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Chemical Composition and *In vitro* Antibacterial and Cytotoxic Effect of *Nigella sativa* L. Seed Extract

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Abstract

Nigella sativa L. is a plant with high medicinal profile in the treatment of diseases. This study aimed to assess the chemical composition and *in vitro* antibacterial and cytotoxic effect of *Nigella sativa* L. seed extract. Seeds were purchased from supermarket and blended into powder using electric blender. The powder was macerated with 96% methanol. The extracts were then qualitatively screened to test the presence of secondary metabolites and agar well diffusion method was employed to study the antibacterial activity of extracts. In this evaluation, 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay was used to examine the cytotoxic effect of extract on peripheral blood mononuclear cells (PBMCs). MTT assay was done on different extract concentrations for 3 days and the results were recorded daily. The findings revealed the presence of tannins, terpenoids, steroids, saponins, alkaloids, phenolic compounds and flavonoids. The antibacterial activity was observed with the inhibition zones ranging from 11.3 ±1.1 to 16.3 ±1.5mm while the minimum inhibitory concentration (MIC) values of extract ranged between 0.5 and 1.25 µg/mL. The black seed extracts contain bioactive substances with germicidal activity and in vitro administration of black seed extract up to the dose of 100 µg/mL resulted no cytotoxic effect on PBMCs.

Introduction

The unreasonable utilization of antibiotics, long-term consumption and inappropriate treatment and prevention measures are the culprits that accelerate the resistance of different pathogenic microorganisms to commercial antibiotics (Soni & Sosa, 2013). Moreover, the ineffectiveness of the antibiotics, they are either unavailable, expensive or the main inducers of various side effects on human body (Gracelin et al., 2012; Kaleena et al., 2011). The increased ability of pathogenic microbes to develop a resistance to the effects of antimicrobial medications is considered as a global health threat that requires extensive and collaborative researches to find an alternative source of antimicrobial products to synthetic chemical treatments (Ugur et al., 2016). Medicinal plants have many bioactive compounds with great pharmacological importance. It has been documented a long time ago that different herbs and the extracts from their diverse parts have varying degrees of antimicrobials with therapeutic potential (Islam et al., 2012). From that standpoint, World Health Organization (WHO) has permitted countries to integrate herbal medicine in their health care systems (WHO, 2013).

Nigella sativa L. is a yearly flowering dicotyledon medicinal plant which belongs to the genus *Nigella* L. of the family Ranunculaceae (Hamza & Al-Harbi, 2015). It is also known as black seed or black cumin in different parts of the world (Paarakh, 2010), and a seed of blessing in the bible (Masood Alam Khan, 2019). *Nigella sativa* L. seeds were scientifically documented

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to contain many natural ingredients, such as carbohydrates, chains of amino acids and sugars like glucose, rhamnose, xylose, arabinose. Some vitamins such as thiamine, niacin, riboflavin, pyridoxine, and folic acid were also reported to be present in the black seeds (El-Naggar et al., 2010). Black seeds are rich in crude fiber, minerals like Ca2+, Fe 3+, and K+, fatty acids such as oleic, linoleic, and palmitic acids, terpenoids, and alkaloids such as nigellidine, nigellimine, and nigellicine (Hassan et al., 2017). Nigella sativa seeds contains the important active compounds called thymoquinone, dithymoquinone, thymohydroquinone, thymol, carvacrol, nigellimine-N-oxide, saponins and alpha-hederin (Abraham, 2019; Aljabre et al., 2015), which have a significant function in the treatment of diabetes (Younus, 2018).

The phytoconstituent of these black seeds have been shown to have anticancer (Younus, 2018), antioxidant (Hassan et al., 2017), gastroprotective, hepatoprotective, analgesic, anti-inflammatory (Aljabre et al., 2015), antihypertensive (Ahmad et al., 2013), antidiabetic (Mohammed et al., 2019), antihistaminic, antinematodal, antischistosomal, anthelmintic, and antimicrobial impacts (Masood A. Khan et al., 2018). The black seed oil has the ability to increase the bile flow and to treat diabetes, polio, diarrhea, back pain, and rheumatoid arthritis. It also plays a major role in the treatment of various diseases like fever, headache, asthma, common cold, migraine, allergies and bronchial pulmonary disorders (Kiari et al., 2018; Kumar & Rehman, 2019). The seed extracts of *Nigella sativa* L. also demonstrate the ability to inactivate MCF-7 breast cancer cells (Mahmoud & Torchilin, 2013). After considering the traditional roles of *Nigella sativa* L. seeds and to acknowledge the importance of this herbal plant in the pharmaceutical field, this study is attempted to assess the chemical composition and in vitro antibacterial and cytotoxic effect of *Nigella sativa* L. seed extract.

Methods

The black seeds were purchased from the supermarket in Kigali, Rwanda. The seed identification was done in the laboratory of Botany, Biology department, University of Rwanda. The healthy seeds that were not showing any mechanical injury and observable rot were washed three times with distilled water and allowed to dry overnight at 40°C. Right after drying, the seeds were blended into powder by using an electric blender. 100 g of powdered seed material was macerated with 96% methanol (1:5) for 3 days using rotary shaker. After extraction, the extracts were decanted and then filtered through Whatman filter paper No. 1. Crude extracts were obtained by evaporating the solvents using rotary evaporator. The yielded thick extracts were dissolved in 2% Sodium Carboxymethyl Cellulose (CMC Na 2%) and the obtained extracts were refrigerated at 4°C for the next stage of the research (Callixte et al.,2020).

The phytochemical screening of the extracts was systematically assessed in accordance to standard method whereby qualitative evaluations were done for different plant bioactive substances like flavonoids (Shinoda test) and steroids (Salkowski test) (Callixte et al., 2020). The other phytoconstituents that were tested are tannins (Ferric chloride test), alkaloids (Wagner test), saponins (Froth test) and phenolic compounds were examined by following the methodology published by Kumar and colleague (Kumar & Rehman, 2019). To qualitatively screen the availability of terpenoids in the extracts, 5 mL of the crude extracts were mixed with 3 mL of chloroform followed by the addition of 2 mL of sulphuric acid. The formation of brown ring confirmed the availability of terpenoids in the screened extracts (Callixte et al., 2020).

The extract of *Nigella sativa* L. seeds was evaluated against a number of ordinal bacteria including *S. aureus* American Type Culture Collection (ATCC) 29213, *Enterococcus faecalis* ATCC 29212, *Pseudomonas aeruginosa* ATCC 27853.The evaluation of antimicrobial activity was done was on the seed extracts via the agar well diffusion method whereby every tested bacterium was aseptically cultured on Mueller–Hinton agar. Three created wells using a cork borer were filled with 100 µL of seed extracts separately and the inoculated plates were then incubated in upright position at 37ºC for 24 hours and dimethyl sulfoxide (DMSO) was used as a negative control and Gentamycin

was employed as a control positive. All the tests were done in triplicate and the inhibition zones were measured in millimeters using Vernier caliper and recorded as the mean±standard deviation (Azizi et al., 2017).

The minimum inhibitory concentration (MIC) is normally defined as the lowest concentration that shows the ability to inhibit the visible growth of bacteria after an overnight incubation. In this study, MIC was determined by broth microdilution method according to the guidelines from the Clinical and Laboratory Standards Institute (Wayne, 2013). 10.24 mg *Nigella sativa* L. seed extract was mixed with 10 mL of DMSO for the sake of preparing a stock solution and the serial dilutions were done ranging from 16 µg/mL to 0.25 µg/mL using Mueller–Hinton broth. A single colony of each test microorganism was diluted in 9 mL of peptone water and acclimatized to give the equal concentration of bacterial cells of 5 × 105 colony-forming units/mL. Following the suspension, 100 µL was inoculated into each well and the Petri dishes were incubated at 35°C for 24 hours (Ugur et al., 2016).

During the analysis of cytotoxicity, human blood was used and the separation of peripheral blood mononuclear cells (PBMCs) and was done by using a Vacutainer which contains the cell separation medium with $NaNO_3$ and follow the instructions as indicated by manufacturer (Rahman et al., 2014). The cytotoxic activity of *Nigella sativa* L. seed extract against PBMCs was evaluated on different concentrations namely 25, 50, and 100 µg/mL, respectively following the incubation for 1,2 and 3 days using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay as described in various published articles (Mohammed et al., 2019). Briefly, a volume of 20 µL of tetrazolium dye was added to every single well at a concentration of 5 mg/mL that was dissolved in phosphate buffer saline followed by the incubation of all plates for the duration of 4 hours at 37°C. Subsequently, 180 µL of the solution was removed from the wells and substituted with 100 µL of dimethyl sulfoxide (DMSO). The rotary shaker was used for mixing the solutions and eventually the results were obtained by using the ELISA microplate reader (Mohammed et al., 2019).

Results and Discussion

The core findings of this experimental study showed the presence of bioactive substances in black seed extracts which have germicidal properties such as tannins, terpenoids, steroids, saponins, alkaloids, phenolic compounds and flavonoids as presented in table 1. This evaluation also demonstrated that the availability of phytoconstituent in *Nigella sativa* L. seed extracts favorized their antibacterial activity against all the tested bacteria but the extracts showed high effectiveness against Gram-positive than Gram-negative bacteria as indicated in Table 2. This could be emphasized by the fact that *S. aureus* ATCC 29213 showed great sensitivity with 16.3 mm of inhibition zone and *P. aeruginosa* demonstrated low but enough sensitivity with 11.4 mm of inhibition diameter as shown on figure 1. The black seed extracts didn't show any effect on the proliferation of normal human PBMCs during the period of three days and the used concentrations of extract as indicated by the results presented in table 3.

To plainly discuss the findings of the current study, number of herbal plants have won researcher's attention due to their purified constituents which have outstanding therapeutic potentials. From that standpoint, this research was aimed to light its beams on the chemical composition and in vitro antibacterial and cytotoxic effect of *Nigella sativa* L. seed extract. The presence of these secondary metabolites in tested black seed extracts is in

Table 1. The Qualitative Results of the Chemical Tests of Methanolic *Nigella sativa* L. Seed extracts

Extracts	Tannins	Steroids	Terpenoids	Saponins	Alkaloids	Phenols	Flavonoids
Seed extracts	+	+	+	++	++	+++	++

Source: Primary Data, 2020

Table 2. Antibacterial Activity of Black Seed Extract Assessed by Agar Well Diffusion Method

Bacteria	Inhibition zones(mm)			MIC(µg/mL)
	100 µL of seed extracts	DMSO	Gentamycin (30 mg/mL)	
S. aureus ATCC 29213	16.3 ±1.5	0	25.6±0.5	0.5
E. faecalis ATCC 29212	14.5 ±0.5	0	20.6±1.1	2.5
P. aeruginosa ATCC 27853	11.3 ±1.1	0	19±0.5	1.25

Source: Primary Data, 2020

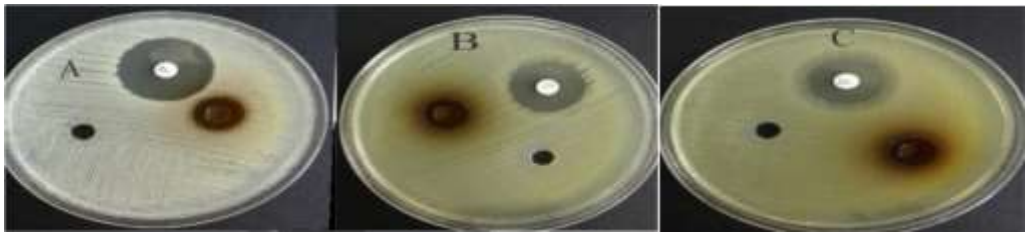

Figure 1. The Antibacterial Effect of Black Seed Extracts Against *S. aureus* ATCC 29213(A), *E. faecalis* ATCC 29212 (B) and *P. aeruginosa* ATCC 27853 (C)

Table 3. The Cytotoxic Effects of *Nigella sativa* L. Seed Extract on Normal Human PBMCs Assessed by the MTT Assay.

Time (days)	Concentration µg/mL	Cell viability (%)
1	25	92
	50	84
	100	78
2	25	89
	50	82
	100	75
3	25	88
	50	80
	100	73

Source: Primary Data, 2020

line with the other studies which reported the availability of tannins, terpenoids, steroids, saponins, alkaloids, phenolic compounds and flavonoids in *Nigella sativa* L. seeds (Amin & Hosseinzadeh, 2016).

In this study, black seed extract showed remarkable effect against Gram-positive bacteria with the greatest zone of inhibition for *Staphylococcus aureus* ATCC 29213. This finding is in tandem with a number of previous researches which emphasized that Gram negative bacteria resist to compounds derived from plants due to the fact that they have a very strong permeability barrier, consisted of the outer membrane, which hinders the penetration of amphipathic compounds and multidrug resistance pumps that extrude toxins across this barrier (Hasan et al., 2013). This statement could be emphasized by the fact that the cell wall composition of Gram-positive and Gram-negative are different. The outer membrane of Gram-negative bacteria composed of phospholipids and lipopolysaccharides that act as a barrier that stop the entrance and reaction of most antibiotics and germicidal substances via cell envelope (Paz et al., 2015).

The antimicrobial activity of black seed extract is also attributed to the availability of thymoquinone and its derivative compounds like thymohydroquinone, dithymoquinone, and thymol (Ugur et al., 2016). Thymoquinone itself was documented to own free rotation

bonds which enable it to rotate and this conformations in CH3 group allows it and other bioactive substances present in black seed to change their shapes, interacts with bacteria and enter or cross their boundary and eventually kill them (Woo et al., 2012). It was as well reported by another study findings that the hydrophobic bioactive substances damage the bacterial plasma membrane, increases cell permeability, disrupt biomolecule synthesis and damage integrity of bacterial cell walls (Scandorieiro et al., 2016).

The extracts inhibit the growth of microorganisms by causing the leakage of proteins and some enzymes from the cell. Flavonoids as one of the secondary metabolites present in black seeds have 3-O-octanoyl-epicatechin which enhance membrane affinity of their long acyl chains. From that perspective, flavonoids that lack hydroxyl groups on their B rings are the most effective substances to hinder microbial membranes than those with hydroxyl (OH) groups (Callixte et al., 2020). Gentamycin as a commercial antibiotic exhibited great bactericidal activity than the examined black seed extracts as clearly presented in table2. As reported from previous studies, the observed germicidal potential of antibiotic than the plant extracts may be attributed to the fact that antibiotics are purified in natural ways and kept in refined states whereas extracts were used in crude forms (Nassima et al., 2019).

In this preliminary study, the black seed extracts didn't show any effect on the proliferation of normal human PBMCs during the period of three days and the used concentrations of extract as demonstrated by results in table 3. This is in tandem with the results of Ugur and Colleagues which did not notice any cytotoxic influence on the proliferation of gingival fibroblasts (Ugur et al., 2016). It is also in conformity with the results published by Mohammed and colleagues that black seed extracts do not have any cytotoxic effect on normal cells (Mohammed et al., 2019). This finding is also in agreement with the previously published in vivo studies where the exposure of cultured rat cortical neurons on different concentrations of *Nigella sativa* L. methanolic seed extract at various times did not induce any toxicity (Nehar et al., 2015). However, this is in controversy with another study that disclosed that the administration of black seed extract increased phagocytic activity of peritoneal macrophages, hepatotoxicity and nephrotoxicity (Mansour et al., 2001; Swamy & Tan, 2000; Yildiz et al., 2010).

The lack of black seed toxicity on PBMCs is in line with the findings obtained by other research which highlighted that the intraperitoneal administration of *Nigella sativa* L. seed extracts for the duration of 5 days did not affect the enzyme levels and change the metabolites in the liver and kidney of rats (Amin & Hosseinzadeh, 2016). This could be assisted by the other research results that reported no observable changes in hepatic enzymes levels such as aspartate-aminotransferase, alanine-aminotransferase, gamma-glutamyltransferase after 288 days of treatment (Zaoui et al., 2002). The safety of black seed derivatives was also observed in another study where the researchers feed Hibro broiler chicks with a diet that contains 20 or 100 g/kg of *Nigella sativa* L. ground seeds for the duration of 84 days and did not adversely affect their growth (Al-Homidan et al., 2002). The obtained findings from this assessment agree with the published data reporting that *Nigella sativa* L. seed extracts have a wide and trustworthy margin of safety (Dollah et al., 2013).

