10	2.7	25	6.6	222	59	119	31.6	376	100
Reduce effort in solving problems	3	0.8	26	6.9	247	65.7	100	26.6	376	100
Give up on the problems I'm facing	4	1.1	16	4.3	193	51.3	163	43.3	376	100
Daydreaming when thinking about problems	36	9.6	166	44.1	136	36.2	38	10.1	376	100
Daydreaming about the continuation of my problem	34	9	191	50.8	113	30.1	38	10.1	376	100
Choosing to sleep instead of thinking about solving problems	24	6.4	88	23.4	190	50.5	74	19.7	376	100
Taking illegal drugs when facing problems	3	0.8	4	1.1	50	13.3	319	84.8	376	100

SS: Totally Agree; S: Agree; TS: Disagree; STS: Strongly Disagree
Source: Primary Data, 2021

In Table 3, the distribution of respondents' frequency based on mental health statement response showed respondents answer SL (Always) to the statement item "I hope to have an interesting or pleasant day when I wake up in the morning" which is 201 people (53.5%). For statement answers with SR (Often), respondents chose this option the most on the statement item "I feel happy" which was 186 people (49.5%). For statement answers with KD (Sometimes) respondents answered the most on the statement items "I feel lonely" and "I feel less excited" at 194 people (51.6%). Respondents' answers JR (Rarely) the most on the statement item "I am able to control my behavior, thoughts, emotions or feelings consciously" which was as many as 164 people (43.6%), while for statement answers with TP (Never), respondent answers the most on the statement item "I think about ending my life" which was 276 people (73.4%).

In Table 4, the results of the study on the dependent variable shows that out of all respondents, there were 203 people (54%) with good mental health and 173 people (46%) with bad mental health. As for the independent variables, it shows that there are 205 people (54.5%) who have high knowledge of stress management and 171 people (45.5) who have low knowledge of stress management. As for the independent variables, it shows that there are 205 people (54.5%) who have high knowledge of stress management and 171 people (45.5) who have low knowledge of stress management.

In Table 5, the results of the bivariate analysis shows that there is a correlation between the knowledge level of stress management and the mental health of Hasanuddin University Makassar students, the results of the chi-square test analysis showed the value of $p = 0.000$ (less than an α value of 0.05) which means that there is a significant association between the knowledge level on stress management and the mental health of Hasanuddin University Makassar students.

DISCUSSION

Based on the results of research that has been conducted regarding the mental health of Hasanuddin University Makassar students who are in the 7th semester or class of 2018 who have currently programmed and started working on a thesis, the results show that more Hasanuddin Makassar University students are in a good mental state, with 203 students (54%) compared to 173 (46%) students with a bad mental state. The distribution of respondents based on the answers to the statements on the mental health questionnaire, students who chose the SL (Always) the most to the statement item "I hope to have an interesting or fun day when I wake up in the morning" were 201

students (53.5%), for the SR (often) answer choices most students answered to the statement item "I feel happy" with 186 students (49.5%).

The results of this study illustrate that Hasanuddin University students who have good mental health can be identified through the circumstances they always or often experience in the past month. This situation is illustrated through statements that can describe the state of individuals who are in positive and healthy feelings and emotions as well as calm and peace of mind, where two criteria have been fulfilled among several criteria used to assess a person's mental health. Good mental health can be defined as a state of well-being that allows individuals to cope with the normal stresses of life and function productively.[10] The criteria regarding mental health were put forward by Alexander A. Schneiders in his book entitled Personality Dynamic and Mental Health (Semiun) and these criteria are described in the research theoretical framework.[11]

Table 3. Distribution of Frequency of Responses to Respondents Mental Health Statements

Mental Health	SL		SR		KD		JR		TP		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
I am happy or content with my personal life	107	28.5	160	42.6	103	27.4	5	1.3	1	0.3	376	100
I feel lonely	24	6.4	62	16.5	194	51.6	75	19.9	21	5.6	376	100
I am scared or anxious when faced with unexpected situations	48	12.8	127	33.8	145	38.6	52	13.8	4	1.1	376	100
I feel like the future looks hopeful and promising to me	69	18.4	120	31.9	132	35.1	46	12.2	9	2.4	376	100
My daily life is filled with interesting things	64	17	122	32.4	138	36.7	45	12	7	1.9	376	100
I felt calm and free from feeling depressed	27	7.2	93	24.7	178	47.3	65	17.3	13	3.5	376	100
I enjoy the things I'm doing	112	29.8	164	43.6	90	23.9	8	2.1	2	0.5	376	100
I am aware when I lose control of acting, speaking, thinking, feeling, or remembering	39	10.4	95	25.3	123	32.7	88	23.4	31	8.2	376	100
I feel very sad and depressed	22	5.9	52	13.8	134	35.6	140	37.2	28	7.4	376	100
I felt loved and needed	48	12.8	120	31.9	141	37.5	57	15.2	10	2.7	376	100
I feel anxious	35	9.3	96	25.5	137	36.4	79	21	29	7.7	376	100
I hope to have an interesting or enjoyable day when I wake up in the morning	201	53.5	117	31.1	49	13	5	1.3	4	1.1	376	100
I felt tense and full of emotion	8	2.1	57	15.2	157	41.8	129	34.3	25	6.6	376	100
I can control my behavior, thoughts, emotions, or feelings consciously	1	0.3	19	5.1	129	34.3	164	43.6	63	16.8	376	100
My hands once trembled when I was trying to do something	39	10.4	104	27.7	119	31.6	80	21.3	34	9	376	100
I feel that there is nothing I want	5	1.3	25	6.6	83	22.1	109	29	154	41	376	100

Table 3. Distribution of Frequency of Responses to Respondents Mental Health Statements

Mental Health	SL		SR		KD		JR		TP		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
I feel calm and peaceful	39	10.4	150	39.9	152	40.4	32	8.5	3	0.8	376	100
I feel that my emotions are stable	10	2.7	31	8.2	161	42.8	132	35.1	42	11.2	376	100
I felt gloomy and sad	12	3.2	51	13.6	173	46	117	31.1	23	6.1	376	100
I feel like crying	32	8.5	80	21.3	138	36.7	105	27.9	21	5.6	376	100
I felt that others would feel better if I died	16	4.3	28	7.4	54	14.4	66	17.6	212	56.4	376	100
I can feel relaxed easily	42	11.2	115	30.6	162	43.1	51	13.6	6	1.6	376	100
I feel that my romantic relationship is full of feelings of loving and being loved	57	15.7	56	14.9	121	32.2	83	22.1	57	15.2	376	100
I felt that everything that happened was not to my liking	22	5.9	61	16.2	190	50.5	83	22.1	20	5.3	376	100
I am troubled by anxiety or confusion	34	9	93	24.7	153	40.7	65	17.3	31	8.2	376	100
I feel that life is a very interesting and enjoyable experience	104	27.7	148	39.4	97	25.8	20	5.3	7	1.9	376	100
I felt so sad that no one could comfort me	9	2.4	44	11.7	125	33.2	125	33.2	73	19.4	376	100
I thought about ending my life	6	1.6	15	4	29	7.7	50	13.3	276	73.4	376	100
I felt restless, unsettled, and impatient	13	3.5	45	12	125	33.2	140	37.2	53	14.1	376	100
I became moody or brooding over something	25	6.6	82	21.8	159	42.3	83	22.1	27	7.2	376	100
I was happy and had a great time	64	17	166	44.1	124	33	20	5.3	2	0.5	376	100
I experience confusion, anger, or nervousness	7	1.9	58	15.4	187	49.7	99	26.3	25	6.6	376	100
I feel worried	29	7.7	94	25	180	47.9	62	16.5	11	2.9	376	100
I feel happy	76	20.2	186	49.5	99	26.3	14	3.7	1	0.3	376	100
I tried to calm myself down	112	29.8	154	41	89	23.7	19	5.1	2	0.5	376	100
I feel less excited	26	6.9	81	21.5	194	51.6	65	17.3	10	2.7	376	100
I feel refreshed and fit when I wake up	44	11.7	130	34.6	152	40.4	42	11.2	8	2.1	376	100
I was in a state of tension, stress, or distress	13	3.5	58	15.4	143	38	128	34	34	9	376	100

SL: Always; SR: Often; KD: Sometimes; JR: Rarely; TP: Never
Source: Primary Data, 2021

The results of respondent's distribution for KD (Sometimes) statements were mostly answered to the statement items "I feel lonely" and "I feel less enthusiastic" with as many as 194 students (51.6%) and for the JR (Rarely) choices most respondents answered in the statement item "I can control my behavior, thoughts, emotions or feelings with full awareness" as many as 164 students (43.6%) These three statement items are sometimes and rarely felt by respondents. This illustrates the state of the respondent's mental health which is not good. It is said to be not good because if the respondent stated that he sometimes or rarely felt these

three items in the last month, it means that the person is in a state of Psychological Distress called depression. This is also in line with the assessment criteria put forward by Alexander A. Schneiders in his book entitled Personality Dynamic and Mental Health. One of these criteria is that individuals can integrate motives and control conflict or frustration.[11]

As for answers to the TP (Never) statement the most chosen were the statement item "I think about ending my life" by as many as 276 students (73.4%). Respondents' answers stated that in the past month, they had never thought of ending their life. This statement can describe the state of mental health of semester 7 students who are programming and starting to work on their thesis while still being in a good state of mental health. This is in line with the criteria for assessing a person's mental health which has also been stated in the research theoretical framework that a person is called mentally healthy if the person can exercise self-control, integrate thoughts and behavior or in other words, the person does not lose control of his behavior or emotions.[11] Fulfillment of one of the criteria for someone who is mentally healthy is not in line with data from the Data and Information Center of the Indonesian Ministry of Health which noted that there were 812 suicide cases throughout Indonesia in 2016 dominated by students.[12] Based on WHO data in Southeast Asia, the suicide rate in Indonesia in 2019 was in the fifth position. The highest number of suicides in Thailand at 12.9 (per 100,000 population), followed by Singapore (7.9), Vietnam (7.0), Malaysia (6.2), Indonesia (3.7) and the Philippines (3.7). This suicide case is associated with various mental disorders, including depressive disorders.[13] Based on the results of knowledge level on stress management in the 7th semester or class of 2018 students, it is known that there are 205 students (54.5%) who had high-level knowledge on stress management compared to 171 students (45.5%) with low-level knowledge on stress management. The results of respondent's distribution based on the answers to statements on the stress management knowledge questionnaire, students mostly chose the SS (Strongly Agree) statement with the statement item "Believes that God Almighty will help his people in facing problems and trials" as many as 287 students (76.3 %) and for the choice of statement S (Agree) most of the students answered the statement item "Seeing the problem from the positive side" as many as 257 students (68.4%). This illustrates that more students have a high knowledge level of stress management. According to Philip G. Zimbardo in Saputra, who is a senior psychologist at Stanford University, his book revealed that there are three forms of coping/stress management, one of which is Emotional Focused Coping, where one dimension of Emotional Focused Coping is returning to religion and reinterpreting the stress experienced in a positive context by taking the wisdom or the positive side of a situation as one of the dimensions of stress management.[14] This is in line with the theoretical framework previously described regarding the dimensions of stress management.[15]

The results of respondent's distribution for the TS (Disagree) statement choice were mostly chosen by students in the statement item "Reducing the effort in solving problems" as many as 247 students (65.7%) and for the STS (Strongly Disagree) statement option, the most students answered item statement "Consuming illegal drugs when facing a problem" as many as 319 of them (84.8%). This presentation also illustrates that most Hasanuddin University students have high-stress management knowledge because they can differentiate negative things which are not things, they supposed to do in managing the stress they experience. This is in line with the theoretical framework previously described that one form of stress management is Maladaptive Coping, this stress management is in a form that leads to negative things that are not recommended to do, where one of the dimensions of Maladaptive Coping is Behavioral Disengagement, reducing efforts to overcome stress or even giving up and the use of alcohol or illegal drugs.[15]

Table 4. Frequency Distribution Based on Dependent and Independent Variables

Variables	n = 376	%
Mental Health		
Good	203	54.00
Bad	173	46.00
Knowledge of Stress Management		
High	205	54.50
Low	171	45.50

Source: Primary Data, 2021

Based on the results of cross-tabulations regarding the correlation between the knowledge level on stress management and the mental health of the respondents, it showed that 138 respondents (68%) had high knowledge of stress management and good mental health. In contrast, there were 106 people (61.3%) who had low-stress management knowledge and poor mental health. As for the results of the chi-square test analysis, it appears that the value of p = 0.000 (<0.05) means that there is an association between the knowledge level of stress management and the mental health of Hasanuddin University students. This shows that the higher the knowledge level on stress management in semester 7 students who are programming or compiling a thesis, the better their mental health state is. This is called psychological well-being. On the other hand, the lower the knowledge level on stress management of semester 7 students who are programming or compiling a thesis, the poorer their mental health state will be, which is also called psychological distress.