Conclusion

The conclusion that can be drawn is that the findings of the current study constitute helpful evidence to validate folkloric importance of *Nigella sativa* L. seed extract as herbal remedy for various bacterial infections due to the presence of secondary metabolites with antibacterial activities. These results of this preliminary assessment also conclude that the popular use of black seed extract did not cause any toxicity effect on normal human peripheral blood mononuclear cells and are safe to be utilized for various therapeutic purposes.

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Assessing the Quality of Life Among Commuting Workers and Uncomfortable Travel

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Abstract

Many studies conclude commuting that has an impact on the quality of life of the commuter both in the physical, psychological, health, and environmental aspects of the commuter. Increased risk of musculoskeletal disorder (MSD), obesity, increased blood pressure, and low physical health conditions are found in prolonged commuting activities as the existing problem in public health. This study using cross sectional design with WHO QOL BREF questionnaire. The total sample 155 respondents of commuting working using KRL Commuter Line Bogor to Jakarta in 2018. The initial model for assessing the relationship directly and indirectly between quality of life among commuting workers and travel uncomfortable, health complaint, psychological condition, bad experience, and income was constructed on the basis of severe hypotheses Based on the results of the path analysis it was found that income has a direct effect on quality of life. Psychological conditions have a direct effect on quality of life. Psychological condition is intervening variable for travel uncomfortable and health complaints as indirect effect. These results may help to identify the direct factor to improve the quality of life among commuting workers and as a basis for developing policies to improve the quality of public transportation services for commuting workers, and as a basis for formulating policies related to housing development locations that are integrated with public transportation facilities.

Introduction

Indonesia faces an increase in the number of commuter workers. It was around 6 million commuters in 2011 up 17% to 7 million in 2014. Basically, commuting has a positive impact on the economy of the destination and area of origin. But it has a negative impact on the quality of life. In addition to the impact of time wasted, transportation costs, and the risk of accidents (Nuvolati G, 2007). Increased risk of musculoskeletal disorder (MSD), obesity, increased blood pressure, and low physical health conditions are found in prolonged commuting activities (Hoehner 2012). Many studies also conclude that commuting has an impact on the quality of life of the commuter both in the physical, mental / psychological, health, and social / environmental aspects of the commuter (Hoehner CM, Barlow CE, & Allen P, 2016 & Mattisson K 2015).

The study found that levels of life satisfaction and happiness were lower for commuters who used public transportation than those who did not include commuters (Stutzer & Frey, 2008) (Gottholmseder, Nowotny, Pruckner, & Theurl, 2009). Commuter workers are also potentially exposed to Particulate Matter (PM) and Ultrafine Particles (UFPs)

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(Knibbs, Cole-Hunter, & Morawska, 2011; Zuurbier et al., 2010), respiratory tract disorders due to air pollution (Zuurbier et al., 2011). Air pollution produces pollutants including particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO2), volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons. (PAHs) (Han & Naeher, 2006).

In addition to physical and psychological impacts, commuting has an impact on social aspects, namely social capital. Commuters tend to limit their free time for social activities and recreation and create negative externalities in society by reducing participatory activities (Sandow, 2011). The phenomenon of commuting related to the quality of life of workers is a problem of public health that must be assessed based on empirical evidence. Research on commuting still revolves around the number, pattern of mobility, and characteristics of commuting. Few studies analyze the link between commuter workers and the health / quality of life of commuters and assess public health and safety aspects. These impacts need to be a concern of the government at this time because the phenomenon of commuter workers in Indonesia has become a daily portrait in major cities in Indonesia, such as Jakarta, Medan, Denpasar, Surabaya, Makassar. In Jakarta-Bogor-Depok-Tangerang- Bekasi in 2014, there were 3.6 million commuters (13%) out of 28 million people. The majority of them aim to work (commuter workers) which is 82% (BPS).

The initial model for assessing the relationship directly and indirectly between quality of life among commuting workers and travel inconvenience, health complaint, psychological condition, bad experience, and income was constructed on the basis of severe hypotheses: (H1) travel uncomfortable directly influences quality of life on commuting workers, (H2) health complaint has direct effect to quality of life on commuting workers, (H3) psychological condition affects directly on quality of life on commuting workers, (H4) bad experience has a direct effect to quality of life on commuting workers, (H5) income directly influences to quality of life on commuting workers, (H6) the influence of travel inconvenience on quality of life on commuting workers is mediated by psychological condition, (H7) the influence of health complaint on quality of life on commuting workers is mediated by psychological condition, (H8) the influence of bad experience on quality of life on commuting workers is mediated by psychological condition, (H9) the influence of income on quality of life on commuting workers is mediated by psychological condition.

Method

This study is part of the research on the quality of life (QOL) of commuting workers who use the KRL Commuter Line and Busway TransJakarta from Bogor to Jakarta in 2018 with WHO QOL BREF questionnaire. The research is funded by The Directorate of Research and Community Engagement of Universitas Indonesia 2018. This study using cross sectional design with a total of 155 respondents of commuting workers using KRL Commuter Line Bogor to Jakarta in 2018. The research questionnaire was approved in regards of ethical studies by the Directorate of Research and Community Service, Faculty of Public Health, Universitas Indonesia with Approval Number 296/UN2.F10PPM.00.02/2018.

A pilot survey involving 30 pre-test subjects has been done to test the validity and reliability of the questionnaire. Then the questionnaire was distributed via Google Form. A brief assessment was conducted and the questionnaire which were answered incompletely were excluded from the study. Finally, 155 completed questionnaires which were qualified to be used in the analysis. As already mentioned briefly, the aim of this study was to construct a path analysis model for assessing the relationship directly and indirectly between quality of life among commuting workers and travel uncomfortable, health complaint, psychological condition, bad experience, and income. In doing this, Lisrel 8.7 was employed. Descriptive analysis was applied to explain the distribution of the answers from respondents for each question. Path analysis is a useful tool for assessing direct and indirect effects of some variables on a specific target variable, which was safety behavior in the present study. The strength of a path is represented by a coefficient conceptually equal

to standardized partial regression coefficients. A coefficient has a range from −1 to +1. The higher the coefficient, the greater the effect one variable has on another. In order to assess the significance of a path in a path analysis model, the t value which is the ratio of the unstandardized estimate to standard error is used. If t > 1.96, the path is significant at 0.05. In addition to each path, the goodness of fit of a path analysis model can also be determined using indices available for such evaluations. These indices can be categorized into two main groups: absolute fit indices and comparative fit indices. Absolute fit indices outline how well the hypothesized model fits the data (Hooper D, Coughlan J & Mullen M, 2008).

The model $\chi 2$ value, Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI) and Root Mean Square Residual (RMR) are some indices categorized in the group. (Hooper D, Coughlan J & Mullen M, 2008). The model $\chi 2$ value is very sensitive to the sample size and normally its value increases as the sample size increases. To fix this problem, (6) (Wheaton B, Muthen B, Alwin DF, 1977) proposed that the ratio of the $\chi 2$ value to the degree of freedom df should be used so that a ratio lower than two is indicative of a satisfactory model fit. (Hooper D, Coughlan J & Mullen M, 2008). RMSEA is another absolute fit index, popular because of its sensitivity and informative and easy to interpret nature. This index is calculated using the model $\chi 2$ value, df, and sample size (N) (Equation (1)) (Kline RB, 2015) (7). An RMSEA value lower than 0.07 indicates a good fit, values lower than 0.1 are indicative of mediocre fit and values higher than 0.1 represent unacceptable model fit. (Hooper D, Coughlan J & Mullen M, 2008)

$$RMSEA = \sqrt{(\chi 2 - df)/(df\,(N - 1))}\,, \qquad (1)$$

Where is the RMSEA, root mean square error of approximation, $\chi 2$ is the Chi-square value of the model, N is sample size. (Hooper D, Coughlan J & Mullen M, 2008)

Results and Discussion

This study also wanted to know how the description of travel inconvenience, health complaint, psychological condition, bad experience, and income of commuting workers using KRL Commuter Line.

Based on the table above, the highest uncomfortable of travel felt inconvenience by workers using the KRL Commuter line is the crowded conditions with the largest average value of 7.63 (scale 0-10) while the least accident conditions are felt with the smallest average value of 4.43 (scale of 0-10). In health conditions, the highest complaints experienced were aches with an average value of 7.14 (scale of 0-10). While the least complaints were experienced with nausea with the smallest average value of 3.56 (scale 0-10). In psychological conditions, the highest feeling experienced by commuter line KRL users is uncomfortable perception with an average value of 6.08 (scale 0-10). While the lowest feeling felt is sad with the smallest average value of 4.24 (scale 0-10). In a bad experience, the most experienced events were schedule delays with an average value of 5.81 (scale of 0-10) while the events most rarely experienced were accidents with the smallest average value of 1.94 (scale of 0-10).We constructed model based on the assumptions of the study, resulting a model with acceptable fit where $\chi 2$ was 0.000 and df 0, model fit index $\chi 2$/df was in acceptable level (less than 2). From the model, the RMSEA was also less than 0.07. From the model (Figure 1), it should be stressed that factors affected to quality of life on commuting workers in nine different ways: (1) direct path from travel uncomfortable; (2) direct path from health complaint; (3) direct path from bad

Table 1. Description of Income Among Commuting Workers Using KRL Commuter Line

Income (IDR)	Amount	Percentage
3 million – 6 million	56	35.9
6 million – 9 million	52	33.3
9 million – 12 million	25	16.0
> 12 million	23	14.7

Source: Primary data, 2018

Table 2. Description of Travel Inconvenience, Health Complaint, Psychological Condition, Bad Experience

No	Variable	KRL Commuter line				
		N	Min	Max	Mean	Std Dev
Code	Travel Inconvenience					
KP 15	Jostle	156	1	10	7.63	2.15
KP 16	Schedule delays	156	1	10	6.92	2.52
KP 17	Noise	156	2	10	5.73	2.02
KP 18	Air pollution	156	1	10	5.52	2.39
KP 19	Traffic condition	156	1	10	5.21	2.58
KP 20	Accident	156	1	10	4.43	2.45
KP 21	Travelling time	156	1	10	5.87	2.60
	Health Complaint					
KS 22	Dizzy	156	1	10	4.20	2.45
KS 23	Nausea	156	1	10	3.56	2.28
KS 24	Stiff	156	1	10	7.14	2.44
KS 25	Fatigue	156	1	10	7.04	2.38
KS 26	Heat exposure	156	1	10	5.51	2.37
	Psychological Condition					
KP 27	Uncomfortable perception	156	1	10	6.08	2.26
KP 28	Feeling angry	156	1	10	5.29	2.31
KP 29	Feeling of stress	156	1	10	5.20	2.56
KP 30	Feeling sad	156	1	10	4.24	2.45
KP 31	Feeling of worry	156	0	10	4.85	2.53
	Bad Experiences					
PB 32	Sexual harassment	156	1	10	2.37	2.30
PB 33	Lost goods	156	0	10	2.81	2.69
PB 34	Accident	156	1	8	1.94	1.54
PB 35	Late schedule	156	1	10	5.81	2.56

Source: Primary data, 2018

Table 3. Description of Quality of Life in Each Domain

Quality of Life Domain	KRL *Commuter line*				
	N	Min	Maks	Means	Std dev
Physical Domain	156	31	81	57.07	10.84
Psychological Domain	156	31	100	67.30	12.37
Domain of social relations	156	25	100	66.04	16.43
Environment	156	44	100	68.46	11.64
Total Quality of Life	156	39.25	90.5	64.72	10.41

Source: Primary data, 2018

experience; (4) direct path from income; (5) direct path from psychological condition ; (6) indirect path from travel uncomfortable which was mediated by psychological condition; (7) indirect path from health complaint which was mediated by psychological condition; (8) indirect path from bad experience which was mediated by psychological condition; and (9) indirect path from income which was mediated by psychological condition;.

The variable affects quality of life in two different ways; (1) direct effect; (2) the effect mediated by psychological condition. As shown in the path model, among these variables,

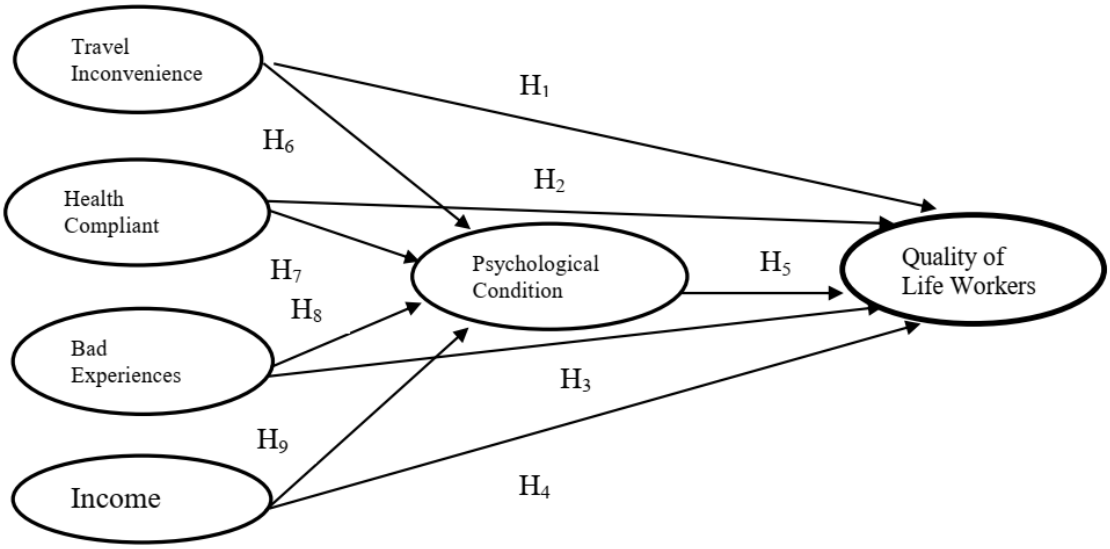

Figure 1. The Path Model for Assessing the Impact of Travel Inconvenience, Health Complaint, Psychological Status, Bad Experience, and Income to Quality of Life on Commuting Workers Using KRL Commuter Line Bogor to Jakarta

psychological condition towards quality of life on commuting workers is the highest impact. Furthermore, for direct effect, psychological condition and income were two variables with a significant influence toward quality of life on commuting workers. Meanwhile, travel inconvenience and bad experience do not influence quality of life on commuting workers directly but it is also shown that travel inconvenience and health complaint have significant indirect effect to quality of life on commuting workers mediated by psychological condition.

Table 3 presents all statistics about each path. From this information and the model in Figure 1, it can be observed that the strongest impact of quality of life directly was psychological condition, followed by income.

Using path analysis model, we are also able to quantify the direct and indirect effects that variables have on each other. Table 4 presents these significance levels of each path in the model of quantities for each variable. As is evident from this table, psychological condition and income toward healthy quality of life was the variable with the highest direct effect. Based on the results of the path analysis it was found that income has a direct effect on quality of life. In cross-sectional studies, high levels of perceived stress were found among people with low socio-economic status as measured by education and level of disability. This may indicate an increased risk of unemployment from perceived stress among people with low socioeconomic levels as compared to those with high socio-economies (Maehlisen, 2018)

Psychological conditions have a direct effect on quality of life. Increased levels of stress and worry can reduce the quality of life of individuals. The level of poor comfort and security that is not guaranteed during travel is a major factor in commuter line KRL not being the main choice in transportation modes. The irritability experienced by individuals not only affects aspects of physical health, but also affects other aspects such as psychological aspects of individuals that can affect the level of quality of life of individuals.

While travel inconvenience and health complaints have an indirect effect on quality of life mediated through psychological conditions. A smooth road condition is a measure that can describe the operational quality of traffic in the form of speed, travel time, freedom of maneuvering, comfort, free vision, road safety and safety. There are several factors of travel conditions or environmental conditions that can affect the quality of life, namely changes

Table 4. Significance Level of Each Path in the Model

Path		Unstandardized Path Coefficient	SE	t
From	To			
Travel Inconvenience	Psychological condition	0.228*	0.071	1.465
Health complaint	Psychological condition	0.405*	0.095	2.349
Bad experience	Psychological condition	0.136	0.0701	1.947
Income	Psychological condition	-0.018	0.0317	-0.569
Travel Inconvenience	quality of life on commuting workers	-0.0331	0.142	−2.605
Health complaint	quality of life on commuting workers	0.0175	0.095	3.245
Bad experience	quality of life on commuting workers	0.0437	0.088	−2.184
Income	quality of life on commuting workers	0.140*	0.065	−1.436
Psychological condition	quality of life on commuting workers	0.249*	0.065	−1.600

Note: * (Significant) if t > 1,96

Source: Primary Data, 2018

in business situations, political uncertainty, technological progress, noise, traffic jams and an atmosphere that is not conducive to the journey to work (Robbins, 2006). Exposure to noise caused by the commuter line KRL when crossing on the rails such as engine noise, horns, and friction between the wheels and rails for a long period of time will result in mild hearing loss.