The results of this study are in line with research conducted by Aulia & Panjaitan (2019) which examined the relationship between psychological well-being and stress levels in final-year students. The results of this study indicate that there is a significant association between psychological health and stress levels, the higher the psychological well-being, the lower the stress level of the student.[15]

The results of this study are in line with the results of research by Sentani et al, which conducted a study of 469 students in the city of Bandung with the results that the use of coping can explain mental health status, which is in line with the transactional model theory, where coping is a dynamic process to affect a person's mental health. Students are included in the good mental category when the selection of coping forms used can reduce stress levels. The forms of coping that are considered to reduce stress levels are emotionally focused-coping and problem-focused coping. Students who fall into the category of mental health are not good when using maladaptive coping in dealing with stressful situations.[12] While the results found by Priyan and Yuvaraj showed more awareness and knowledge about the causes of stress and coping strategies adopted by dental students that have varying levels of stress, especially with online classes, the students cope with this stress with the support of family, friends and few activities that distract themselves.[16] This is in line with research conducted by Fernandes for emotional support in overcoming stress from family (27%), friends (55%), self (10%), and none (8%).[17] Students who are already in their final semester have heavier burdens and responsibilities. This is because they have a final task that must be completed, called a thesis. This can cause students to experience stress. The problems faced by students can be a source of stress. Stress management is one of the procedures for controlling or managing stress which aims to identify the causes of stress experienced and know techniques to deal with stress.[18] Therefore it is necessary for students to know about stress management, especially in final semester students.

Table 5. Analysis of the Correlation between Knowledge Level on Stress Management and Mental Health of Hasanuddin University Students

Variables	Knowledge Level Stress Management				Total		*p-value*
	High		Low				
	n	%	n	%	n	%	
Mental Health							
Good	138	68.00	65	32.00	203	100	0.000
Bad	67	38.70	106	61.30	173	100	
Total	**205**	**54.50**	**171**	**45.50**	**376**	**100**	

Source: Primary Data, 2021

The stress experienced by individuals has a strong association with their mental health. Therefore, it is necessary to make an effort to be able to overcome the stress felt by students. The effort is to know about stress management to deal with stress experienced so as not to interfere with one's mental health. When a person is faced with a stressful situation or situation, then there is a continuous effort to overcome or overcome it. An effective effort is needed to be able to overcome stress on students. The impact on mental health for students can be related to the academic performance achieved, one of which is successful in working on a thesis.[12]

CONCLUSION AND RECOMMENDATION

There is a significant association between the knowledge level of stress management and the mental health of students at Hasanuddin University, Makassar City, Indonesia. As for suggestions for students, it is best to prioritize and promote stress management knowledge that leads to good mental health for students.

AUTHOR CONTRIBUTIONS

RMT designed the research design and write the manuscript, AA conducted data collection and analyzed the data, and MAR and CL analyzed the data and improve the discussion. All authors read, reviewed, and approved the final manuscript. RMT = Ridwan M. Thaha; AA = Ani Asram; MAR = Muh Arsyad Rahman; CL = Clement Lifoia.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Differentials in Reproductive Health Knowledge among Adolescents in Indonesia

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ABSTRACT
Due to societal taboos, traditional and religious norms, Indonesia's Z-generation, who account for a large population, is frequently underinformed about reproductive health. The objectives of this study are to determine whether there are any differences in the knowledge of Indonesian young adults on reproductive health issues, modern contraceptive methods, and sources of information for reproductive health by selected sociodemographic characteristics. From the 2019 Performance and Accountability Survey, 41.582 never-married adolescents between the ages of 10 to 24 years were selected for the analysis. In this study, descriptive and bivariate analyses were performed. The means of the two groups were compared using t-tests. The results show that adolescents still lack information about reproductive health. The overall means for knowledge of reproductive health, modern methods of contraception, and sources of information about reproductive health were 1.97, 2.54, and 3.07, respectively. Adolescents were highly exposed to message about reproductive health on television and the internet. Adolescents that are older, reside in urban areas, are more educated, and are wealthier are reported to have significantly higher knowledge than their counterparts. With enough concern and increased attention being provided to younger adolescents, who reside in rural areas, who have lesser education, and are from the lowest wealth index, emphasis should be placed on increasing information to promote reproductive health literacy among adolescents. Television and digital media are crucial communication channels for educating with young people about reproductive health. Policies and programs should be designed to involve peers, relatives, and teachers in providing information about reproductive health.

INTRODUCTION

Adolescence is the healthiest age group in the population. However, this period is a transitional and critical stage in an individual's life, the beginning of the onset of puberty, the change of physical, emotional, psychological, social, and mental growth.[1,2] Youth constitute a sizable proportion of the Indonesian population. There are 67 million adolescents in Indonesia, with young people aged 10-24 years accounting for about 25% of the total population.[3]

Due to the high proportion of the young population in Indonesia, the reproductive behavior of adolescents is likely to have an important impact on overall reproductive health, demographic, and social outcome. Entering the reproductive phase of life, adolescents are exploring their sexual interests and desires. Because of their incapability to make an informed judgment or make the right decision in life, adolescents are often exposed to high-risk sexual behavior such as premarital sex.[4] Sexual initiation among youth was primarily associated with the risk of adverse reproductive health outcomes, for example, unplanned or unwanted pregnancy, unsafe abortion, maternal health complications, and sexually transmitted infections (STIs) including HIV/AIDS.[2,4] In Indonesia, around 9% of girls got married under the age of 20 years and 7% of them have begun childbearing.[5] Premarital sex is not culturally accepted in Indonesia, but in the country, most females and males had their sexual debut at the age of 17.[6] The 2017 Indonesian Demographic and Health Survey (IDHS) reported 8% of males and 1% of females aged 15-24 years who had never been married has had premarital sex.[6] Comparing these results with those of the 2012 IDHS suggest that sexual initiation has slightly increased from 1% in 2012 for young women and remained constant for young men.[6]

To lead healthy, responsible, and protect themselves from reproductive health problems, adolescents must have adequate information about reproductive health as well as contraceptive method choices. Adolescents in developing countries, including Indonesia often lack basic reproductive health information, whereas reproductive health knowledge is considered one of the keys that enable adolescents to be aware of their rights, and to be able to make meaningful choices and decisions concerning their future.[1] Traditional, norms, and religious values could be one of the factors contributing to the difficulty of sexuality discussion in Indonesia's society, and the topic remains marginal in the health and education program, thus young people have limited knowledge of the nature of sexuality and safe sexual activity.[7,8] At the same time, due to greater exposure to digital media, societal behavior shifted from conservatism to liberal interaction between both sexes, with more permissive attitudes.[8] A wide range of risky sexual activities is occurring every day in different parts of Indonesia, putting the health of young Indonesian in jeopardy.[7] The social environment of young Indonesian is sandwiched between a liberal Western perspective and a strict conservatism at home.[7]

Other than the value barriers of reproductive health-related discussions, the source of reproductive health information obtained by adolescents is also a crucial issue that requires special attention since they need proper and quality information. Inadequate and inaccurate information on reproductive health has some implications for adolescents' health and future.[9] Previous studies suggested that adolescents prefer receiving information from personal sources and mass media, which are their peers or parents.[9–12] Given the unique information challenges and that young people are being squeezed between modernization and traditionalism, exploring knowledge about reproductive health among adolescents is particularly timely. Therefore, the objective of the study was to examine the knowledge of Indonesian adolescents on reproductive health issues, modern contraceptive methods, and sources of information for reproductive health; and whether the knowledge differs by selected sociodemographic characteristics.

MATERIAL AND METHOD

This study was a quantitative analysis based on the 2019 Performance and Accountability Survey (*Survei Kinerja dan Akuntabilitas Program Kependudukan, Keluarga Berencana, dan Pembangunan Keluarga*, or SKAP) data. The survey used a cross-sectional design and was conducted in 34 provinces by the National Population and Family Planning Board (*Badan Kependudukan dan Keluarga Berencana*

Nasional, or BKKBN), aiming to provide population and reproductive health indicator estimates at the national and provincial levels in Indonesia.

The probability proportional to size method was used in the survey to generate a sample of proportional household sizes, which was the survey's sampling frame. Every family member and non-family member (e.g., stay overnight guests) was identified in each selected household and then listed in the family roster. Adolescents who were family members were interviewed using an adolescent questionnaire consisting of reproductive health and family development knowledge issues. As many as 41,582 never married adolescents aged 10 – 24 years completed the interview and were the unit of analysis of this current study.

Data analysis was conducted using SPSS v.23, and both descriptive and bivariate analyses were used. Descriptive analysis was used to understand sample characteristics. Bivariate analysis using t-tests was conducted to examine mean measures of adolescents' knowledge about reproductive health, modern contraceptive methods, and source of information about reproductive health and find significant differences between two groups of each selected socio-demographic characteristic. The criterion for statistical significance was set at a *p*-value of 0.05.

Knowledge of modern contraceptive methods was assessed through familiarity with 11 contraceptive methods. Adolescents were asked whether they had ever heard/read/seen eight contraceptive methods such as female sterilization, male sterilization, Intra Uterine Device (IUD), implant, injectables, pills, emergency contraception, male and female condoms, diaphragm (intravag), and Lactation Amenorrhea Method (LAM). The summary index, ranging from 0 to 11, assigned one point for each method known and 0 otherwise.

Knowledge about reproductive health was assessed through five questions, namely knowledge about a woman's fertile period; the risk of pregnancy (that a woman can become pregnant after having one sexual intercourse); HIV/AIDS; STIs (other than HIV/AIDS); and early marriage consequences. This study devised a summary index that assigned a score of 1 for each 'yes and correct' response and 0 for each incorrect or "don't know" response, yielding a total score ranging from 0 to 5.

The adolescents were asked whether they had heard information about reproductive health through nine sources of information such as radio, television, newspaper, poster, internet, health professionals, religious leader, teacher, and friends/relatives. Responses were scored 1 point for each source of information and 0 if not. In total, therefore, scores on the source of information on reproductive health range from 0 to 9.

The social and demographic variables cover several characteristics, those were age, sex, education, place of residence, wealth index, and region. These variables were selected based on the previous study about adolescents' reproductive health.

As a secondary analysis, this study referred to the ethical clearance of the 2019 Performance and Accountability Survey which was approved by the ethics committee of the Family Planning and Reproductive Health of the National Population and Family Planning Board (No. 434/LB.02/H4/2019).

RESULTS

Table 1 shows the description of 41,582 never married adolescents aged 10-24 years included in this study. Those of younger ages (10-19 years) were the majority of respondents (83%). Slightly more than half of the respondents were male and resided in urban areas (53%). Most of the adolescents had secondary or higher education, and 27% had a primary or less level of education. The majority (77%) belonged to the middle to highest-wealth household index. Most adolescents lived in the Java and Bali regions.

Table 2 also shows the knowledge of modern contraceptive methods among adolescents. A total of 11 questions were asked on methods of contraception. In general, more than half of the adolescents could identify injectables (60%), pills (56%), and male condoms (54%). Long-acting and permanent contraception methods were mentioned by a few adolescents: 26% knew about implants, 17% were aware of IUDs, and 14% were about female sterilization.

Familiarity was low for other methods; only 4% of adolescents mentioned emergency contraception and diaphragm (intravag).

Table 2 summarizes the percentage of adolescents answering yes and correctly to the five knowledge items. The proportions of adolescents who knew and had correct responses to the reproductive health knowledge items ranged from 5% to 60%. Most of the adolescents had heard about HIV/AIDS, but only three out of ten knew about STIs other than HIV/AIDS. Almost half of the adolescents knew that a woman who has gone through puberty may become pregnant after one sexual intercourse, however, only 5% of them were aware of women's fertile period likely to occur in midcycle. Among 41,582 adolescents, less than half of them were aware of the consequences of early marriage.

Table 1. Percentage Distribution of Never Married Adolescents (10-24 Years) by Selected Sociodemographic Characteristics in Indonesia

Characteristics	n = 41,582	%
Age		
10–19	34,438	82.82
20-24	7,144	17.18
Sex		
Male	22,124	53.21
Female	19,458	46.79
Education		
Primary and less	11,309	27.20
Secondary +	30,273	72.80
Place of Residence		
Urban	21,910	52.69
Rural	19,672	47.31
Wealth Index		
Lowest	9,456	22.74
Middle to highest	32,126	77.26
Region		
Java-Bali	25,746	61.92
Non Java-Bali	15,836	38.08

Source: Performance and Accountability Survey, 2019

Table 2. Knowledge of Modern Contraceptive Methods, Reproductive Health, and Source of Information for Reproductive Health in Indonesia

Characteristics	n = 41,582	%
Knowledge About Modern Contraceptive Methods		
Female sterilization	5,704	13.72
Male sterilization	2,855	6.87
Implant	10,666	25.65
IUD	7,102	17.08
Injectables	24,982	60.08
Pill	23,471	56.45
Emergency contraception	1,511	3.63
Male condom	22,642	54.45
Female condom	2,604	6.26
Diaphragm (intravag)	1,509	3.63
LAM	2,724	6.55
Knowledge About Reproductive Health		
Knowledge of women's fertile period	2,062	4.96
Knowledge of the risk of pregnancy	20,079	48.29
Knowledge of HIV/AIDS	25,121	60.41
Knowledge of other STIs	14,293	34.37
Knowledge about early marriage consequences	20,177	48.52
Source of Information for Reproductive Health		
Radio	1,647	3.96
Television	31,231	75.10
Newspaper	4,707	11.32
Poster	10,191	24.51
Internet	17,324	41.66
Health professional	9,754	23.46
Religious leader	3,651	8.78
Teacher	28,876	69.44
Friends/relatives	20,184	48.54

Source: Performance and Accountability Survey, 2019

Table 3 summarizes scores on the various knowledge items and sources of information for reproductive health. The three mean scores of the variables fell below the midpoint of the index, which is 5.5, 2.5, and 4.5 for indices of contraception knowledge, reproductive health knowledge, and source of information for reproductive health, respectively, suggesting inadequate knowledge and exposure to reproductive health. The adolescents' knowledge of modern contraceptive methods was poor. The overall mean score of knowledge about modern contraceptive methods on the 11-point modern methods was 2.54 (SD=2.26). Of the 5 measures, adolescents' knowledge about reproductive health was less favorable, the mean score was 1.97 (SD=1.50). Mean scores were also less than moderate, 3.07 (SD=1.78), for the 9 points of information sources for reproductive health.

A t-test was conducted to find significant differences across selected sociodemographic characteristics related to knowledge of modern contraceptive methods, knowledge of reproductive health, and source of reproductive health information. The mean score index showed statistically significant differences for all socioeconomic factors, including age, sex, education, place of residence, wealth index, and region; for knowledge of modern contraceptive methods; knowledge of reproductive health; and sources of information for reproductive health (p<0.05).

It showed that younger adolescents were poorer in knowledge about modern contraceptive methods, knowledge about reproductive health, and lower exposure to information about reproductive health. It was two times higher for knowledge about modern contraceptive methods among older adolescents than younger ones. Females were found to have higher knowledge of both modern contraceptive methods and reproductive health than males. However, males had slightly higher exposure to reproductive health information compared to females. The higher adolescents' educational level, the higher their knowledge about modern contraceptive methods and reproductive health, and the more they obtained information from various sources.

Furthermore, adolescent who live in rural areas demonstrated lower level of modern contraceptive methods and reproductive health knowledge, also lower exposure to information on reproductive health. As expected, a higher mean of knowledge and exposure to reproductive health information among adolescents comes from the middle to highest household wealth index. Modern contraceptive knowledge and reproductive health knowledge were higher among adolescents who live in Java and Bali region, and they tend to have more exposure from various sources. However, adolescents from regions other than Java and Bali slightly had higher knowledge of modern contraceptive methods.

Table 3. Mean Score of Knowledge About Modern Contraceptive Methods, Reproductive Health, and Source of Information for Reproductive Health by Selected Socioeconomic Characteristics in Indonesia

Characteristics	Knowledge About Modern Contraceptive Methods		Knowledge About Reproductive Health		Source of Information for Reproductive Health	
	mean	*p-value*	mean	*p-value*	mean	*p-value*
Overall score	**2.54**		**1.97**		**3.07**	
Age						
10-19	2.19	0.000	1.73	0.000	2.92	0.000
20-24	4.26		3.12		3.76	
Sex						
Male	2.23	0.000	1.88	0.000	3.08	0.045
Female	2.90		2.06		3.05	
Education						
Primary and less	1.13	0.000	0.75	0.000	2.23	0.000
Secondary +	2.07		2.42		3.38	
Place of Residence						
Urban	2.65	0.000	2.11	0.000	3.27	0.000
Rural	2.42		1.8		2.84	
Wealth Index						
Lowest	2.34	0.000	1.71	0.000	2.78	0.000
Middle to highest	2.60		2.04		3.15	
Region						
Java-Bali	2.52	0.028	2.01	0.000	3.14	0.000
Non-Java-Bali	2.57		1.90		2.95	

Source: Performance and Accountability Survey, 2019

DISCUSSION

Using the SKAP conducted in 2019, this study examined knowledge of modern contraceptive methods, reproductive health, and media exposure among never-married adolescents. Furthermore, it examined the differentials of reproductive health knowledge by selected sociodemographic characteristics. This study indicated that adolescents' knowledge about modern contraceptive methods and reproductive health information is still far from satisfactory. The three mean scores of the variables fell below the midpoint of the index. This suggests that there are areas of concern and adequate knowledge regarding reproductive health, which is important for adolescents, as they are vulnerable to adopting risky behavior.

Inadequate reproductive health knowledge is associated with a lack of information access. Limited access to reproductive health services and young age, which is commonly underserviced due to age stigmatization, are the factors for adolescents of lack of information.[13] In addition, feeling uncomfortable and embarrassed when talking about reproductive health also leads adolescents to be less informed regarding reproductive health knowledge as well as behavior.[14] In fact, receiving comprehensive and accurate information about reproductive health is everyone including adolescents' right to health.[15]

Concerning knowledge of modern contraceptive methods, adolescents performed poorly regarding familiarity with methods of contraception. Open discussion about contraceptive methods among adolescents or the unmarried population is still considered too sensitive and there is a belief that providing this information will encourage sexual activity. Moreover, in many developing countries premarital sex is socially and religiously prohibited, so information about sexual and reproductive health including contraceptive knowledge is rarely provided for adolescents.[16]

However, in Indonesia, contraceptive services in the family planning program are only targeted at married couples. Previous studies have shown poor contraceptive knowledge in the young people population as well. [8,16] However, it was found that many adolescents were most familiar with three common modern methods of contraception (injectables, pills, and male condoms). Studies in Botswana and India also reported similar knowledge.[19,20] In line with a study's finding in Riyadh, this current study disclosed the scarcity of knowledge about long-term contraceptive methods as well.[14] Besides serving as a birth control strategy, providing information about contraception is important for adolescents in the prevention of sexually transmitted infections, such as condoms and HIV/AIDS protection.[15,16] It suggests that there is a need to improve contraceptive literacy.

Overall, Indonesian's adolescents had poor reproductive health knowledge. The finding is similar to the results reported in Malaysia, the Lao People's Democratic Republic, and some areas in sub-Saharan countries.[2,28,29] The main barriers to reproductive health knowledge were possibly the availability, accessibility, acceptability, confidentiality, and even lack of publicity and visibility of available information services.

This current finding confirmed the previous studies' results, disclosing that knowledge of sexual and reproductive health is generally low among adolescents in Indonesia.[21–26] A study in Yogyakarta, where numerous adolescents live there, found that most of the adolescents had poor knowledge regarding reproductive organs, puberty, conception and pregnancy, contraception and abortion, and sexually transmitted diseases.[27]

Most of the respondents had heard about HIV/AIDS, but very few heard of STIs. This finding is consistent with previous studies conducted in several developing countries where most of the adolescents had heard about HIV/AIDS.[14,29–31] Similarly, for the question regarding females' fertile period, the majority of adolescents incorrectly answered the questions.[2,32] This finding shows that there are issues related to understanding the female reproductive system. Considering fertility awareness, knowledge of females' fertile period is important to improve the perception of pregnancy risk and lower the incidence of unintended pregnancy.[33] If adequate information is not provided, the impact can be adverse and may lead to risky sexual behavior.

The findings show that the overall mean score of sources of information was 3.07, which is less favorable. In this study, television, teachers, the internet, and friends/relatives were listed as

common sources of reproductive health information. A similar finding was reflected in some previous studies in Ghana[9] and sub-Saharan African countries[34] found that television is the major source of information for reproductive facts. No different than prior studies, the internet was pointed as one of the common sources for reproductive health information as well.[10] The preference for using the internet as the source of reproductive health information could be due to the unsatisfied nature of the information adolescents previously received.[35] Other studies in India[30] and Botswana[15] found that teachers play an important role in delivering information. Friends were reported as the next common source of reproductive health information after television and teachers as found in Ethiopia.[36] This result contradicts finding from elsewhere that adolescents talk about reproductive health information with their parents[11,12] or health professionals.[37] Information received from the mass media, however, tends to be incomplete and biased in religious and cultural issues, whereas information acquired from peers or parents is often misleading because they may be less exposed to quality information causing the adolescents more vulnerable.[9] Thus, the enhancement of reproductive health knowledge is important to not only target adolescents solely but also the community and their parents in particular.

The findings clearly showed that adolescents who were older, female, had higher education, lived in urban areas, and were wealthier reported significantly having higher knowledge than their counterparts. It reveals the consistent findings of the study from Malaysia[1] that reproductive health knowledge was higher among older adolescents. This can be attributed to the experience, as age increases exposure to reproductive health issues also increases. Similarly, the mean knowledge scores were significantly higher among adolescents with higher education. This finding is supported by a study in Malaysia where higher educational status is positively associated with reproductive health knowledge.[2] It may be due to more disclosure of reproductive health information.

This study highlights higher knowledge of modern contraceptive methods and reproductive health among females than males, which is in line with earlier studies' results.[38–40] The fear of the sexual behavior consequences appears to encourage female adolescents to have more information on reproductive health as well as contraception.[40,41] A study in Kenya found that female adolescents were more likely to find more information about contraceptive methods and reproductive health to avoid the risks of an unwanted pregnancy.[37] Another study in Italy stated that the differences related to sex differences are possibly due to adverse effects of the prevention services design and health promotion which has been traditionally more focused on women.[39] From an optimistic point of view, this finding implies a good sign that adolescents, particularly females, will act and behave positively regarding contraception and reproductive health. Perceived knowledge during adolescence determines the attitude and behavior toward reproductive health in the future.[42] Providing access to quality reproductive health services for both female and male adolescents, however, will ensure that adolescents obtain adequate and comprehensive reproductive health-related information.

In the present study, urban adolescents had higher reproductive health knowledge as compared to rural adolescents. Similar findings were reported by Kumar et al[20] and Awang et al.[1] This could be due to better information access in urban areas. Meanwhile, due to cultural values, having discussions or questions related to reproductive health may be seen as more sensitive in rural areas.[43] Moreover, adolescents from rich households had more knowledge than poor ones. It is consistent with a previous study conducted in India.[44] The higher knowledge among the rich might be due to more exposure to issues through media, as they had greater access to this media.

Although findings offer several insights, they need to be interpreted cautiously considering a few limitations. First, the study used cross-sectional survey data, which no causal effects could be confirmed. Second, there were no in-depth questions about contraceptive methods hence adolescents may have been over-reporting the knowledge. Third, the measurement for reproductive health knowledge is only from five basic pieces of information. Finally, there may be important

variables, which were not captured in the dataset used in this study.

CONCLUSION AND RECOMMENDATION

This study has indicated that knowledge about modern contraceptive methods and knowledge about reproductive health amongst adolescents in Indonesia remained low as the mean score fell below the midpoint of the index, both by overall mean score and selected socio-economic characteristics. The finding highlights that adolescents need to be given information on modern contraceptive methods other than three common methods (injectables, pill, and male condom) and education about women's fertile period, STIs other than HIV/AIDS, the risk of pregnancy, and the consequences of early marriage, particularly to younger adolescents, having lower education, living in a rural area, and from the lower income family.

The findings of this study offer important policy and research implications in the context of the ongoing adolescent reproductive health programs and initiatives in Indonesia. First, there is a need to increase the involvement of teachers, peers, and relatives in the provision of adequate reproductive health information. This could be achieved by providing training to teachers, peers, and the community, emphasizing the importance of the right information, and thus encouraging them to disseminate such information. Furthermore, this could also be attained through using digital media such as the internet, text messaging, social networking sites (SNS), and shareable video sites to provide correct and complete reproductive health promotion. Second, youth programs should be encouraged to reach younger adolescents who have lower education, live in a rural area, and are from the lowest wealth. Third, the lower knowledge among male adolescents could be a confirmation that attention to male-reproductive health knowledge should be considered when planning educational intervention. Consider health promotion programs that target males apart from general sexuality education which includes both sexes. Males have higher risks of premarital sexual behavior, which can create other sexuality-related issues including sexually transmitted diseases.