Exposure to noise is a health risk. There is sufficient scientific evidence that noise exposure can cause hearing loss, sleep disturbance. Changes in blood pressure and the risk of ischemic heart disease for other effects such as systolic blood pressure, SBP, diastolic blood pressure, DBP, and heart rate (Tomei G et al., 2010). The average journey of workers using the KRL commuter line from Bogor station is around two hours with a range of one to three hours. This is consistent with the results of a survey conducted by BPS (2012) which found the average commuter worker trip in the Greater Jakarta area was 61 to 120 minutes. Weaknesses of the commuter line KRL service, namely: (1) the number of passengers exceeds the capacity so that the passengers are jostled and squeezed; (2) frequent disruptions caused by infrastructure such as delays in departure schedules; (3) the occurrence of commuter line KRL accidents caused by human negligence. Shorter commute times and decreased working hours can prevent sleep problems in workers (Kim, 2019).

Transportation problems are one of the factors related to the level of quality of life of a person which is influenced by aspects of physical health, psychology and interpersonal relationships. The number of passengers exceeds the capacity causing passengers to jostle and squeeze each other. So that passengers often experience health problems such as dizziness, nausea, aches, colds, and ringing ears. Path analysis is a strong method for evaluating direct and indirect effects, but it has some limitations. Some of these limitations are discussed by (Jeon J, 2015). For examples path analysis can only be used for explanation and not for prediction (Jeon J, 2015). This study's limitation was the use only commuting workers from Bogor-Jakarta. So that this study can be reflect only these workers in this area.

Conclusion

Based on the results of the path analysis it was found that income has a direct effect on quality of life. Psychological conditions have a direct effect on quality of life. While travel conditions and health complaints have an indirect effect on quality of life mediated through psychological conditions. These results may help to identify the direct factor can be intervening to improve the quality of life among commuting workers using KRL Commuter Line Bogor to Jakarta and as a basis for developing policies to improve the quality of public transportation services for commuting workers, and as a basis for formulating policies related to housing development locations

that are integrated with public transportation facilities so commute times more shorter and prevent sleep problems in workers.

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Knowledge & Attitudes towards Family Use of Maternal Child Health Handbook

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Abstract

The use of the Maternal and Child Health (MCH) handbook requires family support, but the utilization of the MCH Handbook by the family is still low. The objectives of this research are to know the extent MCH Handbook used by the family and the factors related to it. This is an explanatory research with a cross-sectional design. The study sample is the total population in Kemawi Village, which is 60 families who have pregnant woman or baby or toddler. The results of rank-spearman correlation showed that there is a strong and positive relation between knowledge with the use of MCH Handbook (rs = 0.571, p = 0.0001) and between attitude and the use of MCH Handbook (rs = 0.468, p = 0.0001). Multivariate analysis with binary logistic regression showed that the knowledge (OR =4.9) and attitude (OR=11.9) variables had a significant influence together on the use of the MCH handbook with probability is 74.3% . It is suggested to village midwives to increase counseling to the community about MCH Handbook related to mother's health in the postpartum period, especially regarding family attitudes towards the MCH Handbook.

Introduction

Based on the Profile of Health Department of Central Java Province, in 2015, there were 619 cases of maternal deaths. In Semarang District, maternal death was still high (17 cases). The biggest percentages of the causes of mtaternal deaths (40.49%) are hypertension (26.3%), bleeding (21.4%), circulatory system disorders (9.27%), infection (2.76%), etc. Looking at the maternal deaths, as many as 60.9% happened in the postpartum period, 26.33% happened in pregnancy period and 12.75% happened in the labor process (Dinas Kesehatan Provinsi Jawa Tengah, 2015).

Maternal mortality has been attributed to the "3 delays": delay in deciding to seek care, delay in reaching care in time and delay in receiving adequate treatment. The first delay due to the community, family and mother do not recognize their information in pregnant and life-threatening condition (Nour, 2008). Information about pregnancy and life-threatening condition is available in the Maternal and Child Health (MCH) Handbook which is given to pregnant mothers. The MCH Handbook is a book that contains maternal health records (pregnancy, labor, and postpartum), child (Newborn, baby, and toddler) and other information about how to maintain and care for maternal and child (Yanagisawa et al., 2015). Previous research proved that the MCH handbook can facilitate officers (midwife village) in recording and reporting the monitoring data in the local area

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(Hagiwara et al., 2013; Osaki et al., 2015). The Ministry of Health of the Republic of Indonesia developed the Local Area Monitoring of MCH Program with the aim of detecting causes of death in infants and mothers early to avoid the causes of death so as to result in a decrease in infant and maternal deaths (Anggraini et al., 2018). In addition, the MCH handbook can be used to help health personnel in providing Postnatal Care (PNC) (Kaneko et al., 2017)

An Indonesian ministerial decree of 2004 stated that the Maternal and Child Health Handbook (MCH handbook) was to be the only home-based record of maternal, newborn and child health(Osaki et al., 2009). With the accurate and precise recording of the pregnant mothers, also intensively monitored by family and healthcare workers, therefore every pregnancy until childbirth and postpartum is expected to run safely and securely. In the technical guidelines of MCH Handbook, it is stated that the direct target of the MCH Handbook is pregnant mother, while the indirect targets are a) husband/other family members, child caregivers in orphanage/ children's social welfare institutions, b) cadres, c) healthcare workers that are working in mother and child health services, d) The Person In Charge and MCH program manager at the district/city health office. The MCH Handbook user, such as husband/other family members, child caregivers in orphanage/children's social welfare institutions, are required to bring MCH Handbook every time they are visiting health facilities, then keep it well so the MCH Handbook will not lose or damaged, and they also required to actively participate in reading and understanding the contents of the MCH Handbook correctly (Osaki, Hattori and Kosen, 2013). MCH handbook is a tool that can be chosen to monitor the health of baby, toddler, and mothers through family empowerment (Osaki et al., 2019).

Husband or family members as indirect targets of the MCH handbook, are those who are considered to have an influence on the utilization or use of MCH handbook. It is because husband or family members is the closest party to pregnant women who should also learn and understand the MCH handbook. Through a good understanding of the MCH handbook, the use and utilization of the MCH book can be supported by her husband or family member. The support form that provided can be in the form of participating in following up and implementing messages conveyed in the MCH handbook along with pregnant women. That is accordance with the technical guidelines for the use of the MCH handbook published by the Ministry of Health of Republic of Indonesia. Therefore, the husband or family has an important role related to the use of the MCH handbook by pregnant women. The results of the previous research prove that the use of the MCH handbook in Indonesia has a significant effect on an increase in the proportion of pregnant women coming to the antenatal clinic. This study also explained that the involvement of the husband has impacts or influences the stimulus of pregnant women to use the MCH handbook (Magwood et al., 2019).

This research was conducted to the entire population in the Kemawi Village, which is family who has pregnant women or have baby or have toddler. Kemawi village is an active alert village that located in Sumowono Subdistrict, Semarang District. The village midwife in Kemawi Village gave the KIA book to pregnant women to detect early health problems in pregnant women. Utilization of the MCH book requires support from various parties. Family or husband is the party that considered to have an important role in the use of the MCH handbook. In Kemawi Village, the use of MCH handbooks by family or husband is still low. There are several related factors that can influence the use of the MCH handbook. When utilizing the MCH Handbook, the role of the family is important as a support for pregnant mothers. Given the low utilization of MCH Handbook by the family and husband, it is desirable to know the extent of the use of MCH Handbook by the family and what are the factors related to the use of MCH Handbook.

Method

This is explanatory research with a cross-sectional design. The population is families who have pregnant women or have baby or have toddler. The samples are the total population as many as 60 families. The research site is at Kemawi Village. It is an active Alert

Village in Sumowono's Community Health Center Area in Semarang District, which has one village midwife and 28 active cadres. The village midwife has done scheduled training to cadres about mother and child health, and to every ANC service.

This research was carried out on December 2018 through interview method. The questions that asked at the interview time were prepared using a structured questionnaire that was developed independently but in reference to the existing literature. The interview was conducted to the respondent personally. The dependent variable in this study is the use of the MCH handbook, whereas the independent variables of this study consisted of knowledge and attitudes of family.

The data were analyzed descriptively and analytically by using percentage, rank-spearman correlation, and binary logistic regression. Descriptive statistical analysis was used to describe dependent and independent variable. The data distribution in this study is abnormal so bivariate analysis of this study uses rank-spearman correlation, whereas multivariate analysis of this study uses binary logistic regression. The rank-spearman correlation is done to determine the relationship between the dependent and independent variables. Furthermore, multivariate analysis of this study uses binary logistic regression to determine the effect of knowledge and attitudes of family on the use of the MCH handbook. The coding stages that conducted on multivariate analysis are based on median valued and grouped into 2 categories (good and bad). Then the total score is categorized as good (given a value of 1) if the total score > median, whereas the total score is categorized as bad (given a value of 0) if the total score < median.

Results and Discussion

The respondents are 60 people, they are 43 husbands (71.7%), 10 parents or parents in law (16.7%) and 7 relatives (11.7%). The average age of the respondents is 37.7 years (SD= 12.6 yr). More than half of the respondents (63.3%) are graduated from Elementary School and most of the respondents are farmers (45%). Respondents' welfare is mostly included in the II Category of Family welfare (35%). Most of the respondents (83.3%) have more than 2 children, the youngest child is 0.5 month, the oldest child is 156 months with the average age is 19.9 months (SD=25.5 months). Almost all of the respondents already have MCH Handbook (98.3%) as shown in Table 1.

As shown in Table 2, the result showed that most of the respondents could answer correctly about knowledge of MCH Handbook. There are 80% of respondents who answer correctly about MCH Handbook contents, 86% of respondents answer correctly about who needs to read MCH Handbook, and 78% of respondents answer MCH Handbook need to be brought every time pregnant mother visits the community health center/midwife/ doctor. However, there are a lot of respondents who answer "do not know" to some questions, such as parents/family need to read MCH Handbook (46.7%), MCH Handbook contains information about blood donor preparation for pregnant mother (45%), MCH Handbook contains information about the danger sign of postpartum mother (45%).As seen in Table 3, the result showed most of the respondents agree to almost the entire questions item. As many as 80% of respondents agree to the questions of husband/parents/parents-in-law/family need to read MCH Handbook to know what should be done during pregnancy. However, as many as 38.3% of respondents answer disagree to the questions of husband/ parents/ parents-in-law/ family need to read MCH Handbook to know health treatment that should be done after giving birthThe result showed that a lot of respondents have never been reading the MCH Handbook. As shown in Table 4, as many as 50% respondents have never been reading the MCH Handbook to know the danger signs in pregnancy, 53.3% respondents have never been reading the MCH Handbook to know the health treatment during postpartum, 53.3% respondents have never been reading the MCH Handbook to remind pregnant mother to keep the MCH Handbook from being lost. The analysis of the Rank Spearman correlation showed that there was a strong and positive relationship between knowledge and the use of MCH Handbook (rs=0.571, p=0.0001). It was also shown that there was a strong and positive relationship between attitude and the

Table 1. The Distribution of Respondents' Characteristics

	n	%
Age of Respondents		
Minimum = 17 y.o., maximum = 80 y.o., mean=37.7 y.o., SD = 12.6 y.o.		
Age of the Last Child		
Minimum= 0.5 month, Maximum=156 months, Mean=19.9 months, SD=25.5 months		
Number of Children		
>2 children	50	**83.3**
≤ 2 children	10	**16.7**
Total	60	**100**
Education		
Not Going to School	3	**5**
Elementary School	38	**63.3**
Junior High School	14	**23.3**
Senior High School	2	**3.3**
College	3	**5**
Total	60	**100**
Occupation		
Unoccupied	5	8.3
Seller	3	5
Farmers	27	45
Labor	5	8.3
Civil servant	2	3.3
Others	18	3.0
Total	60	100
Ownership of MCH Handbook		
No	1	1.7
Yes	59	98.3
Total	60	100
Family Welfare		
Underprivileged	9	15
Family welfare I	14	23.3
Family welfare II	21	35
Family welfare III	8	13.3
Family welfare III plus	8	13.3
Total	60	100

Source: Primary Data, 2018

use of MCH Handbook (rs=0.468,p=0.0001). Multivariate analysis with binary logistic regression showed a significance of 0.587 for the Hosmer and Lemeshow Test, indicating an acceptable goodness of fit to the model tested. A Nagelkerke R Square of 0.371 showed that good knowledge and attitude of family variable models are risk factors for utilization of MCH handbook at 37.1%. The odds ratio for knowledge was 4.93 and attitude was 11.89 for the incidence of MCH handbook utilization. Families with good knowledge of MCH handbook have a tendency of 4.93 times higher to contribute to the use of MCH handbook. The odds ratio for attitude was 11.89, meaning that families with good attitude of MCH handbook have a tendency of 11.89 higher to contribute to the use of MCH handbook. Knowledge (p=0.01) and attitude (p=0.026) variable have significant influence on the use of MCH handbook. Both can be used to construct a logistic regression equation to determine the probability of MCH handbook utilization if MCH handbook used by family with good knowledge and attitude, as follows equation below:

$$\text{Probability of MCH Handbook Utilization} = \frac{1}{1 + e^{-(-3.1+1.6\,Knowledge+2.5\,Attitide)}}$$

Based on this model, if there was family with good knowledge and good attitude, the probability of MCH handbook utilization was 74.3%. It means 25.7 % of the use of MCH Handbook is explained by other factors besides the independent variables in the logistic regression equation in this research. Most of the

Table 2. Respondents Distribution Based on the Answer in Knowledge Items

Respondents knowledge about MCH Handbook	Do not know		Wrong		Correct	
	n	%	n	%	n	%
MCH Handbook Content						
a. Pregnant mother health record	12	20	0	0	48	80
b. Maternity health record	17	28.3	0	0	43	71.7
c. Postpartum health record	20	33.3	1	1.7	39	65
d. Child health record	16	26.7	0	0	44	73.3
Targets (who need to read) MCH Handbook						
a. Mother	8	13.3	0	0	52	86.7
b. Husband	20	33.3	1	1.7	39	65
c. Parents/family	28	46.7	13	21.7	19	31.7
MCH Handbook need to be brought to this place						
a. Community Health Center / midwife / doctor	12	20	1	1.7	47	78.3
b. Posyandu	13	21.7	0	0	47	78.3
c. Pregnant mother class	20	33.3	0	0	40	66.7
Information about pregnancy in MCH Handbook						
a. Measure body height	18	30	1	1.7	41	68.3
b. Measure Upper Arm Circumference	25	41.7	1	1.7	34	56.7
c. Measure body weight	16	26.7	0	0	44	73.3
d. Consuming Fe pill every day for 90 days	23	38.3	4	6.7	33	55
e. Measure blood pressure every check up	19	31.7	1	1.7	40	66.7
f. Tetanus Toxoid Immunization to prevent tetanus in infants	24	40	4	6.7	32	53.3
g. Husband accompany pregnant mother every check up	15	25	8	13.3	37	61.7
h. Prepare savings for labor costs	19	31.7	0	0	41	68.3
i. Prepare vehicle when needed for labor	16	26.7	0	0	44	73.3
j. Planning for Family Planning	17	28.3	1	1.7	42	70
k. Prepare prospective blood donors for pregnant mother	27	45	8	13.3	25	41.7
Information about pregnancy in MCH Handbook						
a. Sign of giving birth	21	35	0	0	39	65
b. Process / how to give birth	24	40	2	3.3	34	56.7
c. Problems that might happen in giving birth	24	40	3	5	33	55
Information about postpartum in MCH Handbook						
a. How to breastfeed infant	23	38.3	1	1.7	36	60
b. Maternal care after giving birth	24	40	1	1.7	35	58.3
c. Danger signs in postpartum	27	45	2	3.3	31	51.7
Information about child health in MCH Handbook						
a. Child immunization record	15	25	2	3.3	43	71.7
b. Child development record	14	23.3	0	0	46	76.7