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AUTHOR CONTRIBUTIONS

SK and DNF conceptualized and designed the study. SK drafted the manuscript, DNF conducted the data analysis, and SL provided additional analysis and discussions. All authors have read and approved the manuscript. All authors equally contributed to this study. SK = Sari Kistiana; DNF = Desy Nuri Fajarningtiyas; SL = Syauqy Lukman.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Geographic Distribution of DHF Cases and Larvae Free Index In Situbondo Regency, 2019-2021

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ABSTRACT
For the last 3 years of dengue cases in Situbondo Regency, there were 475 patients recorded from January to December 2021 (incident rate, IR = 68.904/100,000) and 4 death cases (case fatality rate, CFR = 0.8%). The average percentage of Larvae Free Index Situbondo scores is still below the Environmental Health Quality Standards for an area of at least 95%. This study aims to describe the mapping of Larvae Free Index and dengue cases in Situbondo district in 2021. The type of this research is descriptive. The object of this research is the value of Larvae Free Index and cases of DHF. The data obtained is secondary data from Larvae Free Index and DHF cases in Situbondo Regency for 3 years starting from 2019-2021. The data is displayed using QGIS mapping using points and polygons. Health information and the potential for dengue fever in the area can be identified using geographic mapping, this information can be used to decide policies in breaking the chain of disease. The number of dengue cases in Situbondo Regency increased from 2019-2021. Larvae Free Index value of each village is better than the previous year. The spread of dengue cases is very high due to the mobility of residents who carry out activities outside the area of residence, resulting in transmission of dengue through mosquito bites. To prevent the spread of dengue cases, people are expected to use mosquito-repellent lotion when traveling.

INTRODUCTION

Dengue Hemorrhagic Fever, also known as DHF, is an endemic disease caused by dengue virus infection and transmitted by the *Aedes aegypti* mosquito.[1] Dengue fever is currently a major global health problem. DHF has always been an endemic disease and a major problem to date.[2] The case of DHF is very closely related to the presence of the *Aedes sp*. The cycle of the *Aedes sp* has four stages, namely egg, larva, pupa andadult. The breeding ground for egg, larva, and pupa stages is in calm and clear water. Puddles of water in containers or water storage containers can make *Aedes sp.*[3]

The highest sufferers in Kediri district in 2016 were mostly in the Pare District and Kunjang District, Ngasem District, showed that *Aedes sp* from the 4 districts were resistant to Temephos and adult mosquitoes were resistant to the chemical insecticide malathion.[4] Larvae *Aedes sp.* Larvae *Aedes sp.* were resistant to Temefos at a concentration of 0.04 mg/lt,[5] further confirmed by Haidah which was associated with the distribution of *Aedes sp* in the 11 sub-districts studied.[6]

Resilience status of the region of the 11 subdivisions of resistance status, only one region is susceptible to detecting the presence of the *Aedes sp* which is proven to be resistant to organophosphate pesticides. Detection of pesticide resistance in *Aedes sp* showed a 250 bp band in the mosquito gene indicating that VGSC is a pesticide-resistant gene, Indonesia uses organophosphate pesticides.[7] Kediri has been using Organophosphate insecticides for quite a long time, the results of Marlik's research showed that *Aedes sp* is resistant to malathion.[8]

DHF is influenced by several factors, namely the host, agentand environment, or an epidemiological triangle. The host factor is human as the main host of the dengue virus, such as population mobility, population density, residential sanitation hygiene, education, occupation, age, race, and nutritional immunity. The agent factor is the virus that causes DHF. Rainfall that periodically causes puddles of water in the media can be a convenient breeding ground for mosquitoes.[9]

Most cases of dengue fever are detected in the rainy season when there are lots of puddles in rainwater containers that are breeding grounds for mosquitoes. Until now, the number of districts infected with dengue fever in Indonesia is 477 districts or 92.8% of all districts in Indonesia. This number is likely to increase from 2010 to 2019.[10]

The increase in the Larvae Free Index value has an impact on the total DHF at the Perak Health Center. DHF cases increased during the rainy season when Larvae Free Index began to decrease, indicating that the presence of larvae was increasing.[11] explained that the lower the Larvae Free Index value will affect the high incidence of DHF.[12] Mosquito Nests and 3M Plus in Baba Village, Baba District, Kediri Regency are considered less eradicated.[13] A contributing factor to the prevalence of dengue fever is the habit of *Aedes* breeding in clear and clean water in the household environment. The preferred place for *Aedes aegypti mosquitoes* is the indoor environment, especially the bathroom.[14] The failure of eradicating mosquito nests is the result of a lack of information and understanding on how to prevent DHF correctly according to government recommendations. The purpose of this study is to describe the geographical distribution of Larvae Free Index and DHF cases in Situbondo Regency in 2019-2021 because DHF cases are still increasing every year.

MATERIAL AND METHOD

This research uses the descriptive research method. The population in this study was the community with dengue fever cases in the Situbondo district, East Java, Indonesia, in 2019-2021. Sample comes from the total population, with a sample of 20 (twenty) Health Centers. Variables include patients with DHF and ABJ cases were obtained from the health office of Situbondo. This research was approved by the Ethics Committee of the Surabaya Health Polytechnic Number EA/1138/KEPK-Poltekkes_Sby/V/2022.

This study describes, map, and interpret Larvae Free Index and DHF in the Situbondo district using the Quantum GIS application. Standard percentage for Larvae Free Index is ≥95% and any percentage below the standard (≤ 95%) is considerent not meeting the Larvae Free Index requirement.[15]

RESULTS

Dengue Haemoragic Fever Cases

The incidence rate of DHF in Situbondo Regency in 2019 was 65.6 per 100,000

population with a total of 448 cases. The health center with the highest incidence of DHF in Situbondo Regency in 2019 occurred at the Mlandingan Health Center with 46 cases. Meanwhile, the lowest number of DHF cases were in Jatibanteng Health Center (0 cases).

The incidence rate of DHF in Situbondo Regency in 2020 is 48.3 per 100,000 population with a total of 331 cases. The health center with the highest incidence of dengue fever in Situbondo Regency in 2020 occurred at the Jangkar Health Center which reached 58 cases. Meanwhile, the lowest DHF cases were at the Widoropayung Health Center as many as 3 cases.

The incidence rate of DHF in Situbondo Regency in 2021 is 68.9 per 100,000 population with a total of 475 cases. The health center with the highest incidence of DHF in Situbondo Regency in 2021 occurred at the Panji Health Center which reached 48 cases. Meanwhile, the lowest DHF cases were at the Widoropayung Health Center as many as 5 cases.

For 3 years (2019-2021) the number of DHF cases experienced ups and downs (fluctuative). The cases decreased in 2020 then the number of DHF increased in 2021. However, in terms of mortality, the number of deaths caused by DHF is the highest in 2020 compared to 2019 and 2021.

In 2019 there were no deaths due to cases of dengue fever, it is likely that in 2019 with the rise of COVID-19, the person who died was declared dead from COVID-19 instead of DHF. The number of cases and mortality in each health center throughout the years can be seen in the following Table 1.

Table 1. DHF Cases in Situbondo Regency 2019-2021

Health Center	2019		2020		2021	
	Cases	Mortality	Cases	Mortality	Cases	Mortality
Sumbermalang	34	0	13	0	8	0
Jatibanteng	0	0	6	0	9	0
Banyuglugur	15	0	5	0	11	0
Besuki	21	0	9	0	28	0
Widoropayung	21	0	3	0	5	0
Suboh	46	0	15	0	19	1
Mlandingan	26	0	10	1	15	0
Bungatan	7	0	6	0	9	0
Kendit	28	0	5	0	9	0
Panarukan	12	0	8	0	36	0
Situbondo	23	0	16	0	47	1
Mangaran	45	0	7	0	33	0
Panji	31	0	16	0	48	0
Klampokan	3	0	11	1	28	0
Kapongan	21	0	22	1	33	1
Arjasa	27	0	34	0	37	0
Jangkar	35	0	58	0	38	0
Asembagus	33	0	49	1	23	1
Banyuputih	7	0	31	2	31	0
Wonorejo	13	0	7	0	8	0
Incidence Rate of DHF	**65/100.000**		**48,3/100.000**		**68,9/100.000**	

Source: Situbondo Health Office Annual Report, 2019-2021

The Value of the Larvae Free Index

The following Larvae Free Index values for 2019-2021 data are obtained from the annual report of the Situbondo District Health Office.

It can be seen from Table 2 that the average Larvae Free Index score for 3 years (2019-2021) is 91%. According to the Minister of Health Regulation Number 50 of 2017 these results are still below the standard larvae-free index of ≥95%. Out of 20 (twenty) health centers, only 4 health centers met the larvae-free index requirements in 2019 - 2020 with a percentage of 20%, while in 2021 there are 6 health centers with a percentage of 30%. However, there are several health centers which never met the standard score requirements, namely Sumbermalang, Banyuglugur, Besuki, Mlandingan, Bungatan, Situbondo, Mangaran, Panji, Kapongan, Arjasa, Asembagus and Banyuputih.

Table 2. The Average Area under Health Center in Situbondo Regency with Larva Free Index from 2019-2021

Health Center	Larvae Free Index in Areas Below Health Center (%)		
	2019	2020	2021
Sumbermalang	90	91	90
Jatibanteng	95	95	94
Banyuglugur	85	84	89
Besuki	87	85	89
Widoropayung	82	71	95
Suboh	95	97	98
Mlandingan	92	80	93
Bungatan	80	91	93
Kendit	90	83	96
Panarukan	96	96	96
Situbondo	83	84	88
Mangaran	91	94	92
Panji	91	92	92
Klampokan	89	94	96
Kapongan	91	91	94
Arjasa	90	92	93
Jangkar	91	92	95
Asembagus	89	88	88
Banyuputih	92	91	88
Wonorejo	97	98	97
Percentage of Areas with Larvae-Free Index ≥ 95% in Situbondo Regency	**20%**	**20%**	**30%**

Source: Larvae Free Index Annual Report Situbondo Health Office, 2019-2021

Distribution Map of DHF and Larvae Free Index Cases in Situbondo Regency in 2019-2021

All figure showed images distribution of cases of DHF and Larvae Free Index at the Situbondo District Health Center from 2019 to 2021. The green area on the 2019 map shows that villages that meet the Larvae Free Index requirements are fewer than in 2020 and 2021. The number of DHF cases has changed up and down so that in 2019 there were 448 cases and no one died then dengue cases in 2020 decreased by 331 patients and 5 people died while in 2021 it increased by 475 patients and 4 people died.

DISCUSSION

Cases of DHF and Larvae Free Index in Health Center in Situbondo Regency

In 2021 in the Situbondo area, there were 475 cases of dengue fever with 4 deaths, which increased compared to the number of cases in 2020. On the contrary, the number of dengue cases was 331 people in 2020, yet the number of deaths was 5 people, which was slightly more than 2021 case. Sequentially backward years, the number of dengue cases in 2019 was 448 people but there were no deaths.

In 2019-2021 villages that are included in the work area of 20 health centers in the Situbondo district,were categorized as not fulfilling the requirements as it did not meet the average Larvae Free Index value. The highest DHF cases were in 2019 at the Suboh Health Center, in 2020 at the Anchor Health Center, and in 2021 at the Panji Health Center. The total number of Larvae Free Index scores that do not meet the requirements of the Health Center working area in 2019 is 100 villages, in 2020 there are 92 villages, and in 2021 as many as 79 villages. Dengue fever cases from 2019-2021 have decreased, this shows that for 3 (three) years there has been a change for the better. Every year villages that do not meet the larva-free index standards undergo necessary changes to meet the health regulatory requirements of the larva-free index.