Source: Primary Data, 2018

respondents are pregnant mother's husbands (71.7%), which means husbands actively participate in the use of MCH Handbook. Study at Banyumas about the role of husband in the treatment of pregnant women including behavioural in giving information (books), providing the cost of prenatal care, behavioural of maternity care (personal hygiene of wife), listening to the wives, giving proper nutrient management and physical activity, who have good behaviour is amount 61.1% (Gamelia, Masfiah and Sari, 2016). Husbands' social support and perceived social norms, were identified as underlying factors associated with delivery care utilization (Story et al., 2012). Study at Magu District, Tanzania about the role

Table 3. Respondents' Distribution Based on the Answer in Attitude Questions

Attitude	Disagree		Agree	
	n	%	n	%
Husband/parents/parents in law/family need to read MCH Handbook to know what should be done during pregnancy.	12	20	48	8z0
Husband/parents/parents in law/family need to read MCH Handbook to know the danger signs in pregnancy.	16	26.7	44	73.4
Husband/parents/parents in law/family need to read MCH Handbook to know what should be prepared for giving birth	16	26.7	44	73.3
Husband/parents/parents in law/family need to read MCH Handbook to know health treatment that should be done after giving birth.	23	38.3	37	61.7
Husband/parents/parents in law/family need to read MCH Handbook to know child's development.	14	23.3	46	76.6

Surce: Primary Data, 2018

Table 4. Respondents' Distribution Based on the Answer in the Use of MCH Handbook Questions

Questions	**Never**		**Sometimes**		**Always**	
	f	**%**	**f**	**%**	**f**	**%**
I read MCH Handbook to know what to do during pregnancy	28	**46.7**	27	45.0	5	8.3
I read MCH Handbook to know the danger signs in pregnancy	30	**50**	26	43.3	4	6.7
I read MCH Handbook to know what to do before giving birth	29	**48.3**	26	43.3	5	8.3
I read MCH Handbook to know health treatment that need to be done in pospartum	32	**53.3**	25	41.7	3	5
I remind pregnant mother to bring MCH Handbook when escorting to health facilities	30	**50**	20	33.3	10	16.7
I remind pregnant mother to keep the MCH Handbook from being lost.	32	**53.3**	14	23.3	14	23.3

Source: Primary Data, 2018

of husband in the treatment of pregnant women including behavioural in giving information (books), providing the cost of prenatal care, accompanying to ANC (Antenatal Care), behavioural of maternity care, listening to the wives, giving proper nutrient management and physical activity (Vermeulen et al., 2016). Based on previous study that conducted by Stapleton, et al., it was found that complication during pregnancy and childbirth was statistically significantly associated with husband support and maternal characteristic (Stapleton et al., 2012). The 2012 Indonesia Demographic and Health Survey (IDHS) reported that complication during pregnancy and childbirth was statistically significantly associated with husband support and maternal characteristic (Agushybana, 2016). It is proved that husband role very important at pregnancy.

Some respondents are included in the second category of welfare family (35%), where those families can live well, with enough income, family members go to school and have good health status. Half of the respondents stated that they have never read MCH Handbook. It shows that half of the husbands or pregnant mother's families are careless to MCH Handbook (Table 4). Respondents' age was between 17 to 80 years old with the mean of 37.7 years old. Adult age can think mature and has a lot more experiences than those young ages. It is suitable with the research of Yoko Aihara about effect of the maternal and child health handbook on maternal and child health promoting belief and

action in Thailand. It was found that the factors which significantly related to MCH promoting belief were family income, age, and education (Aihara et al., 2006). Aiga also found that the older the age, the higher the level of maturity and physical strength at work (Aiga et al., 2016)

Based on the research result, most of the respondents are graduated from elementary school (63.6%), only 3 respondents (5%) did not go to school. It was the same condition at Bhuiyan's research at Palestine that primary school's education is the most of the population research (68,3%) (Bhuiyan, Nakamura and Qureshi, 2006). Education background is one of the factors related to uses the MCH Handbook. There is a positive correlation between women's educational background and reading behavior with respect to MCH-related information(Hagiwara et al., 2013). Study at Mongolia that conducted by Hikita revealed that education correlated significantly with uses of MCH Handbook by pregnant women (Hikita et al., 2018).

Kemawi Village has a midwife who is actively empowered the society. Therefore, those who were only graduated from elementary school already know about mother and child health. It improves their knowledge, attitude and use of MCH Handbook. Based on Table 2, most of the respondents have answered correctly to the knowledge questions. It shows that respondents already have a good understanding about the information in MCH Handbook. This was confirmed from research in Kenya that resulted a high level of health knowledge was significantly associated with possession of an MCH handbook (Kawakatsu et al., 2015). A good knowledge will encourage respondents to have a good attitude and good behaviour, as well as the research result of Yanagiswara that found a relationship of knowledge and cadre's role in using MCH Handbook (Yanagisawa et al., 2015). Good knowledge tends to shape the supportive attitude, which is shown in this research result that most of the respondents have supportive attitude toward the use of MCH Handbook, where many agree statement was conveyed by the pregnant mother's family (Table 3).

Another result in knowledge items that need to be noted is that there were a lot of respondents who did not know that MCH Handbook needs to be read by parents/family (46.7%). As many as 45% of respondents did not know that MCH Handbook contains the information of danger signs after giving birth, and the same percentage did not know that MCH Handbook contains the information of the necessity of providing prospective blood donors for pregnant mother (Table 2). The respondents' attitudes also need to be noted. As much as 38.3% of respondents answered disagree that husband/parents/parentsin-law/ family need to read the MCH Handbook to know health treatment after giving birth (Table 3).

The analysis of the Rank-Spearman correlation showed that there is a relationship between knowledge, attitude, and age with the use of MCH Handbook. Knowledge and attitude have a positive relationship, while age has a negative relationship with the use of MCH Handbook. It means that the better the knowledge and attitude of the family, the use of MCH Handbook by the family will be increased. It is suitable with the research of Kitabayashi in Palestine household, that the better mother's knowledge, the better the MCH Handbook use for ANC (Kitabayashi et al., 2017). The same thing also found by Baequni, by using meta-analysis technique, that mothers who use MCH Handbook during pregnancy tend to have better knowledge than mothers who did not use MCH Handbook (Baequni and Nakamura, 2012). A good family's knowledge about MCH Handbook will encourage a better use of MCH Handbook by the family. As well as the attitude of supporting the MCH Handbook use will encourage the utilization of MCH Handbook. This research result proves that attitude has a straight correlation with the use of MCH Handbook. Good knowledge tends to build a supportive attitude. There was an effect of knowledge, attitudes and family support on the quality of utilization of MCH books (Osaki et al., 2019). Age will determine how they act. The older they are, the higher the level of maturity and physical strength at work. The level of maturity which marked by age will increasingly show maturity, including independence in the attitude. Age had significant relation with respondent's perceived in the use of MCH

Handbook (Susilaningrum et al., 2018).

Conclusion

The results from all of the respondents are 63.3% who graduated from elementary school, 45% working as a farmer, and 98.3% have MCH Handbook. Respondents' knowledge about MCH Handbook, mostly could answer correctly, however as many as 45% still answer wrongly that MCH Handbook contains the information about danger signs of postpartum. Respondents' attitudes about MCH Handbook, mostly agree, however as many as 38.3% answered disagree related to husband/parents/parents-in-law/family need to read MCH Handbook to know the health treatment that should be done after giving birth. In the variable of MCH Handbook use, as many as 53.3% of respondents have never read MCH Handbook to know the health treatment after giving birth. Rank-spearman correlation analysis showed that there was a strong and positive relation between knowledge with the use of MCH Handbook (rs=0.571, p=0.0001), between attitude and the use of MCH Handbook (rs=0.468, p=0.0001). Whereas multivariate analysis that uses binary regression logistic showed that knowledge (p=0.01) and attitude (p=0.026) variable have significant influence on the use of MCH handbook. Within binary regression logistic, it also shown that families with good knowledge and good attitude have the probability 74.3% to use MCH handbook.

It is suggested to village midwives to increase counseling to the community about MCH Handbook related to the mother's health in the postpartum period. Attitude variables more contribute to the use of MCH handbook than knowledge variables, so it is suggested that the interventions that will carry out are more prioritized to lead to family attitudes that related to MCH handbook. Authors would like to gratefully acknowledge the support from the Dean of Faculty of Public Health of Diponegoro University.

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Is there a Relationship Between Pregnant Women's Characteristics and Stunting Incidence In Indonesia?

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Abstract

Teenage pregnancy has an impact on the outcomes. Teenage pregnancy is at risk of adverse health, an increased risk of domestic violence, poor nutrition, and sexual and reproductive health problems, lower levels of education, and higher levels of poverty compared to women who postpone marriage age. The study aims to determine the relationship between marriage and Adolescent pregnancy with the incidence of stunting in children under five years in Indoneasia. The study used a cross-sectional approach from 2014 IFLS (Indonesian Family Life Survey) data. The bivariate analysis used the Chi-Square Test when the multivariate analysis used logistic regression. The results found the prevalence of stunting in Indonesia in 2014 was 36.6%. The stunting prevalence is higher in toddlers of married mothers of adolescents (42.4%) compared to mothers of married mature (35%). The stunting prevalence was also higher in children under five years from adolescent pregnant women (44.4%) compared to mothers who were of sufficient age (35.6%). Teenage pregnancy is associated with the incidence of stunting. A married teenage woman is 1.2 times at risk, and a woman who is less than 20 years pregnant is 1.3 times at risk of having a stunting toddler. Teenage pregnancy increases the prevalence of stunting. Cross-sectoral integrated interventioans are needed to prevent adolescent pregnancy. It is required to decrease the prevalence of stunting. The various risks that occur in teenage pregnancy are the basis for the importance of pregnancy prevention efforts in this age group by involving the related sectors.

Introduction

Adolescence is a transitional period marked by physical, emotional, and psychological changes. Teenagers are prone to various problems. Reproductive health problems that are often faced by adolescents are problems of sexuality, sexually transmitted infections (STIs), HIV / AIDS, abortion, a pregnancy outside of marriage, unwanted pregnancies, and early marriage. Teenage pregnancy is associated with an increase in early marriage. The incidence of early marriage in Indonesia is still high. In the 2017 Susenas report, the percentage of married women aged ten years and over in rural areas reached 37.79% in 2012 and 37.71% in 2013 (BKKBN et al., 2018). The high rate of early marriage in Indonesia causes the first pregnancy to also occur at an early age or when the mother is still a teenager and is often called teenage pregnancy

Teenage pregnancy causes very complex problems regarding physical, psychological, economic, and social. Physical problems that are often experienced by pregnant adolescents are anemia, impaired fetal growth in the womb, risk of premature labor, risk of abortion, and the occurrence of preeclampsia. Psychological problems due to young age result in emotional instability that will affect fetal growth and development. Children born to adolescent

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mothers often experience developmental and behavioral disorders. Health problems in pregnant adolescents are at risk of causing maternal and fetal death (Mersal and Khalil, 2013)

Teenage pregnancy will have an impact on pregnancy outcomes. Teenage pregnancy adversely affects the nutritional status of the fetus and infant. Raj et al (2010) explained that children under five who were born to women who were married in adolescence were significantly more at risk of having stunted children. Mothers giving birth to babies under 20 years of age are a risk factor for low birth weight (LBW). Prakash et al (2011) found that children born to mothers with poor reproductive health have a lower chance of survival and a higher chance of experiencing growth failure, one of which is stunting. Teenage girls who pregnant use to have a low Body Mass Index (BMI)/underweight. Underweight is associated with a lack of nutritional intake resulting in low weight during pregnancy. Incorrect weight gain results in a high incidence of premature births is a factor in the occurrence of stunting in children under-five (Vivatkusol, 2017).

Many factors cause the problem of stunting in toddlers, one of which is maternal factors. Age during pregnancy is a maternal factor that can be a direct and indirect problem with fetal and toddler growth disorders. Maternal factors include poor nutrition during pre-conception, early pregnancy, maternal mental health, premature birth, IUGR (Intra Uterine Growth Restriction), short birth spacing, and hypertension (WHO, 2012). Various research results explain the relationship between adolescent pregnancy and the incidence of stunting, but the results of research in Indonesia use very limited national data to explain this relationship, so it is necessary to research with the aim of knowing the relation between teenage pregnancy and the incidence of stunting in Indonesian toddlers by controlling the other.

Method

The study used a cross-sectional approach using secondary data from IFLS (Indonesian Family Life Survey) in 2014 or known as SAKERTI (Survey of Indonesian Household Life Aspects). The population is all children under five born alive in Indonesia in 2010-2014. Samples are toddlers who meet the inclusion criteria, namely biological children, live births, in the implementation of IFLS 2014 children aged 1- 5 years, children live with their biological parents (father and mother), available data on length or height, available data required (factor children, maternal factors and family factors), the child does not experience accompanying harm. The sample size that met the inclusion criteria was 4,809 children under five. The research variables were identified from a structured questionnaire. Maternal age at pregnancy is the mother's age in years at the time of pregnancy of the child being analyzed, which is calculated by finding the difference between the year of birth of the child and the year of birth of the mother, with a classification of fewer than 20 years (teenage pregnancy) and 20 years or more (full-age pregnancy.). The incidence of stunting was measured by the Z score of PB / U index in children under 2 years and TB / U in children 2 years and over. The results of the Z score calculation of PB / U or TB / U were grouped into normal (Z score ≥ -2) and short (Z score <-2). Confounding variables are family factors (number of children under five, place of residence, socioeconomic status, access to health facilities, environmental health), child factors (birth weight of children, gestational age, multiple births, infectious diseases, immunization status, exclusive breastfeeding) and maternal factors (mother's education, marital status, parity, physical activity, mother's height, father's height, quality of ANC and quantity of ANC). Data processing begins with examining the variables to be analyzed, then explores the data by looking at the distribution of data to determine the types of data distribution available. In addition, data cleaning was also carried out that were not in accordance with the interests of the analysis as well as missing data, so that it was not included in the next analysis. Furthermore, the data merger was carried out by combining data that had been checked and cleaned of data using binding IDs (household ID and individual ID).). The next step is to transform the data by making a compute or recode for certain variables. Data analysis uses univariate

analysis to see the frequency distribution of each variable, bivariate analysis using the Chi-Square test for proportional bed test, and simple logistic regression test for multivariate candidate variable selection. Multivariate analysis used multivariate logistic regression controlling for confounding variables.

Result and Discussion

Table 1. Description of Age of First Marriage and Age of Pregnant Women with Incidence of Stunting in Toddlers in Indonesia

Mother's Age When Pregnant	Toddler's Height		p
	Normal (n=3047)	Stunting (n=1762)	
o Mature (n=4242)	64,4	35,6	0,001
o Teenage Pregnancy (n=567)	55,6	44,4	
Total	63,4	36,6	

Source: Primary Data, 2019

Table 1 shows the differences in the prevalence of stunting according to the age of the mother during pregnancy. Based on the age of the mother during pregnancy, it shows that stunting prevalence is higher in children under five from mothers who are pregnant in adolescence age (44.4%) compared to mothers who married on aged over 20 years (35.6%). Teenage pregnancy is a public health problem. The results of the study found 35.6% of the incidence of stunting in full-age pregnant women and 44.4% of the incidence of stunting in pregnant women of child age. In various regions and regions, a large number of teenagers are already sexually active. About half of them are married and gave birth in their teens. Every year in the world, approximately 16 million adolescents aged 15-19 years give birth, or about 11% worldwide. 95% of these births occur in low- and middle-income countries, where birth rates average two times higher than in high-income countries (WHO, 2013). In Indonesia, it is recorded that more than 50% of first pregnancies occur during adolescence (Kemenkes RI, 2018).