The effect of the high value of Larvae Free Index is due to not being monitored with a maximum of the larva monitoring officer program.[16] Half of the larvae monitoring officers sometimes only prioritize the quantity of work

and not paying attention to the quality of work, with this the influencing factor is the lack of facilities for larva inspection which affects the work of the officers against the mismatch of goals and expected results.[17]

There are several risk factors that can affect DHF, one of which is the house (type of container inside and outside the house, distance between houses, height from the water surface, climate and house arrangement), social environment, and biological environment. The spread of mosquitoes between one house and another is the distance between houses so that mosquitoes can easily spread to the next house and so on.[18] Places that affect mosquitoes laying eggs outside or inside the house are due to puddles of water in various containers such as the type of water reservoir, the location of the water reservoir, the color of the container, the depth of the water and the origin of the water.[19]

Mosquito *Aedes sp* DHF vectors can live at an altitude of 0 to 500 meters above sea level, but the *Aedes sp.* at an altitude of 1000 meters above sea level can survive.[20] *Aedes* can survive and breed up to an altitude of ± 1,000 m above sea level. For an altitude higher than ± 1,000 meters above sea level, the temperature is too low for mosquitoes to breed.[21]

Situbondo Regency has implemented the eradication of mosquito nests program, however due to the large number of larvae in the area, the Larvae Free Index Value has yet meet the requirements, because *Aedes* may have been resistant to chemical compounds to eradicate larvae. This theory is related to Demes research on *Aedes aegypti* in Kediri, which showed *Aedes aegypti* have been resistant to the chemical temephos with a concentration of 0.01 mg/l, 0.02 mg/l, 0.03 mg/l, 0.04 mg/l.[21] Larvae *Aedes aegypti* originating from the Depok, Sleman area can be found to have an average mortality of 97% still susceptible to temephos.[22]

Geographical Distribution of DHF and Larvae Free Index Cases in the Situbondo Regency in 2019-2021

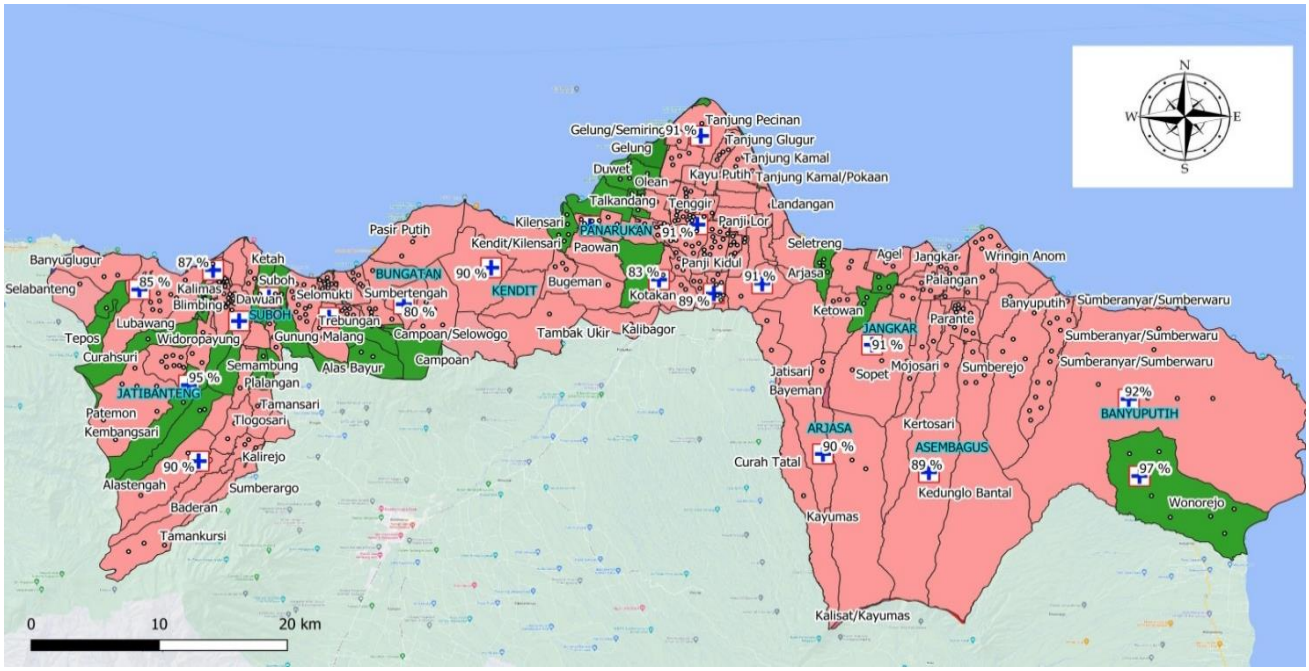
In 2021, the highest dengue case in East Java was Situbondo Regency. In this study, the function of the geographic distribution map of DHF and Larvae Free Index cases is as a media presenter in displaying the location of the distribution of DHF and Larvae Free Index cases in the Situbondo Regency in 2019-2021. The green area indicates that the working area of the Health Center has an Larvae Free Index value that meets the requirements of >95%, while the pink area indicates that the area is categorized as not meeting the requirements of <95%.

The Larvae Free Index value increases every year based on data from 2019 to 2021. This is in line with changes in the green area on the map whose distribution is getting wider. In addition, cases of DHF experienced ups and downs (fluctuative).

Regions whose Larvae Free Index scores do not meet the requirements for 3 years (2019-2021) are 72 villages, namely Plalangan, Tlogosari, Baderan, Kalirejo, Tamansari, Alas Tengah, Sumberargo, Jatibanteng, Banyuglugur, Kalianget, Selobanteng, Kalisari, Besuki, Coastal, Langkap, Kalimas, Mlandingan Kulon, Selomukti, Trebungan, Sumber Anyar, Bletok, Bungatan, Patemon, Selowogo, Kendit, Paowan, Olean, Talkandang, Kotakan, Kalibagor, Tanjung Glugur, Mangaran, Tanjung Kamal, Tanjung Pacinan, Ardirejo, Semiring, Trebungan, Bulk Jeru, Mimbaan, Eucalyptus, Panji Lor, Tenggir, Tokelan, Klampokan, Juglangan, Panji Kidul, Battal, Gebangan, Kandang, Kesambi Rampak, Landangan, Pokaan, Wonokoyo, Bayeman, Kayumas, Jatisari, Kembangsari, Agel, Asembagus, Gudang, Wringin Anom, Trigonco, Perante, Awar-Awar, Kedunglo, Pillow, Kertosari, Mojosari, Banyuputih, Sumberejo, and Sumberanyar.

In 2021 the number of villages that meet the requirements for the Larvae Free Index score in Situbondo Regency is more compared to 2019. It can be seen that the village areas that meet the requirements for the 2021 Larvae Free Index value have changed quite well, 57 villages that meet the requirements and 79 villages do not meet the requirements.Meanwhile in 2019, only 29 villages eligible and 107 villages did not meet the requirements.

In figure 1, 2, and 3 it can be seen that the distribution of DHF cases in the working areas of smaller health centers (Panji Health Center, Besuki Health Center, and Jangkar Health Center) is more compared to the wider Health Center working area.

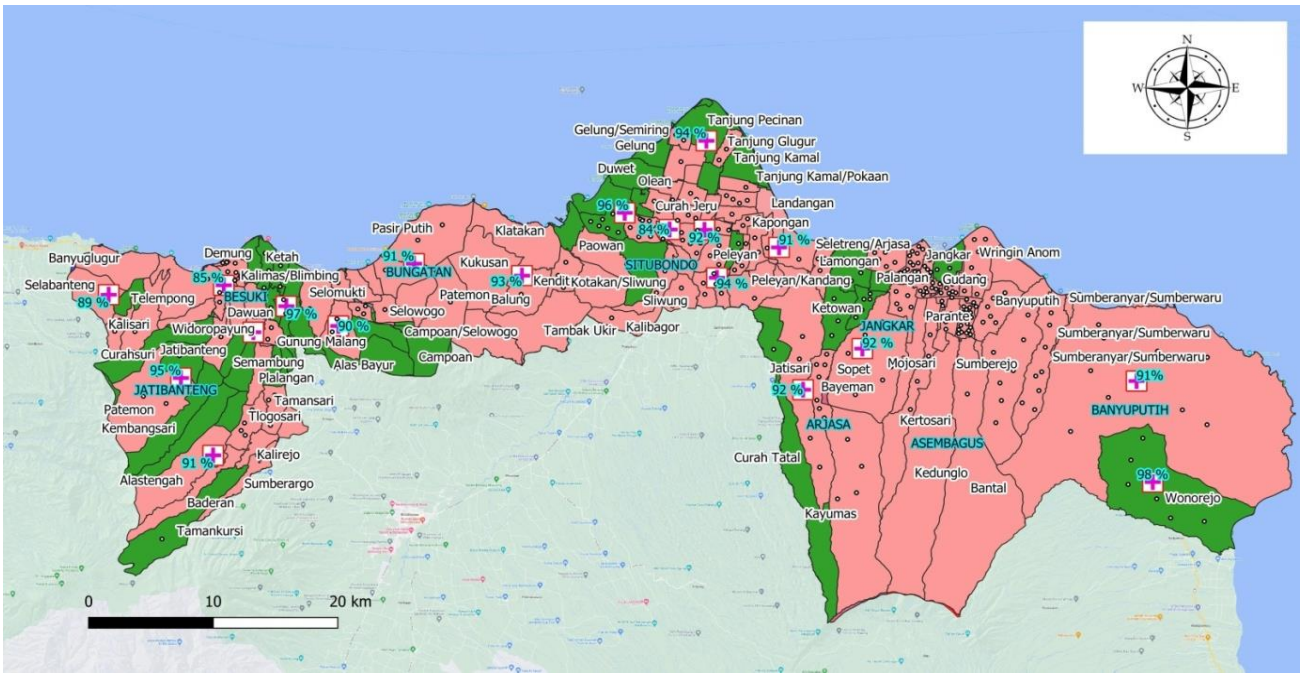


Note

- ○ : Cases
- ✚ : Health Center
- : Larvae Free Index (< 95%)
- : Larvae Free Index (> 95%)

Source: DHF and Larvae Free Index Annual Report Situbondo Health Office, 2019

Figure 1. Distribution Map of DHF and Larvae Free Index Cases in the Situbondo Regency in 2019

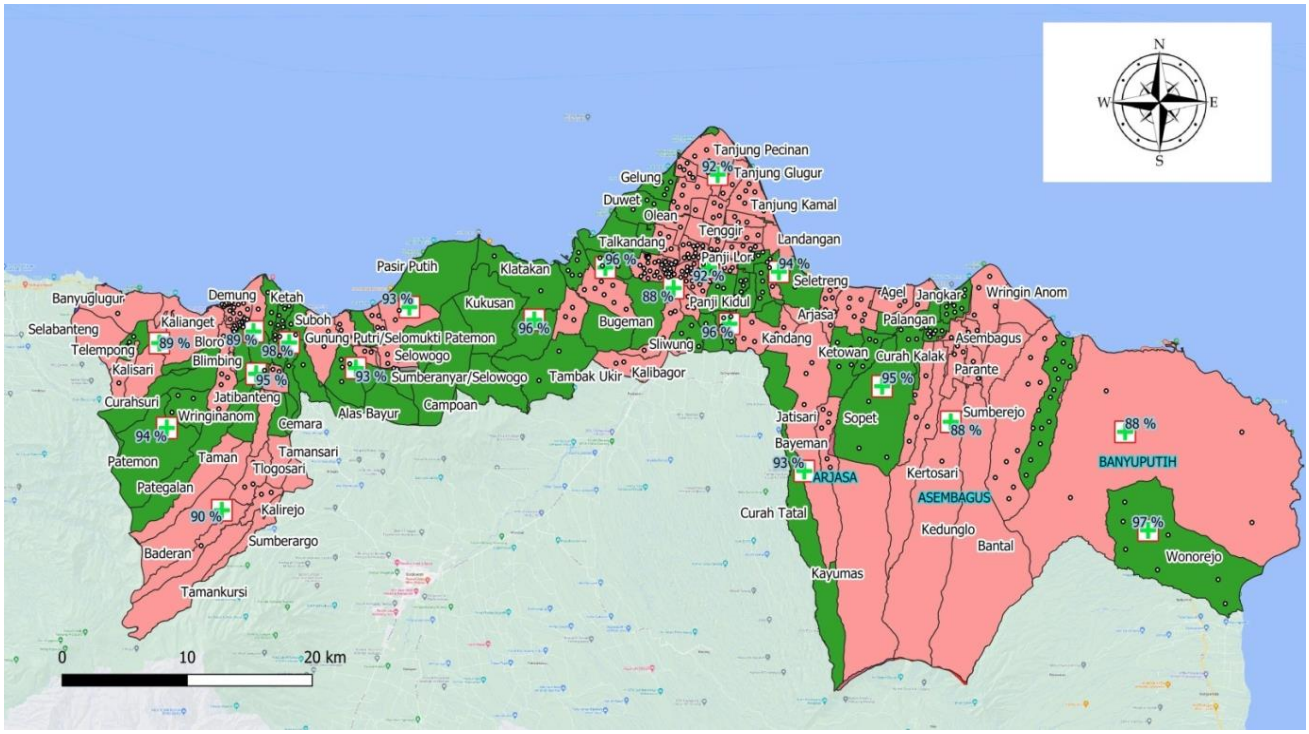


Note

- ○ : Cases
- ✚ : Health Center
- : Larvae Free Index (< 95%)
- : Larvae Free Index (> 95%)

Source: DHF and Larvae Free Index Annual Report Situbondo Health Office, 2020

Figure 2. Distribution Map of DHF and Larvae Free Index Cases in the Situbondo Regency in 2020



Note
- : Cases
- : Health Center
- : Larvae Free Index (< 95%)
- : Larvae Free Index (> 95%)

Source: DHF and Larvae Free Index Annual Report Situbondo Health Office, 2021

Figure 3. Distribution Map of DHF and Larvae Free Index Cases in the Situbondo Regency in 2021

That population density does notaffect the number of dengue cases.[23] Contrary to other studies, there is a very influential relationship between population density and the number of dengue cases.[24] In Karang Malang District, Sragen Regency, it shows that spatially there is a relationship between population density and DHF.[25] Bivariate analysis obtained a value of 0.001. It means that there is a statistically significant relationship between population density and the incidence of dengue cases.

The spread of dengue cases is very high due to the mobility of the population of Situbondo Regency who carries out activities outside the area where they live so the transmission of dengue cases occurs through bites from mosquitoes of the *Aedes* (*Ae. aegypti* or *Ae. albopictus*) infected with the dengue virus and then biting healthy humans. The existence of a place for mosquitoes to breed can lead to dengue cases, such as an area of the house where there are unused bottles so that it becomes a breeding ground for mosquitoes. So the occurrence of a large number of cases of DHF is due to high mobility.[25]

To prevent the occurrence of dengue cases in the Situbondo Regency area, every Situbondo resident is expected to use mosquito repellent lotion when doing activities outside the home to not get bitten by mosquitoes, as a step to prevent transmission of dengue cases. It is recommended for the people of Situbondo Regency to use mosquito repellent lotion when traveling outside the home to avoid mosquito bites and apply eradication of mosquito nests to reduce the number of areas that do not meet the Larvae Free Index requirements, thusthe incidence of dengue cases for the upcoming year is reduced.

CONCLUSION AND RECOMMENDATION

DHF cases in Situbondo Regency in 2019 were 448 cases, in 2020 as many as 331 cases, and in 2021 as many as 475 cases. The most cases of dengue fever in 2019 were at the Mlandingan Health Center, the most dengue cases in 2020 at

the Anchors Health Center, and the most dengue cases in 2021 at the Panji Health Center. The average percentage of Larvae Free Index scores for 3 years (2019-2021) is 91% and there are several areas of health centers whose Larvae Free Index scores for 3 years have never met the requirements, namely Sumbermalang, Banyuglugur, Besuki, Mlandingan, Bungatan, Situbondo, Mangaran, Panji, Kapongan, Arjasa, Asembagus and Banyuputih. The highest dengue cases from 2019, the most common areas are in the work area of the Panji Health Center where the Larvae Free Index score does not meet the requirements. The highest DHF case from 2020 is the area that occurs a lot, namely in the work area of the Anchor Health Center with aLarvae Free Index value that does not meet the requirements. The highest dengue cases from 2021 in the most common areas, namely in the work area of the Panji Public Health Center with Larvae Free Index value that does not meet the requirements.

The results of this study can be used as a source of information in the form of map images for agencies related to the spread of DHF cases and the Larvae Free Index area in order to make it easier to find out information on DHF case data so that the implementation of the DHF case-control program is maximal, by using mosquito repellent lotion when doing activities outside the residence.

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AUTHOR CONTRIBUTIONS

DN and HNM compiled and planned the research; HNM conducted research in the field; HNM, M, and RLA analyzed the data; HNM and DN discussing the results; HNM and M writing papers; HNM and DN compiling the article. DN = Demes Nurmayanti; HNM = Hanifah Nailul Mukarromah; M = Marlik; RLA = Ruslan La Ane.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Factors Associated with Chronic Kidney Insufficiency Stage: A Cross-Sectional Study

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ABSTRACT
Chronic Kidney Insufficiency (CKI) is a kidney disorder that occurs for at least three months and can become a chronic kidney disease. Many risk factors can cause CKI related to individual characteristics and lifestyle. The purpose is to determine the relationship between age, gender, diabetes mellitus, hypertension, smoking, and consumption of energy supplements with CKI stage in a selected hospital in Indonesia. This research was an analytic observational quantitative with a cross-sectional design. The number of samples was 325 patients using the accidental sampling technique. The instrument used creatinine results and Glomerular Filtration Rate calculations based on laboratory tests, questionnaires, and observation sheets. Bivariate analysis with Chi-Square. Most of the respondents in the CKI stage V (38.8%), late elderly (35.4%), male (56.9%) had a history of diabetes mellitus (55.4%), hypertension (67.7%), did not smoke (78.5%), and does not consume energy supplements (62.5%). Bivariate analysis showed a meaningful relationship between age (X^2=8.52, p=0.019), history smoking behaviour (X^2=7.12, p=0.026), diabetes mellitus (X^2=4.39, p=0.037, and hypertension (X^2=7.99, p=0.026) with CKI stage. Age, smoking behaviour, history of diabetes mellitus, and hypertension were associated with the CKI stage.

INTRODUCTION

The number of Chronic Kidney Disease (CKD) patients increases and cause serious health problems. The number of CKD patients from 1990 to 2017 was 697.5 million and Estimates of CKD sufferers in is 37 million 2021 in the United States.[1,2] CKD was ranked 12th as the highest cause of death in 2017; 1.2 million CKD patients died.[3] The incidence of CKD in Indonesia also increases yearly. The number of new patients in 2017 was 30,831 and became 66,433 in 2018, active patients from 77,892 to 132,142.[4] The prevalence of CKD increased from 1.8 to 3.8 in 2018.[5]

CKD patients will experience impaired renal clearance, fluid and Na accumulation, Ca and P imbalances, anaemia, and uremic bone disorders. The decreased function causes the kidneys unable to eliminate toxic metabolic wastes and excess body fluids. This condition requires the patient to undergo dialysis for life. Dialysis is considered if the patient's Glomerular Filtration Rate (GFR) is less than 15 ml/1.73m^2.[6] The ideal frequency of hemodialysis is 2-3 times per week, with 4-5 hours per procedure.[7]

CKD can be caused by other diseases, including hypertension,[8,9] diabetes mellitus,[10] other kidney diseases, SLE, and other unknown causes. The other risk factors include age, gender, smoking history,[11] and consumption of energy supplements.[12] Previous studies have shown more CKD sufferers in adults than in other age groups, more often in men than women, and more often in blacks than in whites.[13,14,15] Previous studies examined patients who had been diagnosed with End-Stage Renal Disease, in contrast to this study uses patients with Chronic Kidney Insufficiency (CKI) and presents data in the form of a description of the stage.

CKD is a health problem with the second-highest cost from the Indonesian Social Security Administration data after heart disease. Therefore, the incidence of CKD must be controlled, and action is needed to reduce the risk of CKD occurrence. One way to prevent CKD is to know the risk factors and control them. Based on these data, researchers are interested in researching factors related to the stage of CKI.

MATERIAL AND METHOD

This research is a quantitative with an observational analytic survey using a cross-sectional design. The study was conducted at the Prambanan Regional General Hospital, Yogyakarta, Indonesia. The independent variables were age, gender, history of diabetes mellitus, history of hypertension, smoking and consumption of energy drinks. CKI's stage became the dependent variable. The research was held from July to December 2020. The total population used patients' data in hemodialysis units, internal medicine rooms, and internal medicine outpatients in 2019, which amounted to 929. Determination of the number of samples used the Slovin formula;

$$n = \frac{N}{\mathrm{N}\ (\mathrm{d}^2) + 1}$$

With details n = number of samples; N = number of the population; d = precision, researchers used 5.0%. Based on the calculation, the minimum sample required is 280 people. The number of respondents who participated in the study were 325 patients. The sampling technique used accidental sampling. The inclusion criteria were patients with CKI problems who were willing to be respondents. Exclusion criteria were history of routine use of analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), tuberculosis and HIV/AIDS, urinary tract infections, and urinary tract stones.

The research instrument was an observation sheet to record age (in years), gender (based on Identity Card), diabetes mellitus (doctor's diagnosis), and hypertension history (doctor's diagnosis). The observation sheet was filled in based on the data contained in the medical record. Another instrument was a questionnaire to measure the variables of smoking history and history of consuming energy supplements. The CKI stage uses an examination of creatinine levels with fasting (at least 8 hours) venous blood samples according to the SOP written in the observation sheet. It calculates the GFR value using the formula:

$$GFR\ \left(\frac{ml}{minute}\right) = \frac{(140 - age)\ x\ weight\ (kg)}{72\ x\ serum\ creatinine}$$

In women, the result is multiplied by 0.85. The unit of GFR is ml/minute/1.73 m^2. The results of the calculation of the CKI stage are divided into 5, normal (GFR 90), Stage I (GFR 60-89), Stage II (GFR 45-59), Stage III (GFR 30-44), Stage IV (GFR 15-29), and Stage V (GFR < 15). Three assistants assisted data collection with the minimum criteria for nursing a Diploma in Nursing education and a working period of 7 years. Researchers explain the purpose, benefits, and process of the research. Researchers also explained what should and should not be done during the research process. Respondents signed informed consent as evidence of agreeing to participate in the study. The study was conducted after obtaining ethical clearance from the Ethics Commission of Universitas Respati Yogyakarta 140.3/FIKES/PL/VII/2020 and research permission from the Director of the Prambanan Hospital with Number 070/494. Univariate analysis using frequency distribution and the bivariate test using Chi-Square.

RESULTS

Age data is categorized into six stages according to the Ministry of Health of the Republic of Indonesia, namely late adolescence (17-25 years), early adulthood (26-35 years), late adulthood (36-45 years), early elderly (46-55 years), late elderly (56-65 years), very late elderly (65 years and over). Table 1 showed the most common is in the late elderly (35.38%) and males (56.92%). Most had a history of diabetes mellitus (55.38%) and hypertension (67.69%). The majority of respondents did not have a history of smoking (38.15%) and did not consume energy supplements (62.46%).

Table 2 shows that the percentage of stage CKI increases with age; the elderly, late and very late elderly show the incidence of stage V > 20%. Based on gender, male and female respondents were mainly in Stage V, at 28.0% and 10.8%. Most patients with diabetes mellitus and hypertension had Stage V, with 34.8% and 34.2%, respectively. Patients who do not smoke show the highest percentage of Stage I (17.7%), while cigarette consumption shows more stage V events than non-smokers. The incidence of stage I CKI mainly was in people who did not take stamina-enhancing supplements (6.5%). The incidence of stage V showed almost the same results between consuming supplement stamina and not consuming.

Based on the results of the bivariate test, the independent characteristics-age, is related to the CKI stage (X^2=8.52, p=0.019). At the same time, however, gender does not show a significant relationship (X^2=1.96, p=0.259). History of diabetes mellitus and hypertension was associated with the stage of Chronic Kidney Insufficiency (X^2=4.39, p=0.037 and X^2=7.99, p=0.023). The patient's lifestyle related to the CKI stage was smoking behaviour (X^2=7.12, p=0.026), while the consumption of stamina enhancing supplements showed no correlation (X^2=2.70, p=0.184).

Table 1. Characteristics of Respondent

Characteristics	n = 325	%
Age		
Late adolescence	15	4.62
Early adulthood	15	4.62
Late adulthood	35	10.77
Early elderly	76	23.38
Late elderly	115	35.38
Very late elderly	69	21.23
Gender		
Men	185	56.92
Women	140	43.08
Diabetes Mellitus		
Yes	180	55.38
No	145	44.62
Hypertension		
Yes	220	67.69
No	105	32.31
Smoking Behaviour		
No	124	38.15
Mild	62	19.08
Moderate	75	23.08
Severe	64	19.69
Consumption of Energy Supplements		
No	203	62.46
Not Every Day	97	29.85
Every Day	25	7.69
Chronic Kidney Insufficiency Stage		
Stage I	24	7.38
Stage II	34	10.46
Stage III	50	15.38
Stage IV	91	28.00
Stage V	126	38.77

Source: Primary Data, 2020

DISCUSSION

The early stages of CKI have not caused real signs and symptoms, so many do not know. Although asymptomatic, functionally, the body has increased urea and creatinine levels.[16] If there are no symptoms, it is infrequent for patients to check their conditions at health facilities; patients will come when they have complaints. Stage V patients will experience more severe signs and symptoms due to progressively damaged kidney function. The kidneys can no longer maintain fluid and electrolyte balance and cannot dispose metabolic waste.[17] Following the results of this study, patients with stage V must undergo hemodialysis to clear waste metabolites.