Teenage pregnancies are often characterized by delayed initiation of prenatal care, poor prenatal health behaviors, and low birth weight babies. Recent research has also shown that healthy babies born to teenage mothers are at increased risk of postneonatal death (Rosengard, 2006). Teenage pregnancy and early marriage pose a risk to public and social health, as well as individual tragedy. Associated with mental health, parenting, and education issues, as well as obstetric risks. Maternal physiological insecurity represents a 2-3 times higher risk for low birth weight and fetal growth restriction, prematurity, and poor newborn health. Teenage pregnancies can also endanger maternal health, with pregnancies under 25 years of age found significantly higher anemia and medical risks (bleeding, blood transfusions) in mothers under 16 years. It is confirmed that depression is particularly high in pregnancy and postpartum, accounting for 40-50% of moderate to severe symptoms. Likewise, teenage pregnancy is associated with higher rates of depressive symptoms. Depression has been shown to persist from the early years of adolescent pregnancy care, and follow-up over 17 years found a substantial increase in major depression among women with teenage pregnancies. Regarding early marriage, it is agreed that a very early age of marriage, often immediately after menstruation, also causes the highest mental health problems. There is evidence of suicide and self-injury among child brides around the world. Domestic and partner violence have been found to increase mental health problems in women such as depression or even suicide, and worsen somatic health, as well as establish physiological risk factors, such as high cardiovascular disease and stress reactivity. Regarding productive health, women exposed to violence were 16% more likely to have babies with low birth weight, and twice as likely to have an abortion,

compared to women who did not experience partner violence. However, an aprospective population-based study in South Africa found a two-way relationship, that is, not only was partner violence associated with an increased risk of future depression, but also depression was associated with an increased risk of future violence in transition to motherhood. Several studies have shed light on how partner violence will impact mental health risks found among women with a history of teenage pregnancy (Sezgin and Punamaki, 2019).

Unwanted pregnancies at conception as well as pregnancies that are not on time. Similar to the intended pregnancy, an unwanted pregnancy can lead to an unplanned birth (48%), termination of pregnancy (43%), or miscarriage (9%). In 2006, 49% of all pregnancies among women aged 15 to 44 were accidental, increasing from 50 to 52 per 1000 women aged 15 to 44 years in 2001.1,2 From a public health perspective, the benefits to maternal and child health were not can be avoided (Haider, 2013).

The results of the study found that the prevalence of stunting is a serious problem, so it must remain a priority program. The impact of stunting will increase the risk of morbidity and mortality, delayed motor development, and stunted mental growth (Purwandini, 2013). Stunting toddlers are more susceptible to infections, especially diarrheal and respiratory diseases, and malaria. Infection increases malnutrition, thus creating a vicious cycle of developmental disabilities (Vonaesch, 2017), low productivity (Anugraheni, 2014) and an increased risk of degenerative disease in the future (Picauly and Toy, 2013; Crookston et al., 2010) because stunting is at risk of obesity. Gaining just a few pounds can cause a person's Body Mass Index (BMI) to rise above normal (Timæus, 2012). Conditions of overweight and obesity that continue for a long time will increase the risk of degenerative (Anugraheni, 2014).

Table 3 shows that there is no difference in gestational age at delivery, the incidence of twins, a history of infectious diseases, exclusive breastfeeding, immunization between women who are pregnant at adolescence and mature.

Table 4 shows that there is no difference in the prevalence of stunting according to marital status, maternal height, and ANC quality. There is a difference in the stunting prevalence according to the mother's education. The lower the mother's education, the higher the prevalence of stunting. Based on the parity, the stunting prevalence is higher in grand multipara (more than three children) and primipara (one child). Compared to multipara

Table 2. Family Characteristics of Teenage Pregnant Woman

Family Characteristics	Woman Age in Pregnancy		p
	Mature	Teenage	
Number of Toddlers			
o one (n=3940)	88,7	91,0	0,0001*
o more than one (n=869)	11,3	9,0	
Residential Area			
o Urban (n=2764)	59,5	42,3	0,0001*
o Rural (n=2045)	40,5	57,7	
Socioeconomic Status			
o High (n=2429)	52,9	46,4	0,0001*
o Low (n=2380)	47,1	53,6	
Access to Health Facility			
o Easy (n=4608)	96,1	94,0	0,021*
o Difficult (n=201)	3,9	6,0	
Environmental Health			
o Good (n=495)	10,7	6,9	0,004*
o Poor (n=4314)	89,3	93,1	

*multivariate candidate variable
Source: Primary Data, 2019

Table 3. Toddler Characteristics on Teenage Pregnant Woman

Toddler Characteristics		Woman Age in Pregnancy		P
		Mature	Teenage	
Born Weight				
o	>3,5 kg (n=1277)	70,7	29,3	0,0001*
o	3,1 – 3,4 kg (n=1127)	69,4	30,6	
o	2,8 – 3,0 kg (n=825)	60,6	39,4	
o	<2.8 kg (n=1168)	53,6	46,4	
Gestational Age				
o	Mature (n=3941)	81,8	82,9	0,535
o	Premature (n=868)	18,2	17,1	
Twin-birth				
o	Single (n=9837)	96,5	96,3	0,817
o	Twin (n=2654)	3,5	3,7	
Infectional Disease				
o	Never (n=910)	19,3	16,2	0,153
o	Infrequently (n=2521)	52,4	52,7	
o	Frequently (n=1378)	28,3	31,0	
Immunization				
o	Complete (n= 1593)	33,6	30,2	0,107
o	Uncomplete (n=3212)	66,4	69,8	
Exclusive Breastfeeding				
o	Yes (n= 1593)	39,7	43,4	0,088
o	No (n=3212)	60,3	56,6	

* multivariate candidate variable

Source: Primary Data, 2019

Table 4. Mother's Characteristics Based on The Age When Pregnant

Mother's Characteristics		Age When Pregnant		P
		Mature	Teenage	
Education				
o	Elementary (n= 1100)	22,7	24,0	0,0001*
o	Junior HS (n=1172)	22,4	39,0	
o	Senior HS (n=1764)	36,9	34,9	
o	Graduate (n=773)	17,9	2,1	
Marital Status				
o	Have Spouse (n=4705)	98,0	96,3	0,007*
o	No Spouse (n=104)	2,0	3,7	
Parity				
o	Primipara (n=9837)	64,2	75,5	0,0001*
o	Multipara (n=2654)	30,3	23,6	
o	Grandemultipara (n=1386)	5,5	0,9	
Physical Activity				
o	Light (n=1497)	30,9	33,2	0,476
o	Average (n=1212)	25,5	23,3	
o	Sufficient (n=1183)	24,8	23,5	
o	Heavy (n=917)	18,9	20,1	
Mother's Height				
o	Standard (n= 3142)	66,1	61,6	0,034
o	Short (n=1653)	33,9	38,4	
Father's Height				
o	Standard (n= 5664)	73,4	74,5	0,627
o	Short (n=3967)	26,6	25,5	
ANC Quality				
o	Good (n= 3093)	29,7	31,4	0,416
o	Poor (n=1716)	70,3	68,6	
ANC Quantity				
o	Sufficient (n= 3093)	64,2	65,3	0,619
o	Insufficient (n=1716)	35,8	34,7	

(number of children 2-3), birth weight, and immunization status. Based on the physical activity of the mother, the heavier the mother's activity, the higher the prevalence of stunting in children under five. Based on the height of the father, the stunting prevalence is higher in children under five from fathers with short body height (≤ 160 cm) (47.2%). Compare to fathers with standard body height (> 160 cm) (33.3%). Based on the number of antenatal care visits (ANC quantity), it shows that the prevalence of stunting is higher in mothers with an insufficient ANC visit, which is less than four times the standard (39.4%) compared to the sufficient (35.1%).

The results in table 5 show that the mother's age at pregnancy is related to the incidence of stunting. The relation's strength indicates that a woman who is pregnant at the teenage has a risk of 1,256 times (95% OR: 1,001-1,577) to have a stunting toddler. The model of the relation between maternal age at pregnancy and the incidence of stunting by controlling for variables of residence, child's birth weight, father's height, ANC visits, maternal education, environmental health, physical activity, socioeconomic status, and immunization status as confounding variables. Confounding variables associated with the incidence of stunting was the area of residence, child's birth weight, father's height, antenatal care (ANC) visits, maternal education, maternal

Table 5. Relation of Teenage Pregnancy and Stunting Incident in Indonesia

Variable	B	P	OR (95% CI)
Mother's Age When Pregnant			
o Mature			1
o Teenage	0,228	0,049	1,256 (1,001-1,577)
Residential Area			
o Urban			1
o Rural	0,252	0,001	1,287 (1,107 – 1,496)
Baby Birth Weight			
o ≥3,5 kg		0,000	1
o 3,1 – 3,4 kg	0,183	0,076	1,201 (0,981-1,47)
o 2,8 – 3,0 kg	0,480	0,000	1,616 (1,302-2,006)
o <2.8 kg	0,743	0,000	2,103 (1,73-2,556)
Father's Height			
o Standard			1
o Short	0,464	0,000	1,590 (1,352-1,87)
ANC Visit			
o Sufficient			1
o Insufficient	0,737	0,029	2,091 (1,076-4,060)
Mother's Education			
o Graduate		0,001	1
o Senior HS	0,200	0,082	1,221 (0,95-1,53)
o Junior HS	0,361	0,003	1,435 (1,127-1,827)
o Elementary	0,484	0,000	1,623 (1,269-2,076)
Environmental Health			
o Good			1
o Poor	0,229	0,067	1,257 (0,984-1,606)
Physical Activity			
o Light		0,004	1
o Average	0,043	0,669	1,044 (0,857-1,271)
o Sufficient	0,326	0,001	1,385 (1,139-1,684)
o Heavy	0,226	0,035	1,253 (1,016-1,546)
Socioeconomic Status			
o High			1
o Low	0,137	0,070	1,147 (0,989-1,33)
Immunization Status			
o Complete			1
o Uncomplete	0,319	0,000	1,375 (1,177-1,607)
Constant	-2,056	0,000	

Overall Percentage = 63,3%

Source: Primary Data, 2019

physical activity, and immunization status.

The relationship model between the age of marriage and the incidence of stunting obtained an Overall Percentage value = 63.3%. It means that the model can explain 63.3% of the causes of stunting by controlling the variables of the area of residence, child's birth weight, father's height, ANC visits, maternal education, environmental health, physical activity, socioeconomic status, and immunization status. The remaining 36.7% is explained by other variables not analyzed in this study.

Table 5 shows that the area of residence is related to the incidence of stunting. Children under five living in rural areas have a risk of 1.287 times (95% OR: 1.107 - 1.496) of experiencing stunting compared to those living in rural areas. Based on the child's birth weight, the lower the birth weight, the higher risk of experiencing stunting. Babies born weighing less than 2.8 kg have a 2.103 times risk (95% OR: 1.73-2.556) of experiencing stunting compared to babies born with or equal to 3.5 kg. Babies born weighing less than 2.8-3.0 kg have a 1.616 times risk (95% OR: 1.302-2.006) of experiencing stunting compared with babies born more or equal to 3.5 kg. There was no difference in the risk of stunting between babies born with a birth weight of 3.1-3.4 kg and 3.5 kg. The fathers' height is also associated with the incidence of stunting. Children with short fathers had a 1.59 risk (95% OR: 1.352-1.87) of experiencing stunting compared to children of fathers with standard height.

Table 5 also shows the relation between antenatal care and the incidence of stunting. Mothers who attend antenatal care visits (ANC) to health facilities are a protective factor for stunting. Mothers who do not take antenatal care are at risk of having stunting toddlers of 2.091 times (OR 95%: 1.076-4.06) compared to mothers who do antenatal care. Based on the mother's education, it shows a pattern that the lower the mother's education, the greater the risk of having a stunting toddler. Mothers with elementary school education (SD) have a risk of 1.623 times (95% OR: 1.269-2.076) compare to graduated mothers. Ones with a junior high school education are 1.435 times more likely (95% OR: 1.127-1,827) to have stunting toddlers compare to graduated mothers. The daily activities of mothers are also related to the incidence of stunting in children under five. The heavier the physical activity, the greater the risk of having a stunting toddler. Mothers with heavy activity have a risk of 1,253 times (OR 95%: 1,016-1,546) compared to mothers with light activity. Mothers with moderate activity have a risk of 1,385 times (OR 95%: 1,139-1,684) to have stunting toddlers compare to mothers with light activity. Complete immunization during infancy is a protective factor for stunting. Incomplete immunization infants have 1.375 times the risk (95% OR: 1.177-1.607) compare to those who receive complete immunization.

This study proves the relation between teenage pregnancy and stunting. Research findings in urban slum populations with a cross-sectional study with a sample of 482 children 1-5 years found 185 (38.38%) underweight and 222 (46.06%) stunting. The prevalence of malnutrition is higher in children whose mothers are under 20 years of age, and children of educated mothers are better nourished than those who are illiterate (Mittal and Ahluwalia, 2007). The prevalence of stunting in children decreases with the increasing age of the mother. Children born to mothers with poor reproductive health have a lower chance of survival and a higher chance of developing growth failure (stunting, wasting, and underweight) (Prakash et al., 2011). Adolescence is a period of biological growth with the onset of puberty which triggers sexual maturation and reproduction, resulting in physical, psychological and social changes as well as the possibility of pregnancy and childbirth. The consequences of teenage pregnancy and childbirth are serious because of the health and social burdens that the long-term health care costs for mothers and children and the high dropout rate. Adolescents and their babies have a high risk of morbidity and mortality (Aung, 2018).

Pregnancy at the early age of a woman also adversely affects the nutritional status of the fetus and baby. Nutritional disturbances that occur during pregnancy and childhood will have an impact in the short term, including disruption of the metabolic program of glucose, fat, hormones, receptors and genes, growth and muscle mass, as well as body

composition, and impaired brain development. Meanwhile, the long-term impacts include disruption in the child's physical, mental and intellectual development, which is permanent, low immunity and work productivity, the risk of suffering from chronic disease diabetes mellitus, coronary heart disease, hypertension, cancer, and stroke. Marriage age and adolescent pregnancy will have an impact on pregnancy outcomes. A mother giving birth to a baby at a young age, which is under 20 years, is a risk factor for low birth weight (LBW) (Rajagopalan, 2003).

Consequences of pregnancy in adolescence are the high rates of hypertensive disorders of pregnancy, anemia, gestational diabetes, delivery complications, determining an increase in maternal and fetal mortality. some studies showed an increased trend of prenatal, intrapartum, and postpartum intercurrent events among pregnant adolescents. As to problems with the newborn, gestation during adolescence is associated with higher rates of low birth weight (LBW),preterm delivery, respiratory diseases, and birth trauma, besides a higher frequency of neonatal complications and infant mortality. Considering the high prevalence of adolescent gestation and its consequences, this study had the objective of analyzing complications related to adolescent pregnancy (Azevedo et al., 2014). In mothers who experience pregnancy at a young age, the biological mechanism associated with premature birth is that the blood supply to the cervix and uterus have not fully developed in some adolescents causing the nutrients flow to the fetus during pregnancy is also not good. Low blood flow to the genital organs can increase the risk of infection in the genital organs as well as premature birth. Premature birth is one of the factors that increase the incidence of stunting in toddlers (Sharma, 2013).

Mothers who are pregnant in their teens are also still in their development period, so there is a struggle for nutrients between the fetus and the mother's metabolism. This situation will get worse if the mother's nutritional intake is inadequate so that the fetus will experience growth restriction, thereby increasing the risk of the fetus being born with low birth weight or premature birth. Both of which are factors in the occurrence of stunting in toddlers. (Prendergast and Humphrey, 2014). The various risks that occur in teenage pregnancy are the basis for the importance of pregnancy prevention efforts in this age group by involving the related sectors.

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Socioeconomic Status in Relation to Stunting and Motor Skill Development of Toddlers in Urban and Rural Areas

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Abstract

The development of child motor skills is closely related to nutritional status. Stunted children generally experience delays in motor development. The objective was to determine the relationship between stunting, socioeconomic status, and children's motor skill development. This research was conducted in 2018 using a cross-sectional method. Respondents were 80 children aged 48-60 months in urban and rural areas of West Java. The researcher used a simple random technique data collection on anthropometric, socioeconomic, and motor skills development. Then it was analyzed using chi-square and Fisher exact methods. The researcher used a simple random technique data collection on anthropometric, socioeconomic, and motor skills development. Then it was analyzed using chi-square and Fisher exact methods. We found that stunting prevalence in rural areas was higher than in urban areas. As much as 30 % of children in rural areas and only 12.5 % of children in urban areas were categorized as stunted. There is no significant association between stunting with the family's socioeconomic status and motor skill development. The weight for the age variable showed a significant association with stunting. Children who are malnourished have a stunting risk of 10.9 times greater than normal children (OR 10.9 $p < 0.001$).

Introduction

Stunting is defined as the height of a person is under -2SD from the standard deviation of Child Growth Standards median (WHO, 2006). Stunted toddler reflects a condition of growth faltering caused by chronic nutritional insufficiency, so they become shorter stature than the age. This condition due to the accumulation of nutritional deficiencies that occur since pregnancy until the children are 24 months old (Bloem, et al., 2013). In 2017, more than half of the world's stunting toddler population was in Asia (55%), while the remaining 39 % were in Africa. Studies reported 83.6 million stunting toddlers in Asia, whereas the highest was in South Asia (58.7%). World Health Organization (WHO) mentioned Indonesia was the third country with the highest prevalence stunting in the Southeast Asia/ South-East Asia Regional (SEAR) region from 2015 until 2017. Indonesia Basic Health Research reported that stunting prevalence in 2007 was 36.8 %, the number increased to 35.6 % in 2010 and reached 37.2 % in 2013 (Pusdatin, 2018). Stunting prevalence decreased to 6.4 % in 2008. Yet still above the global prevalence number of 22.2% in Indonesia, since WHO determines the definition of nutrition case is less than 20 % (Budiastutik & Nugraheni, 2018).

Previous studies reported that the prevalence of stunting in most developing countries showed a higher number in rural than in urban areas (Taguri, et al., 2009). In Peru, the national average stunting rate remained unchanged (rural prevalence of stunting stagnated at 40 % while urban stunting dropped from 16% to 10% (WHO, 2014). Indonesia showed a similar result, where the stunting

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prevalence in rural areas is higher (45 %) than in urban areas (35.3 %). Toddlers in rural areas have a risk of stunting 1.27 times greater than toddlers in urban areas (Simbolon, Suryani, & Yorita, 2019).

There are several short and long terms health risks of stunted children. Short-term impacts include increased incidence of illness and death, delayed cognitive, motor, and verbal developments, and increased health costs (Sari, et al., 2009). Moreover, child development plays a key in the future health, educational success, and economic status (Nyuyen, et al., 2017). Toddlers' motor skill development is a determinant of physical activity in adulthood (Laukkanen, Havu, Saakslahti, & Taija, 2014).

Several factors are related to the risk of stunting of children. The socioeconomic factor closely affects the family's ability to meet nutritional needs and to access adequate health services for children (Pusdatin, 2018). The study aims to determine the association between stunting with socioeconomic status and motor skill development of children aged 48-60 months in urban and rural areas of West Java Province.

Method

For this cross-sectional study, the population was toddlers aged 48-60 months from kindergarten and daycare in Bandung city and Ciamis District. The data sampling used the cluster and simple random techniques. The researcher used the cluster method to determine area coverage in the district, sub-district, and village areas. And the random sampling method to determine samples from kindergarten and daycare. Before the research, it required the parents to sign a consent form for their children's involvement. This study involved 80 children aged 48-60 months in the urban and rural areas of West Java. As a representative, samples in urban areas were taken from Bandung City, while for rural areas represented by Ciamis District. The data analysis was conducted using chi-square and Fisher exact methods. Stunting prevalence was the dependent variable. Meanwhile, the independent variables were nutritional status (weight for age and weight for height), socioeconomic status, and motor skill development.

Assessment of children's nutritional status is conducted based on the WHO Child Growth Standard (WHO, 2006). The anthropometric indicators used are weight for age (WAZ), height for age (HAZ), and weight for height (WHZ). WHO's Child Growth Standard median defines Stunting as the proportion of children below −2SD. Before the data collection, the data collectors were firstly trained to ensure that the obtained data were eligible to be analyzed.

Children's motor skill development was measured using Age and Stages Questionnaire, Third Edition (ASQ-3) (Squires & Bricker, 2009). The parameter chosen in this instrument was the methods for children's gross motor and fine motor skill development measurement. The score limit for the gross motor was 36.27 when the fine motor was 19.82. Children with a total score under the threshold number were categorized as undeveloped.

The researcher uses "Instrument (Scale) for Measuring the Socioeconomic Status of a Family" (Aggarwal, 2005) to measure the socioeconomic status of the children's family. There were 22 questions related to income, number of family members, and level of education, occupation, and property ownership. There were five categories of social status namely poor, lower-middle, upper-middle, high, and upper-high.

Results and Discussion

The collected data were analyzed statistically using SPSS for windows version 22. Table 1 shows the descriptive data analysis of children aged 48-60 months, namely: the characteristics respondents, socioeconomic status, and the level of child's motor skills development. Table 1 presents the characteristics of the sample. There were 80 children involved in the study. As many as 40 children were from urban areas, and the remaining amount of 40 children were from rural areas. The number of female and male children was almost the same either in a rural or urban area. In rural areas, the average children's weight is 15.49 with a deviation standard of 2.77. Meanwhile, in urban areas, it is 15.70 with a deviation standard of 2.49. The average height of children in rural areas is 100.65 with a deviation standard of 4.84,

and in urban areas, it is 101.36 with a deviation standard of 4.3.

Several anthropometric parameters determined children's nutritional status, namely: weight, height, and age of the child. Weight descriptive analysis showed that most children in both areas were normal. None of the children from rural areas are overweight. Meanwhile, only 2.5 % of children were overweight in urban areas. The prevalence of underweight children in rural areas showed higher numbers than in urban areas. There are 17.5 % children in the rural, while only 2.5 % in urban areas. Weight for age reflects body mass relative to chronological age. Malnutrition in children reflects the bad nutritional and health status. Globally, malnutrition has contributed to at least half of all the deaths per year in children under five (Liu, et al., 2015). Moreover, children with the mild underweight condition have a higher correlation with mortality than the variance in severe underweight (Bhagowalia, Chen, & Masters, 2011).

The weight for height data shows that most children had standard weight for height/ body mass index (BMI). The number of wasting children is the same (2.5 %), either in urban or rural areas. The number of normal children in the rural area is 95 %, and urban is 97.5 %. There is only one case of overweight children who came from rural areas. Low weight for height or wasting is a common way to describe a recent and severe process that has led to significant weight loss, due to acute starvation and/or severe disease. Other research mentioned wasting has higher ratio of mortality hazard than stunting or underweight condition in children (Olofin, et al., 2013).

Based on height for age data, the prevalence of stunting in rural areas was higher than in urban areas. As much as 30 % of children in rural areas and only 12.5 % of children in urban areas were categorized as stunted. Stunting is a physical indicator of chronic malnutrition. It is often associated with the underdevelopment progress of children. A study found that children who lived in rural areas are more likely to be stunted than children from urban areas. Several studies conducted in developing countries, such as Nepal, Bangladesh, Malawi, and Nigeria, have revealed that children settled in rural areas are at higher risk of malnutrition conditions (de Poel, O'Donnell, & Doorslaer, 2007) (Srinivasan, Zanello, & Shankar, 2013). In 2018, Indonesia Basic Health Survey reported 30.8 % stunting cases in Indonesia and 29.9 % in West Java. The number of stunting decreased to 29.2 % in 2019 (Pusdatin, 2018).

Stunting, or short stature for age, is one of the main manifestations of malnutrition (Gillespie & Hadad, 2003). Stunting reflects prolonged inadequate dietary quality and quantity and frequent infections during childhood (Victora, et al., 2008). In 2008, research showed that there were 32% or 178 million stunted children in developing countries (Black, et al., 2013). In Indonesia, although the prevalence of stunting among children under five years old has decreased in the past few decades, but the number is still exceeded the WHO recommendations (Semba, et al., 2008). Stunting in early childhood has adverse long-term consequences, including shorter adult height, lower attained schooling, reduced adult income and economic productivity, as well as lower offspring birth weight. Stunted children who gain weight rapidly later in childhood and adolescence are at high risk of chronic nutritional diseases (Victora, et al., 2008).

Family socioeconomic factors were related to stunting prevalence. Economic conditions are nearly associated with the ability to meet nutritious and nutritional intake for pregnant women and toddlers. Other factors such as sanitation and food safety are also known to increase the risk of infectious diseases (Pusdatin, 2018). In 2008, based on data from the Joint Child Malnutrition Estimates, countries with high numbers of upper-middle society can reduce the stunting rate by 64 %, while in the country of the lower middle class only reduced about 24% (UNICEF, 2018). In this study, we tried to find the relation between family socioeconomic status and stunting cases. The socioeconomic status of the children's family was divided into five categories. Namely: poor, lower-middle, upper-middle, high, and upper-high.

This study shows that both in rural and urban areas, most families have upper-middle socioeconomic status. The %age of families

with high socioeconomic status is highest in the urban areas. Families with high socioeconomic status in urban areas were 25 %. Meanwhile, in rural areas, it was only 12.5%. Lower-middle socioeconomic status in rural areas has a higher prevalence than urban areas. The number of families classified as lower-middle in urban areas is 32.5%. While in rural areas it reaches 37.5%. Children with lower socioeconomic status have a greater risk of stunting in rural areas (Julia, Weissenbruch, Waal, & Surjono, 2004).

Nutritional adequacy in the First 1000 Days of child life is essential to support child development and adult health. Maternal prenatal nutrition and child nutrition in the first two years of life (1000 days) are crucial factors in neurodevelopment and lifelong mental health. Failure to provide essential nutrients during a critical period of a child's brain development can result in impaired brain function (Schwarzenberg, Georgieff, & AAP Committee on Nutrition, 2018). Gross motor and fine motor skills are related to the fulfillment of nutritional needs in a child's developmental stages (Putri, Stephani, & Sumarno, 2020). Therefore, this study also measured the gross motor and fine motor skills development level.

The result found that most children had mastered the fine and gross motor skill growth according to their age. Overall, children's motor skill ability in rural and urban areas shows a good level of development. However, the level of child development in rural areas is higher than in urban areas. The number of developed children in rural areas is 97.5 %. While in urban areas, the number is only 90 %. Children who live in rural areas are estimated to have adequate open space for playing and doing physical activities (Putri, Stephani, & Sumarno,

Table 1. Characteristic of Children Aged 48-60 Months in Urban and Rural Area

Variable	Rural		Urban	
	Number (N=40)	**%age (%)**	**Number (N=40)**	**%age (%)**
Age (mean ±SD)	55.70±2.77		54.27±3.50	
Weight (mean ± SD)	15.49±2.77		15.70±2.49	
Height (mean ±SD)	100.65±4.84		101.36±4.30	
Gender				
Male	18	45	19	47.5
Female	22	55	21	52.5
Weight for Age				
Under-weight	7	17.5	1	2.5
Normal	33	82.5	38	95
Over-weight	0	0	1	2.5
Weight for Height				
Wasting	1	2.5	1	2.5
Normal	38	95	39	97.5
Over-weight	1	2.5	0	0
Height for Age				
Stunting	12	30	5	12.5
Normal	28	70	35	87.5
Socio-economic Status				
Poor	2	5	1	2.5
Lower-middle	15	37.5	13	32.5
Upper-middle	18	45	14	35
High	5	12.5	10	25
Upper-high	0	0	2	5
Motor Skill				
Not Developed	1	2.5	4	10
Developed	39	97.5	36	90

Source: Research Primary Data, 2018

Table 2. Association of Identified Variable with Stunting

Variable	Stunting Number (N=17)	%age (%)	Normal Number (N=63)	%age (%)	OR	P-value
Area						
Rural	12	30	28	70	3.0	0.056*
Urban	5	12.5	35	87.5		
Gender						
Male	5	13.5	32	86.5	0.4	0.117*
Female	12	27.9	31	72.1		
Weight for Age						
Malnourished	6	66.7	3	33.3	10.9	0.001*
Normal	11	15.5	60	84.5		
Weight for Height						
Wasting	1	33.3	2	66.7	1.9	0.517[a]
Normal	16	20.8	61	79.2		
Socio-Economic Status						
Lower-middle	9	29	22	71	2.1	0.176*
Upper-middle	8	16.3	41	83.7		
Motor Skill						
Not Developed	3	60	2	40	6.5	0.062[a]
Developed	14	18.7	61	81.3		

* chi-square test, [a] Fisher exact test

Source: Research Primary Data, 2018

2020). Besides the genetic potential, the pattern established by environmental factors affects motor development (Venetsanou & Kambas, 2009). Furthermore, its development in any specific case depends on the affordances and opportunities of the environment, the physical and psychological properties of the child, and the difficulty of the tasks (Kakebeeke, et al., 2017). Early childhood development plays a role in a child's future health, educational success, and economic status (Feinstein & Duckworth, 2006). Nowadays, over 249 million children are estimated not getting their full growth potential in developing countries, with nearly 53 % (89 million) of these live in South Asia (Black, et al., 2013).

This section relates stunting with socioeconomic status and motor skill development by a bivariable test (Table 2.). We simplify variables with more than two categories into just two. Weight for age variable into two categories, namely malnourished and normal. Weight for height variable into wasting and standard. Socioeconomic variables into lower-middle and upper-middle class. In this research, stunting prevalence was the dependent variable. Meanwhile, the independent variables were nutritional status (weight for age and weight for height), socioeconomic status, and motor skill development.

Data analysis using the Fisher exact test showed that motor skill development and weight for height variables were not related to stunting. Stunted children had a high risk of delayed motor skill development (OR 6.5, $p < 0.001$). Weight for height variable shows no significant association with stunting, but wasted children had a greater risk of stunting (OR 1.9, $p < 0.001$). Studies showed that toddlers with stunting demonstrated delayed growth and overall development. Moreover, there is a correlation between the history of infectious disease and the family socioeconomic status with stunting prevalence in West Nusa Tenggara (Pacheco, Picauly, & Sinaga, 2017).

Data analysis using the bivariable chi-square test showed no relation between stunting with area differences, but the odds ratios for stunting (OR 3.0, $p < 0.001$) were highest for children in rural areas. Nutritional status is often associated with differences in demographic conditions, where children in rural areas had a risk of stunting greater than in urban areas. Many studies also have reported that rural children have a higher risk of becoming wasted than urban children

(Pasricha & Biggs, 2010) (Harding, Aguayo, & Webb, 2018). In this study, gender differences showed a negative association with stunting, but female children have a higher odds ratio for stunting (0.4%, $p < 0.001$) compared to male children. This result in line with some studies conducted in West Bengal (Chowdury, Chakraborty, & Ghosh, 2008) and pre-pubertal children in Indonesia (Julia, Weissenbruch, Waal, & Surjono, 2004). Socio-economic status also did not show a significant association with stunting. But children from the lower-middle class had a greater risk of stunting (OR 2.1, $p < 0.001$) compared to children from the upper-middle class. The socio-economic status of the family is known to be associated with children's nutritional status. Children from the upper-middle class show a lower risk of stunting (32 %) than children from the lower-middle class (Mzumara, Bwembya, Halwiindi, Mugode, & Banda, 2018). Family income is one of the socio-economic indicators to fulfill family needs (Reyes, et al., 2004).

Among other variables, only weight for age variable has a significant association with stunting. Analysis results using the chi-square test showed that children with poor nutritional conditions had stunting risk ten times greater than normal children (OR 10.9, $p < 0.001$). This finding was in line with a study among Malaysian children, where stunting risk was approximately 19 % highest among underweight children and adolescents ($p = 0.030$) (Partap , Young, Allotey, Sandhu, & Reidpath, 2019). Several studies have shown that children with Severe Acute Malnutrition (SAM) have a 12 times greater risk of death than a well-nourished child (Olofin, et al., 2013). Recent studies have shown that children who are wasted and stunted are at a higher risk of death. Compared to those with only one of the two conditions (Myatt, et al., 2018).

Conclusion

Paragraph Stunting is the impaired child's growth and development due to poor nutrition, repeated infection, and insufficient psychosocial stimulation. The prevalence of stunting in rural areas was higher than in urban areas. 30 % of children in the rural areas and only 12.5% of children in the urban areas were categorized as stunted. There is no significant association between stunting with socioeconomic status and motor skill development. The weight for age variable showed a significant association with stunting. Children with malnutrition conditions had a stunting risk of 10.9 times greater than normal children (OR 10.9 $p < 0.001$).