The study results prove that not only can CKI attack elderly but also other various ages, as in this study, it is known that it can strike in late adolescence. Age is one of the non-modifiable factors that play a role in the progression of CKI, especially in old age.[18] The study results are in line with previous studies that more CKD incidence is in elderly than younger people.[19,20] Decreased estimated glomerular filtration rate (eGFR) in older people is one of the risk factors for high CKI cases at that age.[21] In addition, for several other reasons for the high prevalence of comorbid conditions (such as prostatic hypertrophy or congestive heart failure), drugs and medical interventions for the treatment of comorbid conditions can cause or influence the development of CKI.[22] The results also showed that more men were diagnosed with CKI than women. Men are at greater risk than women regarding lifestyle, work, and sex hormones.[23] In line with previous research that most CKD sufferers are male.[24] The results showed that gender was not related to the stage of CKI; both men and women had the same chance of developing CKI. The results of the study are in line with Harris's research which states that the gender is not associated with the incidence of CKD.[25]

Table 2. Factors Associated with Chronic Kidney Insufficiency Stage

Variables	Chronic Kidney Insufficiency Stage												$X^2(p)$
	Stage I		Stage II		Stage III		Stage IV		Stage V		Total		
	n	%	n	%	n	%	n	%	n	%	N = 325	%	
Age													
Late adolescence	1	0.3	2	0.6	3	0.9	3	0.9	6	1.8	15	4.6	
Early adulthood	2	0.6	1	0.3	2	0.6	6	1.8	5	1.5	15	4.6	
Late adulthood	4	1.2	5	1.5	7	2.2	6	1.8	13	4.0	35	10.8	8.52
Early elderly	7	2.2	8	2.5	15	4.6	24	7.4	21	6.5	71	23.1	(0.019)
Late elderly	4	1.2	13	4.0	15	4.6	37	11.4	46	14.2	115	35.4	
Very late elderly	6	1.8	5	1.5	8	2.5	15	4.6	35	10.8	69	21.5	
Gender													
Men	7	2.2	13	4.0	10	3.1	64	19.7	91	28.0	185	56.9	1.96
Women	17	5.2	21	6.5	40	12.3	27	8.3	35	10.8	140	43.1	(0.259)
Diabetes Mellitus													
Yes	4	1.2	5	1.5	13	4.0	45	13.8	113	34.8	180	55.4	4.39
No	20	6.2	29	8.9	37	11.4	46	14.2	13	4.0	145	44.6	(0.037)
Hypertension													
Yes	11	3.4	13	4.0	22	6.8	63	19.4	111	34.2	220	67.7	7.99
No	13	4.0	21	6.5	28	8.6	28	8.6	15	4.6	105	32.3	(0.023)
Smoking Behaviour													
No	22	6.8	27	8.3	46	14.2	19	5.8	10	3.1	124	38,2	
Mild	1	0.3	3	0.9	2	0.6	26	8.0	30	9.2	62	19,0	7.12
Moderate	1	0.3	2	0.6	1	0.3	22	6.8	49	15.1	75	23,1	(0.026)
Severe	0	0.0	2	0.6	1	0.3	24	7.4	37	11.4	64	19,7	
Consumption of Energy Supplements													
No	21	6.5	23	7.1	31	9.5	65	20.0	63	19.4	203	64,5	
Not Every Day	2	0.6	9	2.8	11	3.4	17	5.2	58	17.8	97	29,8	2.70
Every Day	1	0.3	2	0.6	8	2.5	9	2.8	5	1.5	25	7,7	(0.184)

Source: Primary Data, 2020

There are more patients who have a history of diabetes mellitus than those who do not. The study results are in line with previous studies that most of CKD patients have a history of diabetes mellitus.(10) Diabetes mellitus causes microvascular disease, one of which is impaired flow to the kidneys. Decreased blood flow causes diabetic nephropathy as a significant factor in terminal renal failure.[26] This study supports previous research that there is a relationship between the last patient's diabetes mellitus and the incidence of CKD.[27,28] However, the results are not following previous studies, that the diabetes mellitus variable is not associated with the incidence of CKD in patients on hemodialysis.[29]

The results showed more patients with a history of hypertension, in line with previous studies, that most CKD occurred in patients with a history of hypertension.[30] The study results prove the theory that hypertension is associated with CKD incidence. Hypertension causes vasoconstriction of the renal blood vessels so that the blood flow that carries nutrients and oxygen is impaired. This condition results in damage to the kidney cells. Old age can cause kidney nephrons to die and not function.[31] The study results are in line with previous studies; there is a significant relationship between hypertension and stadium of CKD.[9] The opposite effect in the Kalengkonga study was that there was no relationship between hypertension and the incidence of CKD.[32]

The risk of CKI increases along with cigarette consumption. Nicotine in cigarettes will enter and circulate through the bloodstream and undergo metabolism mostly in the liver and kidneys. Cigarettes have a stimulating effect on the sympathetic nerves. As a result of the race, there will be an increase in blood pressure, heart rate, and the build-up of catecholamines in the bloodstream. In the acute phase, the renal vasculature undergoes vasoconstriction, which increases the resistance of the renal vasculature. Resulting in a decrease of the glomerular filtration rate and filter fraction.[33] The results of the study support previous research stating that there is a relationship between a history of smoking and the incidence of chronic kidney failure.[8,34,35]

Research data shows that more patients do not have a history of consuming energy supplements. Energy drink supplements contain several psychostimulants, such as caffeine and amphetamines. Caffeine and taurine are contents of energy supplements that can harm kidneys. The diuretic effect is obtained due to increased blood flow to the kidneys and accelerates the glomerular filtration rate. In addition, it is also due to a reduction in the reabsorption process in the renal tubules.[36] Amphetamines trigger vasoconstriction of arteries leading to the kidneys, resulting in decreased blood flow to the kidneys resulting in reduced nutrients and oxygen needed by the kidneys. The lack of blood flow causes kidney cells to experience ischemia, stimulates inflammation, and ends with a decrease in blood-filtering power.[29]

This study showed no relationship between energy supplement consumption and CKI stage, in line with previous research that there was no relationship between energy supplement consumption and CKD.[37] Many food supplements are circulating in society, such as vitamins and minerals, plant ingredients and extracts, proteins and amino acids, omega-3 fatty acids, probiotics, and prebiotics.[38,39] The initial purpose of food supplements is to compensate for nutritional deficiencies. An unbalanced diet extends life and provides several benefits for disease.[39, 40] In this study, the self-questionnaire only asked about the habit of taking supplements but did not ask in detail about the type, duration, dosage, and content of the supplements. The unequal distribution of respondents between those who consumed and did not consume energy supplement drinks could be one of the factors in the study's results showing no relationship. On the other hand, the opposite results were shown by other studies, namely the relationship between consumption of energy drinks containing a combination of caffeine and taurine with the incidence of CKD.[12]

This study has several limitations since researchers does not limit the educational background and knowledge of the respondents, the instrument is made simple with a limited number of questions. This study results in the loss of some detailed information. Researchers did this to get a large number of respondents. This study shows data on the number of cigarettes and energy supplements consumed each day without more detailed information about these two behaviours. However, despite the limitations of this data collection, this study

applying a simple, economic and contact-free approach, most importantly, can produce significant results in a short period of time.

CONCLUSION AND RECOMMENDATION

The results showed that the factors associated with the CKI stage were age, smoking behaviour, history of diabetes mellitus and hypertension. Meanwhile, gender and history of energy supplement consumption were not related to the CKI stage. People with hypertension and diabetes mellitus can be more vigilant in maintaining their health and avoiding factors that aggravate the CKI stage. Therefore, it is necessary to regularly check health-related blood sugar control, blood pressure and kidney function and implement a healthy lifestyle considering the signs and symptoms that do not appear in the early stages. Stage V patients are advised to routinely perform hemodialysis and comply with the management to avoid further complications.

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AUTHOR CONTRIBUTIONS

Study conception and design SF, NHR, and UK; Data collection SF, NHR, and UK; Data analysis and interpretation SD, AN, SF, UK, and FLI; Drafting of the article SF, NHR, UK, SD, and FLI; Critical revision of the article SF. SF = Siti Fadlilah; NHR = Nazwar Hamdani Rahil; UK = Uswatun Khasanah; SD = Santi Damayanti; AN = Ariyanto Nugroho; FLI = Fika Lilik Indrawati.

CONFLICTS OF INTEREST

There was no conflict of interest in this study.

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Relationship between Food Calories Intake and Lung Function in Pedicab Drivers in Surabaya City

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ABSTRACT
The increasing number of motor vehicles will increase the exposure of air pollution. Air pollution can cause respiratory disorders, especially on pedicab drivers who are working. Respiratory disorders are one of the diseases that can reduce quality of life and one of the risk factors of respiratory disorders is malnutrition. The purpose of this study was to determine the calorie intake of pedicab drivers with and without lung function impairment. This study uses analytical cross-sectional study, correlational study by using purposive sampling. Variables include: food calorie intake with 24-hour recall method. Respondents in the study consisted of 112 respondents in lung function impairment group (60 people (53.57%) had a deficit level of food calorie intake) and 11 respondents without the impairment group (5 people (45.45%) had a deficit level of calorie intake). The average types of food that were consumed by lung function impairment group are rice, tofu, tempeh, eggs, and sambal. There was no significant difference (p>0.05) between each item consumed by respondents. There was no significant difference of the effect of calories between the two groups (p>0.821). Therefore, it can be concluded that low intake of calories can be related to lung function, although further research is still needed regarding the relationship.

INTRODUCTION

The second largest city in Indonesia is Surabaya. At present, air pollution in urban areas, including in Surabaya, has become a serious problem. The use of fuel which is used as a driving force for vehicles, engine ventilation systems, and most notably the exhaust from the combustion of fuel combustion is the mixing of hundreds of gases and aerosols and the main cause of the release of various pollutants.[1] The increasing use of motor vehicles and urban energy consumption are two factors that can contribute to a decline in air quality, if not controlled, it will worsen air pollution, congestion, and the effects of climate change which cause health, productivity, and economic harm to the country.[2] Air pollution is the cause and factor that causes many respiratory diseases such as Chronic Obstructive Pulmonary Disease (COPD), asthma, and lung cancer.[3-5] This can affect the pulmonary physiology of people who are on the streets, especially on pedicab drivers who are working.[6,7]

Several studies have been conducted regarding the relationship between socioeconomic status and respiratory disorders.[8,9] Pedicab drivers have also been shown to tend to have Lead (Pb) blood levels that exceed the normal threshold because they often rest around the road,[10] these Pb levels can also be exacerbated by smoking habits where Pd is one of the toxic components contained in a cigarette. Therefore, pedicab drivers are at high risk of experiencing chronic lung dysfunction, especially COPD.

Various dietary patterns have been linked to the risk of respiratory disease. A person's nutritional status is an important factor affecting the development of the disease course of lung function disorders. Diet and nutrition are modifiable factors in chronic disease development and progression.[11-13] Socioeconomic status is closely related to the fulfillment of nutrition of the community. Socioeconomic factors can affect various aspects of life, including daily eating habits.[13-15] The relationship between malnutrition and chronic lung disease (including COPD) has long been known, where malnutrition has a negative influence on the structure, elasticity, and function of the lungs, strength and endurance of respiratory muscles, defense mechanisms of lung immunity, and breathing regulation. Conversely, lung disease (including COPD) will increase energy requirements and can decrease dietary intake. Nutritional interventions in COPD patients are aimed to control anorexia, improve lung function, and control weight loss. The need for nutrients is calculated according to the results of the nutrition assessment.[15-17]

The condition of malnutrition can also be aggravated by the condition of decreased appetite which can occur among smokers because smoking can weaken and interfere the somatosensory function of the tongue. In addition to smoking that can affect appetite, cigarettes also constrict the heart blood vessels, and digestive tract so that it interferes with the process of absorption of nutrients. Hence, decreased appetite and impaired absorption of nutrients can cause nutritional disorders.[18-20]

Nutritional status can be measured with quantitative methods to find out the amount of food consumed so that consumption of nutrients can be calculated by using the Food Consumption List (*Daftar Konsumsi Bahan Makanan/DKBM*) or other required lists such as the Household Size List (*Ukuran Rumah Tangga/ URT*), the Raw-Cook Conversion List (*Daftar Konversi Mentah-Masak/DKMM*) and list of oil absorption. Currently, the 24-hour recall method is still used to acquire data on food consumption. with the consideration that it does not require a large amount of time and cost but has a lower level of accuracy.[21] Calories as part of nutrition have a very important role, where it is converted into energy in the body. Without energy, the cells in the body would die and the lungs would stop. Over-consumption of calories causes overweight which causes the lungs to work harder causing breathing difficulties.[15]

Figure 1 showed the conceptual framework of the research. In an earlier study by Suryadinata, et al from November 2015 to January 2016 at a private university in South Surabaya, 110 respondents examined were divided into 2 groups, smokers and non-smokers. Based on BMI measurements, there were 6 respondents experiencing malnutrition among smokers and 2 respondents among non-smoker respondents.[22] In conclusion, the purpose of this study was to know the calorie intake of pedicab drivers with and without lung function impairment.

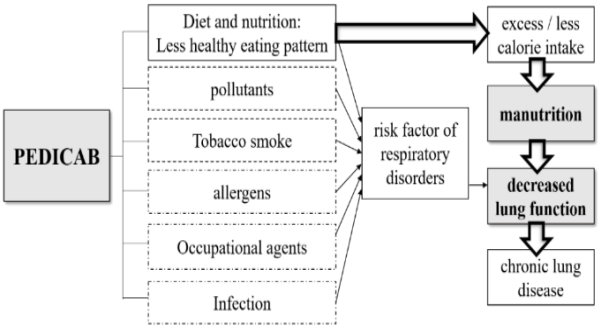

Figure 1. Conceptual Framework the Research[15-17,22]

MATERIAL AND METHOD

This research method is an analytical cross-sectional study with direct interviews, located around Surabaya area. The research period started from April 2019 to September 2019 and No. 011/KE/III/2018 had been issued by the University of Surabaya as a certificate of ethics for the study. The lung function test of the respondents used the spirometry method (CONTEC SP10®) with instructions given by the physician, where the respondent would be divided into two groups (lung function impairment group and without lung function impairment group). The research variable to be measured in this study was the calorie intake consumed by respondents by 24-hour recall method, where the data obtained were ordinal scale, namely deficit (<80% of the minimum size measurement of calorie intake) and non-deficit (≥80% of the minimum calorie intake).