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Linking ASI-Mobile Android-Based App on Mothers' Attitude and Behavior on Exclusive Breastfeed

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Abstract

Exclusive breastfeeding within the Palangka Raya municipality is far below target, on which 14,99% (2016) and 16,76% (2017), respectively. There were several primary health has the feeding bout, only cover 2,58%. Due to a lack of mothers' knowledge, regarding beneficial and proper breastfeeding practices. Todays technology presumably has the advantages as promotional media. The study was aimed to quantify the android-based application, so-called ASI-Mobile, towards mothers' attitude and behavior, on exclusive breastfeeding within Jekan Raya district, Palangka Raya Municipality, Central Kalimantan. The Research was conducted in March – October 2019, using a quasi-experimental design, and the sample was 60 pregnant women, in the third trimester period, over the Jekan Raya District areas. ASI-Mobile was subjected to 30 pregnant women, while others 30 mothers by counseling, the conventional promotion type. Purposive sampling was used, their socio-economic was collected, descriptive analysis was conducted. Bivariate analysis, Wilcoxon ranked test was used to analyzed the effect of the treatments. We've have found a significant link on ASI-Mobile application toward mothers' attitudes (p-value 0.046) and behavior (p-value 0.018). We concluded that the ASI-Mobile, an android-base application, is more effective towards shifting mothers' attitudes and behavior on exclusive breastfeeding within our study area.

Introduction

Improving the quality of human resources is one of the directions of health development, where one indicator of its success is declining infant mortality rate (IMR) and improving the nutritional status of the community. One such effort is through the breast-feeding program (BF), as outlined in Government Regulation (PP) Number 33, 2012 on the provision of exclusive breast milk. The coverage of exclusive breastfeeding in Indonesia, at the national level, has reached 61.33%. The number has surpassed the strategic plan of 2017, at 44% (Kementerian Kesehatan RI, 2018). Nevertheless, the number of exclusive breastfeeding coverage in central Kalimantan in 2017 shows 11%, lower compared with the year 2016, which penetrated 20.5% (Dinas Kesehatan Provinsi Kalimantan Tengah, 2018). Based on the profile of the city health Office of Palangka Raya (DInas Kesehatan Kota Palangkaraya, 2018) the coverage of the exclusive breastfeeding in Palangka Raya city in 2017 amounted to 16.76% and 2016% for 14.99%. This figure indicates far below the national target of 80%. Health promotion is one of the efforts made for the dissemination of information and education on exclusive breast milk. The use of social media for health promotion is an emerging area of inquiry, showing that the use of social media for health promotion can increase participant engagement, and can provide a cost-effective tool to provide social support for individuals in the health sector, as well as to identify how to make the best use of social media as a health promotion tool (Jane, et al., 2018).

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The development of information technology can be used as a health promotion media, one of them by using Android application. Using SMS, effect of nutritional messages have adequate effects on awareness and dietary compliance in hypertensive patients (Merita, et al., 2019) . Nutrition education Media based on Android (Perdana, et al., 2017; Eliana & Kurniawati, 2015), increase knowledge, attitude, and practice of balanced nutrition in elementary school children. Also, (White, et al., 2016) expressed the findings and model of the application that they designed in such a way by basing into theory, and applied with the game model, can improve the role of the husbands to empowered their wives to breastfeed their newborn. Given that situation, it is alleged that, access to information through an Android-based application, can reach the community quickly and able to contribute to awareness efforts, related to exclusive breastfeeding. Through this research, Android-based applications named ASI Mobile. The purpose of this research is to analyze the influence of Android-based Mobile application on the attitudes and behavior of pregnant women about the exclusive breastfeeding in Jekan Raya Sub-district

Method

The design of this research is quasi-experimental, consisted of two group comparison pre-test-post tests. One group was subjected to ASI-Mobile application, while the other group was subjected to conventional promotional methods, Counseling. Below is ASI-Mobile interface at a glance:

Figure 1. The ASI-Mobile application interface; (a) Menu; (b) Menu – continued; Each menu has informative; (c) Sub-Menu on ASI-Mobile icon and (d) Sub-Menu on Multimedia, contains Education Video.

The population of this study is the third trimester periods of pregnant women in Jekan Raya Sub-district. The determination of the sample, considering the minimum criteria for the two-sample hypothesis test is free of each other, with the value, average, and standard deviation (Hermina & Hidayat, 2011). Based on the formula, then the large sample in this study is as much as 27.66, equal to 30; so that the total sample is 60 individuals, purposively sampling. Questionnaires were also developed to assess the attitudes and behaviors of pregnant women regarding exclusive breastfeeding, through in-depth interviews. Qualified expectant mothers will be given an explanation of the research process to be carried out and asked for approval of the willingness to be respondents. Respondents are who have expressed a willingness to be divided into treatment groups and control groups. Moreover, before the intervention of treatment according to the method of each expectant mother who will be given treatment application of ASI-Mobile and pregnant women control group with conventional methods on breast counseling will be given a pretest questionnaire for the assessment of attitudes. After completing the pre-test questionnaire, each pregnant woman is explained the ASI-Mobile application on Android and how to operate the application.

Meanwhile, in pregnant women, the control group at the time of the visit will be provided with concessional information/ counseling on exclusive breastfeeding. Furthermore, any expectant mothers who have been given application and counseling will be carried out a post-test assessment after childbirth or Nifas period and the age of the first week of infants (7 days) to assess the attitudes and behaviors of the exclusive breast milk. Data were analyzed using the Wilcoxon sign rank test

Result And Discussion

As previously described, a study was subjected to two groups, using different promotional methods, here we provided the characteristics:

Table 1. Characteristics Respondents, Counseling (n:30) and ASI-Mobile app (n:30); DMW (Districts Minimum Wages)

Characteristics	Counselimg	Application
Age		
Risk (< 20 years and > 35 years)	28 (46.7%)	28 (46.7%)
Un-Risk (20 - 35 years)	2 (3.3%)	2 (3.3%)
Education		
Basic - Middle	2 (3.3%)	8 (13.3%)
Higher Education	28 (46.7%)	22 (36.7%)
Occupation		
Work	4 (6.7%)	10 (16.7%)
Not Working	26 (43.3%)	20 (33.3%)
Parity		
Primigravida	6 (10%)	8 (13.3%)
Multigravida	24 (40%)	22 (36.7%)
Wages		
< DMW	20 (33.3%)	23 (38.3%)
≥ DMW	10 (16.7%)	7 (11.7%)

Source: Primary data, 2019

Table 1 shows that in sample groups given counseling guidance, from 30 the majority samples are included in the Age of risk (< 20 years and > 35 years) i.e. as many as 28 individuals (46.7%). Similarly, in the sample groups given the ASI-Mobile application, the majority are included in the Age of risk (< 20 years and > 35 years) i.e. as many as 28 individuals (46.7%). Reviewed from the characteristics of education, both sample groups have relatively equal characteristics i.e. the majority have a high level of education i.e. 28 individuals (46.7%) are on counseling groups and 22 individuals (36.7%) in the ASI-Mobile application group. Likewise, on the characteristics of the work, both groups have relatively identical characteristics. The sample group, which was given the majority counseling, did not work as much as 26 individual (43.3%) And in the ASI-Mobile application group as much as 20 individuals (33.3%).

Based on parity characteristics, both sample groups have relatively equal characteristics i.e. the Multigravida majority, which is as much as 24 individuals (40%) On counseling groups and 22 individuals (36.7%) In the ASI-Mobile application group. Similarly reviewed from the earning characteristics, both groups have relatively identical characteristics.

The sample group, given the majority counseling, has an income lower than District Minimum Wages (DMW), which is as much as 20 individuals (33.3%) And in the ASI-Mobile application group as much as 23 individuals (38.3%).

The analyses have revealed that sample group of pregnant mothers given counseling guidance, the average score of expectant mothers against exclusive breastfeeding at the time of pretests of 75.7 ± 4.9. After counseling or at the time of Posttest there was an increase in the average attitude score of 77 ± 4.7. Likewise, in the group of pregnant mothers given the ASI-Mobile application, there is an increase in the average attitude score against the exclusive breast milk, which at the time of the average pretests attitude score of 73.3 ± 5.9 and at the time of posttest increased to 79.6 ± 5.3.

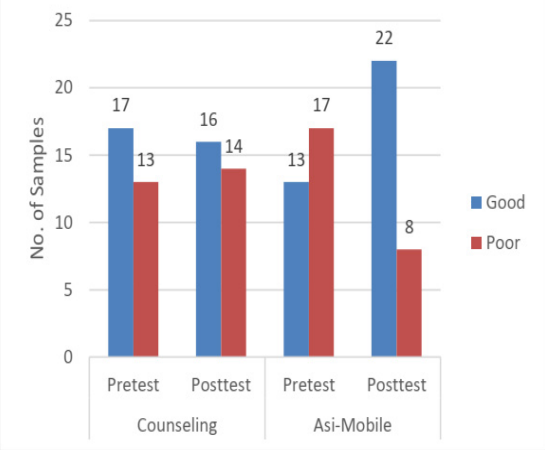

Figure 2. Descriptive on Pre-Test vs Post-Test on no. of Pregnant Women Attitudes as per Group

Based on Figure 2, it is shown that in a sample group of pregnant mothers given counseling guidance, the expectant mother's attitude toward exclusive breastfeeding before counseling (pretest) majority in the category of good is as much as 17 individuals. After being given counseling or at the time of the posttest there is not a lot of changes that there are 16 individuals who are in the good category. While in the group of pregnant mothers given the application of ASI Mobile, at the time of Pretest, the majority of pregnant women have a poor attitude that is as many as 17 individuals and expectant mothers who have a good category of 13 individuals. Once given the ASI-Mobile application, there is an increase in the number of pregnant women who have a good category attitude as much as 22 individuals. Mothers who have a less good category attitude decline to 8 individuals.

To test the influence of counseling on the expectant mother's attitudes towards exclusive breastfeeding, use the t-test in pairs. The testing process is conducted by comparing the attitude score before and after counseling. Based on the test results of the comparison of expectant mothers before the after counseling, it is shown that the average score of expectant mothers against exclusive breastfeeding at a pretest of 75.7 ± 4.9. After counseling or at the time of Posttest there was an increase in the average attitude score of 77 ± 4.7. By using the t-test in pairs gained a P-value of 0.290 ($p > 0.05$) which indicates there is no significant difference in the average score between before with the after counseling. In other words, counseling does not prove to improve the attitude of the mother significantly.

To test the influence of counseling on the expectant mother's attitudes towards exclusive breast milk, use the t-test in pairs. The testing process is conducted by comparing the attitude score before and after counseling. Based on the test results of the comparison of pregnant women's attitudes before the after given the application of ASI Mobile, it is shown that the average score of expectant mothers against exclusive breastfeeding at the pretests of 73.3 ± 5.9. Once given the ASI-Mobile application or at the time of the posttest, there is an increase in the average attitude score of 79.6 ± 5.3. By using the paired T-test, you get a P-value of 0.000 ($P < 0.05$) which indicates that there is a significant difference in the average attitude score between before with the after given ASI-Mobile application. In other words, giving the ASI-Mobile app proved to improve the attitude of the mother significantly.

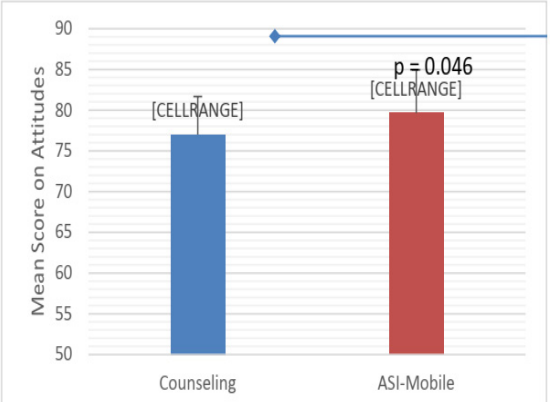

Figure 3. A Pairwise comparison as per methods been deployed

Based on the results of the test comparison of the expectant mother's attitude after counseling with after given the ASI-Mobile application, it is shown that the average expectant mother's attitude towards exclusive breastfeeding in counseling groups amounted to 77 ± 4.7 and in the Mobile application group of 79.6 ± 5.3. By using the paired t-test, we have calculated the p-value of 0046 (P < 0.05) which indicates there is a significant difference in the average attitude score between the counseling groups with the ASI-Mobile application group where the average ASI-Mobile application group score is higher than the counseling group. In other words, the test is evidenced that the delivery of Mobile applications proved more effective in enhancing the expectant mother's attitude towards exclusive breastfeeding. Testing the influence of counseling and ASI-Mobile application is done by nonparametric using the Chi-Square test (Table 2).

Table 2. Chi-square Test on the Effect on Exclusive Breastfeeding as per Methods

Exclusive breastfeeding	Group		p-value
	Counseling	ASI-Mobile	
- Yes	13 (21,7%)	22 (36,7%)	0,018
- No	17 (28,3%)	8 (13,3%)	

Source: Primary data analysis, 2019

Based on the test results of the influence of ASI-Mobile and counseling for the mother's behavior in providing exclusive breastfeeding in Table 2, it was shown that in the counseling group, from 30 research samples, mothers who gave the exclusive ASI as much as 13 people (21.7%) And as many as 17 people (28.3%) do not provide exclusive breast milk. Different in the ASI-Mobile application group, there are 30 research samples, as many as 22 people (36.7%) Mothers who give exclusive ASI, only 8 people (13.3%) which is not. Using the Chi-Square test, you get a P-value of 0.018 (P < 0.05) which indicates the difference in the behavior of mothers given counseling with ASI-Mobile application in providing exclusive breast milk. From this test, it is evidenced that the delivery of ASI-Mobile application is more effective in shaping the behavior of mothers to provide exclusive breastfeeding.

The characteristics of sample research in general show similarities, whether it is age, education, occupation, parity, and income. An overview of the mother's attitude towards exclusive breastfeeding before and after the intervention meets the rules of normality. The results showed that there were no significant differences in the average attitude between before with the following counseling. In other words, counseling does not prove to improve the attitude of the mother significantly. The result was not similar, regarding the effectiveness (Aprilina & Linggardini, 2015) stating that there was a difference in maternal attitudes after lactation counseling. Counseling is an opportunity to discuss various matters, such as preconceptual health issues, because three out of four mothers stated that PPRK should be part of their routine when visiting midwives so that the patient's problems can be properly consulted with the midwife (Skogsdal, 2019). The counseling process cannot run effectively because the midwives do not involve the mother during counseling so that mothers tend to be listeners and lack the skills of midwives as counselors in asking open questions or two-way communication failures. Also, the exclusive knowledge and practice of breast-feeding that are largely not exclusive to other factors form a mother's attitude towards exclusive breast milk. Counseling is also a very important role in increasing the knowledge of mothers, so the more often information (Ambarwati, 2013).

However, the difference is indicated by a tie-in t-test result, in which a group of mothers using the ASI-Mobile application shows

meaningfulness of increased attitudes, before and after the intervention (Figure 3). This meaninglessness is also found in comparison to the effectiveness of counseling with ASI-Mobile application in the contribution to the attitude of the mother to exclusive breastfeeding (Figure 4). Based on this, the findings have a corresponding implication on which researcher experimented on the millennial mother (whom birth between 1980 and 1994), through two ways of providing information (Beard, 2014). The first information by providing a short message (SMS) and the second way with an application program that comes with video features (YouTube®). Results show that by using an application program, equipped with accessible features, contributes to an increase in nursing mothers by 11.72% in 3 years. The need for information tends to fulfill each individual, unique, and not the same (Coughlin, 2016). It is further reported, that the attitude is personal, and of course, leads to changing attitudes. Noting the characteristics of research samples, during the study period, some considerations, especially for the achievement of health objectives relating to breastfeeding policy, are access to present information, no longer static; One-way consulting process has begun irrelevant. Based on the results of the research of ASI-Mobile application is more effective in shaping the behavior of mothers to provide exclusive breastfeeding.