The population in this study was the pedicab drivers in Surabaya, East Java. The sample of this study were from populations that have met the criteria, including becoming a pedicab driver for >10 years; active smoker (a person who had smoked more than 100 cigarettes during his life and still smoked the last 28 days); and had no appetite problem or eating patterns. The sampling technique used purposive and consecutive sampling methods. The sample size used in this study was at least 70 people. The method for calculating the sample was used a formula for which the population was known. In 2016, the population size was known based on research into Surabaya's pedicab transportation policies from 1970 to 1980.[23] This study stated that pedicab provisions that were operated during the daytime were 2/3 of the total number of pedicabs, at 400, so that a large population can be 2/3 of 400 which was 266. The sample size in this study (n) was at least 100.

Then, this study used the 24-hour recall method to measure food consumption as an interview guide in the preparation of interview questions. The 24-hour recall method was carried out three times but not consecutively, Because the scheme illustrates the variation in calorie and nutrient intake, it is applied three times on weekdays and once on weekends. In this study, respondents received questions about food and beverages consumed in the previous 24 hours, including portion sizes, using a picture of a spoon, a plate, a glass, or another measurement commonly used daily as stated.[24] The results are then synchronized with the daily average intake. The data acquired in this study are primary data collected directly from research participants via direct dialogue (interviews). Then the data were presented descriptively. Data analysis used to determine the relationship of food calorie intake with pulmonary function (FEV1/FVC) with an ordinal scale was chi-square test.

RESULTS

Characteristics of the Respondents

The number of pedicab drivers involved in the study was 123 people, with 112 people in the lung function impairment group and only 11 people without the lung function impairment group. Most of Body Mass Index (BMI) in both groups were normal, while respondents with a disease history of most frequently encountered in the lung function impairment group, with 11 respondents, and none from the other group (Table 1). All values of the P value showed the value of $p>0.05$ which mean there was no difference between the two groups so that the distribution of characteristics does not affect the two groups.

24-Hours Recall Frequency Analysis

The average calories in the group with impaired lung function and without impaired lung function can be seen in Table 2. The calorie intake of group without lung function disorders (2124.07 kcal) was greater than those with lung function disorders (1722.19 kcal). In both groups, the composition of calorie intake on holidays was greater than on weekdays (Table 2). Classification of food calorie intake was divided into 5, namely: deficit (<70% of the value of the minimum measure of calorie intake); less (70-80% of the value of a minimum

measure of calorie intake); sufficient (80-100% of the value of a minimum measure of calorie intake); good (100-110% of the minimum size measure of calorie intake); and more (> 110% of the minimum caloric intake measure value).[25]

The average types of food that were consumed by the lung function impairment group are rice, tofu, tempeh, eggs, and sambal and the drinks that are most often drunk are coffee and tea, while the average types of food consumed by respondents without lung function impairment group are rice, tofu, tempeh, eggs, and sambal and the most frequent drinks are also coffee and tea (Table 3). In addition, there was no significant difference (p>0.05) between each item consumed by respondents.

In Table 4, it was shown that the respondents who had deficit calorie intake were clearly higher in Lung Function Impairment group (60 of 112) compared to respondents in the group without the most significant lung function disorders (5 of 11). Based on the different tests, it showed the real difference in calorie intake and lung function values (p>0.821). The minimum number of respondents that exists between the two different groups was very different, the minimum number varies between respondents. The limitation of this study was that the number of respondents from the two groups is not balanced so the statistical test results may not be appropriate given the disparity of numbers.

Table 1. Characteristics of Respondents

Characteristic	Lung Function				*p-value*
	Lung Function Impairment Group		Without Lung Function Impairment Group		
	n = 112	(%)	n = 11	(%)	
Age (Years)					
Early-late adults (≥45)	26	23.21	2	18.18	0.818
Early-late elderly (46-65)	86	76.79	9	81.81	
BMI (kg/m²)					
Thin	8	7.14	1	9.09	
Normal	81	72.32	9	81.81	0.941
At risk – obese	23	20.54	1	9.09	
Disease History					
Have Disease History					
Diabetes	5	4.46	0	0	
Hyperuricemia	2	1.79	0	0	1.000
Hypertension	3	2.68	0	0	
Lung disease	1	0.89	0	0	
Don't Know/ None	101	90.18	11	100	
Allergy					
Have Allergy					
Egg	1	0.89	0	0	1.000
Fish	1	0.89	0	0	
Don't Know/ None	110	98.21	11	100	
FEV_1 Value (%)					
Average	49.13786		73.56727		
SD	7.181966		4.208715		

Source: Primary Data, 2019

Table 2. Food Intake Profile of Respondents That Contain Calories

Food Calories Intake (kcal)		Lung Function Impairment Group	Without Lung Function Impairment Group
Recall 1st (kcal)	Recalls held on holidays	1886.76	2281.43
Recall 2nd (kcal)	Recalls held on weekdays	1646.95	2142.32
Recall 3rd (kcal)	Recalls held on weekdays	1636.99	1931.69
Average Recall 1st, 2nd, and 3rd (kcal)		**1722.19**	**2124.07**

Source: Primary Data, 2019

Table 3. Food Intake Profile of Respondents That Contain Calories

Respondents Consumed	Lung Function								*p-value*
	Lung Function Impairment Group				Without Lung Function Impairment Group				
	n	Mean (kcal)	Minimum (kcal)	Maximum (kcal)	n	Mean (kcal)	Minimum (kcal)	Maximum (kcal)	
Rice	112	737.70	780.1	975.1	11	762.37	520.1	975.1	*
Tofu	94	237.28	247.2	494.5	11	184.77	164.8	247.2	0.205
Tempeh	94	420.97	483.77	530.93	11	348.55	306.68	412.97	0.205
Chili	90	27.01	20.4	35.7	11	24.70	22.1	45.7	0.205
Egg	89	263.03	229.17	286.45	11	264.66	239.71	294.17	0.204
Tea	70	31.64	28.9	38.5	11	47.78	38.5	56.23	0.205
Coffee	65	1652.31	1891.33	2026.4	9	1925.48	1656.8	2563.8	0.288
Chicken Meat	59	106.77	64.2	149.73	7	77.93	64.2	96.25	0.379
Instant Noodle	59	685.43	559.9	839.9	6	621.19	439.45	739.45	0.430
Vegetable Soup	57	358.93	249.5	499	5	452.38	374.5	543.25	0.482
Spinach Soup	48	40.65	28.7	57.4	5	50.5	38.7	67.3	0.488
Tamarind Vegetable Soup	47	197.66	117.6	235.2	3	189.5	135.3	256.6	0.605
Sauteed Vegetables	39	160.43	138	184.05	4	170.02	118.2	198.16	0.573
Vegetable Lodeh	33	195.24	134.2	268.5	8	210.37	128.71	542.21	0.348

*No statistics are computed because rice was a constant
Source: Primary Data, 2019

Table 4. Relationship Food Calories Intake to Lung Function

Calorie Intake Level Classification	Lung Function Impairment Group (n = 112)	Without Lung Function Impairment Group (n = 11)	*p-value*
Deficit	60	3	
Less	33	1	
Sufficient	16	5	0.821
Good	1	1	
More	2	1	

Source: Primary Data, 2019

DISCUSSION

In the pulmonary function disorder group, the most calorie intake level classification was deficit in the group with normal BMI levels of 43 subjects, while the lowest calorie intake level classification was the group with normal BMI level, as many as .1 subject (Table 1). The close relationship between calorie intake and lung function is also strengthened by the analysis (Table 2), proving low fat and high carbohydrate intake reduces lung function only in women. Lung function is positively related to high protein and fat intake, but negatively related to high carbohydrate intake, which can be affected by age and obesity.[26] Most Asians, including Indonesians, consume relatively large amounts of carbohydrates (e.g., rice) as a staple food compared to Western countries, but consume low amounts of animal protein sources.[26]

The most age group was the elderly with normal BMI levels of as many as 48 subjects, most of the elderly respondents have normal BMI. Even in theory, older people are more at risk experiencing an increase in BMI. Elderly with BMI <25 and >35 kg/m2 are at higher risk of experiencing decreased functional capacity, as well as experiencing gait and balance problems, risk of falling, decreased muscle strength, and malnutrition. Obesity among older adults is most likely caused by consuming more calories than energy expenditure. Decreased basal metabolic rate and physical activity level in older adults are important contributors to obesity. Often, in older adults, common changes are in body composition, such as increased fat mass and decreased muscle mass.[27]

Lower BMI was associated with increased mortality at 1 year, but dependent on first-year

survival. Lower BMI resulted in a similar or lower risk of death compared to reference. Patients with lower BMI, who have limited comorbidities and better physical function, have a better survival.[28]

Respondents' nutritional intake was assessed using the 24-hour recall method. In the measurement, several factors that can affect a person's nutritional intake, including: Nutrition knowledge, which is an important component in health. Low knowledge is often associated with poor health outcomes and a lack of nutrition in adults.[29] The existence of bad habits or certain restrictions in fulfilling a person's nutritional intake, the existence of excessive food preferences will result in a lack of variety of food so that the body does not get nutritional intake from other sources. Economic status can affect one's nutritional status,[30] and alcohol consumption can contribute to nutritional deficiencies.[31]

Psychological factors also affect patterns of high-calorie food intake. Studies by Park showed the identification of eight genetic variants associated with sweet taste preference in genes involved in taste receptor signaling. Adults with an intense need for sweet flavor have a higher consumption of sucrose-containing foods and an increased glucose tolerance.[32] The genetic impact is eliminated by high mental stress and absence of physical activity.[33] Foods that contain low fiber and low protein can trigger type 2 diabetes mellitus. The condition of this disease is exacerbated by high stress increases with high sugar-sweet food intake, because high anxiety can cause the release of sympathetic hormones which can increase cortisol and glucose levels. decrease insulin release, or affect insulin hormone sensitivity and resistance.[34,35]

The 24-hour food recall method has both advantages and disadvantages. The difficulty in carrying out the 24-hour recall method is highly dependent on the respondent's memory. Therefore, respondents must have a good memory, so this method is not suitable for children under 7 years old, parents over 70 years old, and people who have memory loss or forgetful people.[36] But in practice, the 24-hour recall method is relatively cheap, easy to implement, and does not overburden respondents.[21,36] This 24-hour food recall method should be combined with the Food Frequency Questionnaire (FFQ) method so that the data obtained would also asses the frequency of various types of foods within a certain period time so that it can describe a person's daily food consumption patterns.[21,36] Between these two methods, there is nothing superior because everything is seen from the initial purpose of each study.

Some limitations of this study include: This study does not look at other things that affect the respondent's nutritional intake such as education factors, gender differences, and environmental factors, so the results obtained only measure one parameter that can affect nutritional intake, which is only smoking. The parameter of calorie intake measurement in this study still cannot describe the actual condition of the respondent's calorie intake because to see someone's nutritional intake in the interview we have to weigh what is eaten by the respondent.[6,7] From many types of food consumed by respondents, several calorie comparisons are available in each of these foods consisting of rice, chicken meat, and egg.

Rice is in the top of food pyramid, it is included in the food group that must be consumed by the body every day, which is grains. Because the body requires a lot of nutrients and all of the nutrients cannot be obtained from just one food source. White rice has lower fiber compared to cooked rice from mixed rice (whole grains). In mixed rice, the white rice is mixed with grains of other types, so that there is more fiber and fewer carbohydrates than many types of processed rice.[37] The type of processed chicken can affect the number of calories. For Eggs, how to process and the origin of eggs have different calories. The biggest calories come from duck eggs (salted eggs) compared to chicken eggs.[38]

CONCLUSION AND RECOMMENDATION

Based on the results of research conducted on pedicab drivers in Surabaya, it can be concluded that the description of the calorie intake, the majority of people with respiratory distress status had deficit calorie intake (53.57%), and the level of calorie intake in the group without respiratory distress majority is sufficient (45.45%). However, there was no significant

difference in the effect of calories on food between the two groups (p>0.821).

Therefore, in elderly patients, to maintain healthy lung function, it is better to pay attention to food intake, by reducing calorie intake and increasing protein intake.

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AUTHOR CONTRIBUTIONS

From the research process until the writing of this article, all authors played a role in this research. AL plays a role in compiling and designing the research, RVS acts as a data analyzer, and RDA and INYD act in data collection in the field. AL = Amelia Lorensia; RVS = Rivan Virlando Suryadinata; RDA = Reza Dwi Anggrealdi; INYD = I Nyoman Yoga Diputra.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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