In this study, the behavior of mothers in delivering exclusive breastfeeding is measured at the time after childbirth and the age of the first week of baby 7 days (Table 2). These results show the meaninglessness of behavior (p-value value 0.018). This suggests that changes in attitudes as discussed earlier will affect behavior. In the 2 groups acquired behavioral data with different proportions. The Counseling Group (n:30 people) gives the exclusive breastfeeding as much as 13 people (21.7%) And who did not provide exclusive breastfeeding of 17 people (28.3%). Meanwhile, in the application group, as many as 22 people (36.7%) Provide exclusive ASI, the remaining 8 people do not give exclusive ASI. This suggests that treatment with an application gives a better influence when compared to behavioral-related counseling. However, the results of this research show some things i.e. giving mothers excuses not to give exclusive breastfeeding they have given access to the application. The most common reason is that breastfeeding has not come out/Little (n: 7 people) and 1 person is grounded because of the way of childbirth with the Caesarian section (SC). As presented, more than 7 of those mothers with a history of multigravida parity. The implication that access to information does not affect behavior and it is presumed that mothers base on previous habits or experiences. However, in general, the use of applications in this research influences behavioral changes in the granting of exclusive breast milk. There was a tendency to inconsistent behavior in providing exclusive breastfeeding when the mother faced problems such as milk has not come out, very little, nipple forms, and abrasions (Ambarwati, 2013). Moreover, fussy children have lack of support from husbands, families, and health officers. Mothers who successfully give breastfeeding as early as possible without giving food or pre-lacteal drink for 1 week after childbirth are mothers who get full support from the family especially the husband (Liliana, et al., 2017). Another findings and model of the application that they design in such a way by basing the theory, and applied with the game model, can improve the role of the husband, to encourage the wife to give exclusive breastfeeding to the baby (White, et al., 2016).

Breastfeeding is also linked to health outcomes in women. This can speed up the postpartum period, and return to pre-pregnancy weight. It can also reduce the risk of postpartum depression, type II diabetes, metabolic syndrome, and breast and ovarian cancer. In many cases, the health benefits of breastfeeding are increased according to the duration and exclusivity of breastfeeding in the first six months. However, breastfeeding rates (especially for exclusive breastfeeding) worldwide are less than optimal (Zielinska, 2017). The family, in this case, Father (husband), has an important role in the exclusive ASI decision. The implication of this research suggests the need for information, but not limited to mother. Father (husband) is precisely a role in reminding the importance of exclusive breastfeeding for babies. Researchers

have been studied how a father engages with things related to breastfeeding, by giving them challenges (Bien & Davies, 2014). The result gives a positive signal, that the father, needs two things, that is information that is always available (through gadgets) and access to health workers for consultation. Furthermore, it confirms that the role of father as a partner in decision making, and of course, is responsible for the intake of infants through breast milk, in helping to remind the importance of it to their respective spouses.

Conclusion

We can conclude that there were no significant differences in the average attitude between before with the following counseling. In other words, counseling does not prove to improve the attitude of the mother significantly. Also, ASI-Mobile application is proven to be more effective in improving expectant mothers' attitudes towards exclusive breastfeeding (p-value 0046). Moreover, the delivery of ASI-Mobile application is more effective in shaping the behavior of mothers to provide exclusive breastfeeding (p-value 0.018).

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Parental Monitoring and Risk Behavior in Middle Adolescents

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Abstract

Friends played significant role due to middle adolescents tended to imitate behaviour of their friends including the risk behaviour. Parental monitoring could minimize the risk. However, the excessive unreasonable parental monitoring tended to increase risk behaviour of middle adolescents. Therefore, the purpose of this study was to know whether perceived parental monitoring had a significant relationship with risk behaviour among middle adolescents. This study used quantitative method with two measuring instruments in the form of a questionnaire, Parental Monitoring Questionnaire which consisted of 25 items to measure parental monitoring and Adolescence Risk Behaviour Questionnaire which consisted of 15 items to measure risk behaviour. The participants in this study were 105 male senior high school student age 15-17 years, who lived with both of their parents in Jakarta. Correlation test results showed that there was a significant relationship between perceived parental monitoring and substance use, premarital sex, and criminal behaviour among middle adolescents. Based on these results, the researcher presented some discussion materials and the suggestions that needed to be considered for further research.

Introduction

Statistical data has shown that the prevalence of risky behavior often appears during the developmental stage of adolescents, especially in adolescents who are in high school education and above (> 14 years), such as smoking behavior, alcohol use, sexual activity, engaging in delinquency, acting criminally, and so on. (Schuster, Mermelstein, & Wakschlag, 2013). Some of the risky behaviors of adolescents in Indonesia have shown a number that needs attention because they are alarming. One of the risky behaviors is smoking. The 2018 Basic Health Research (Riskesdas) found that the prevalence of smoking in people over 10 years old was 28.8 percent. In fact, the percentage of Indonesian adolescents aged 13-15 years who smoke is 19.4%, which is the highest among other ASEAN countries (data from the Southeast Asia Tobacco Control Alliance in databoks.katadata.co.id). Another risky behavior is that 70 percent of teenagers start drinking alcohol from the age of 15-19 percent and women 58 percent. Meanwhile, other risky behavior, namely free sex behavior is not a strange thing in the life of Indonesian adolescents. In July 2019, 33 percent of adolescents in 5 major cities in Indonesia have had sexual intercourse before marriage, and 58% of them have penetrated between the ages of 18 and 20 (Liputan 6.com). Drug use during adolescence is associated with an increased risk of depression in young adulthood. Younger marijuana users (ages 14 to 15) had a significantly higher risk of suicidal behavior, although not overall (Gobby et al., 2019).

Many theories explain the factors that can cause or influence risky behavior in adolescents. One of the factors that influence adolescent risk behavior comes from the

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relationship between parents and adolescents. At this stage, the relationship between parents and children gradually becomes more equal or horizontal, so that adolescents feel they have a greater degree of autonomy and independence compared to the previous period (Parks in Tagliabue, Olivari, Giuliani, & Confalonieri, 2018). This in turn can lead to conflicts between adolescents who begin to protect their privacy and their parents' desire to stay informed about the whereabouts of their teenagers (Petronio & Caughlin, 2005; Hawk et al., 2009).

In adolescence, what might happen is an increase in alcohol consumption, it can happen based on their environment. This can occur in adolescents and new adults, which can interfere with long-term accumulated alcohol consumption, and often adolescents have higher levels of consumption (Carpenter et al., 2019), and tend to develop themselves to the limit of permitted behavior. Parental monitoring is defined as the knowledge of parents about the whereabouts, activities and relationships of their teenagers. In the context of risk factors, parental monitoring has shown a promotive and protective effect on adolescents. Apart from that, parental monitoring can also protect adolescents by resisting the effects of externalizing problems (Kelly et al., 2017). Suwarni (in Jatnika, 2017) explains, the unbalanced and excessive implementation of parental monitoring can actually contribute to risky behavior.

Previous research conducted by Stattin and Kerr (2000) tried to explain the relationship between parental monitoring and risk behavior in adolescents. The sample in this study focused on the early adolescent stage, namely Swedish teenagers aged 14 years and their parents. In this study, parental monitoring applied by parents to adolescents was measured using a youth report version of the questionnaire and the parents report. The results of this study indicate that parental monitoring has a significant relationship with risky behavior, such as delinquency, smoking, drug use and sexual activity. The results of this study also indicate that parental monitoring requires a two-way process, between the active role of parents (parental knowledge, parental solicitation and parental control), and the active role of children (adolescent disclosure). So not only parents play a role in parental monitoring, but teenagers themselves can also contribute to the successful process of parental monitoring.

On the other hand, previous research conducted by Stavrinides (2011) also tried to explain the relationship between parental monitoring and risky behavior in adolescents. The sample in this study focused on the early adolescence stage, namely adolescents aged 14-15 years and their parents. In this study, parental monitoring that was applied by parents to adolescents was measured using a questionnaire version of the parents report. The results of this study indicate that parental monitoring does not have a significant relationship with risky behavior, such as delinquency, smoking, sexual activity and drug use.

Research by Stavrinides (2011), which measures parental monitoring from the point of view of parents, is deemed inappropriate. The meaning or perception of children towards parental monitoring carried out by parents itself has a much more important role because the success of parental monitoring does not only come from the active role of parents, but teenagers themselves can also contribute to the successful process of parental monitoring, by selecting information - what information do parents want to disclose or share. Adolescent's willingness to disclose information to parents is influenced by adolescent perceptions of monitoring or supervision carried out by the parents themselves (parental monitoring).

If parental monitoring is perceived by adolescents as a form of parental support that provides comfort because it shows someone who cares and cares about them, then the willingness of adolescents to disclose information to parents tends to be high (Diclemente, Wingwood, Crosby, Sionean, Cobb, Harrington, & Oh, 2001). In this situation, parental monitoring can be used as an effort to minimize risky behavior. Based on the explanation above, it can be concluded that one of the important things in parental monitoring is the adolescent's perception of the supervision or monitoring of activities carried out by the parents themselves (Diclemente, Wingwood, Crosby, Sionean, Cobb, Harrington, & Oh, 2001). Walgito (2010) defines perception as an

individual process to organize and interpret stimuli received through the senses. Based on this explanation, the perception of parental monitoring can be defined as an individual process, which in this study is adolescents to choose, organize and interpret the actions of parents to carry out supervision, which can be done by gaining knowledge about the activities or whereabouts of children, and also using rules to limit children's behavior.

In this study, parental monitoring will focus on how parents can get information about the activities and existence of adolescents directly, by involving the active role of parents (parental knowledge, parental solicitation and parental control), and the active role of children (adolescent disclosure). In this study, parental monitoring applied by parents to adolescents is then perceived and measured from the adolescent's point of view using a youth report version of the questionnaire. The reason the researchers conducted this study was because many parental monitoring studies only involved the active role of parents as an effort that could be made to obtain information about the activities and whereabouts of adolescents directly. Research that discusses and includes the role of adolescents in parental monitoring is rarely found in the parental monitoring literature. Whereas as explained above, the success of parental monitoring does not only come from the active role of the parents, but the teenagers themselves can also contribute to the successful process of parental monitoring.

Method

Data collection was carried out quantitatively, namely correlational, from March to June 2019. The purpose of this study was to see whether there was a significant relationship between parental monitoring and risk behavior in middle adolescence or not. In this study, researchers found 105 participants who fit the criteria and were willing to participate. The sample characteristics for this study were male adolescents aged 15-17 years, high school students or equivalent, residing in the Jakarta area, and living with both of their parents. The sampling technique used in this study is a non-probability sampling technique, which is a sampling technique that is not randomly selected (Creswell, 2012). The nonprobability sampling approach that researchers used in this study was convenience sampling. Creswell (2012) explains that the research participants who were selected to be the sample could be due to coincidence or other factors that the researcher had planned. In this study, researchers will only take people within the reach of the researchers, who can be contacted, according to their characteristics and willing to participate.

Parental Monitoring Questionnaire (PMQ), this was done by adapting and modifying the youth-report version of the Parental Monitoring Questionnaire scale that was first compiled by Stattin and Kerr in 2000 (Stattin & Kerr, 2000; Kerr, Stattin, and Burk, 2010; Stattin and Kerr in Hamza and Willoughby, 2011; Stattin & Kerr in Everri, Tiziana, & Fruggeri, 2015). This instrument consists of 25 items that are used to assess the four dimensions of parental monitoring, namely: parental knowledge, adolescence disclosure, parental control, and parental solicitation. Cronbach's alpha values for the PMQ dimensions range from .900 to 0.949. The validity tests used in this measuring instrument are the content validity by means of expert judgment and construct validity. The construct validity technique used was internal consistency validity. In this validity test, researchers used Spearman correlation because the data obtained were not normally distributed. Racz & McMahon (2011) explains, an item is declared valid if it has a corrected item total correlation value at least equal to 0.2. The corrected item-total correlation PMQ values ranged from .541 to .934.

PMQ measuring instrument uses a 5-point Likert Scale, with the following specifications: 1 (strongly disagree) and 5 (strongly agree), which is one type of summative scale. This means that the responses of all items will be added up to determine the final score of parental monitoring as perceived by middle adolescence. Middle adolescence who gets high scores perceives that they get supervision from their parents. Meanwhile, middle adolescence with low scores perceives themselves as not getting enough parental supervision. Adolescence Risk Behavior Questionnaire

(ARBQ), it done by making their own measuring tool, namely ARBQ (Adolescence Risk Behavior Questionnaire), which is used to measure the frequency of adolescent behaviors and actions that have the potential to have a negative impact on individual health and well-being such as the use of illegal substances (smoking, alcohol, and drugs), premarital sex, and criminal behavior. There are 17 items used to assess three aspects of risky behavior, namely: substance use behavior, premarital sex behavior, and criminal behavior. The items that the researcher asked about on this measuring instrument have been adjusted to the behaviors that are mostly categorized as risky behaviors that were carried out during Indonesian adolescence, especially those living in big cities like Jakarta.

Cronbach's alpha values for aspects of the ARBQ range from .808 to .962. The validity tests used in this measuring instrument are the content validity by means of expert judgment and construct validity. The construct validity technique used was internal consistency validity. In this validity test, researchers used Spearman correlation because the data obtained were not normally distributed. Racz & McMahon (2011) explains, an item is declared valid if it has a corrected item total correlation value at least equal to 0.2. The corrected item-total correlation ARBQ values range from .000 to .955. Items which have a validity value of 0.000 are associated with homicide and rape behavior. In the measuring instrument trial, there were no study participants who reported having committed murder and rape behavior, so the researcher decided to delete the two items so that the total item of the ARBQ measuring instrument became 15 items.

The ARBQ measuring instrument uses a 5-point Likert-Scale, with the following specifications: 1 (never done) and 5 (always done), which is one type of summative scale. That is, the responses of all items will be added up to determine the final score of the frequency of risky behavior carried out by middle adolescence.

The method of scoring the ARBQ measuring instrument can be done by adding up all the respondents' answers on each aspect. So that it will produce three total scores because this measuring instrument measures three aspects separately, namely substance uses behavior, premarital sex behavior, and criminal behavior. Middle adolescence with high scores has a higher tendency to engage in risky behavior in certain aspects. Meanwhile, middle adolescence with low scores has a lower tendency to engage in risky behavior in certain aspects. The data analysis method that researchers will use is the correlation statistical technique. This statistical correlation technique is used to determine the relationship between two variables (Gravetter and Wallnau, 2013).

Results and Discussion

Researchers found as many as 105 male adolescents aged 15-17 years who live with their parents in the Jakarta area. Researchers collected data using a questionnaire that has been distributed by researchers online. Data collection was carried out from June 4, 2019 to June 17, 2019. The following is an overview of the demographic data of the 105 study participants.

Table 1. Participant Demographic Data (N = 105)

Category	Total	%
Ages		
15 years old	21	20.00%
16 years old	33	31.43%
17 years old	51	48.57%
Residence Area		
North Jakarta	14	13.33%
East Jakarta	27	25.71%
South Jakarta	23	21.90%
West Jakarta	20	19.05%
Central Jakarta	21	20.00%

Substance Use Behavior		
Ever Did it	56	53.33%
Never Did it	49	46.67%
Premarital Sexual Behavior		
Ever Did it	38	36.19%
Never Did it	67	63.81%
Criminal Behavior		
Ever Did it	102	97.14%
Never Did it	3	2.86%

Based on the age category, from a total number of 105 participants who filled out the questionnaire, the most age category was at the age of 17, which was 48.57%. Then followed by participants at the age of 16, namely 31.43% and finally at the age of 15, which was 20.00%. On the other hand, based on the category of residence area, from the total number of participants of 105 people who filled out the questionnaire, the category of residential area was mostly domiciled in East Jakarta, namely 25.71%. This was followed by participants domiciled in South Jakarta, namely 21.90% and the least number of participants domiciled in North Jakarta, namely 13.33%. The Ministry of Health of the Republic of Indonesia explains that adolescents at risk are adolescents who have engaged in risky behavior, such as using illegal substances and having premarital sex (Department of health, 2003). In table 4.1, it can be seen from the 105 study participants, 53.33% had used substance use behavior, 36.19% had used premarital sex behavior, and 97.14% had committed criminal behavior. If calculated as a whole, as many as 102 (97.14%) study participants were adolescents at risk because they had committed at least one form of risky behavior.

This study intends to see whether there is a significant relationship between perceptions of parental monitoring and middle adolescence risk behavior using statistical correlation methods. Before conducting a correlation test, it is necessary to do a normality test to see to what extent the distribution of the research variables has followed the normal distribution curve or not. If the data is normally distributed, the researcher must perform a parametric test. If the data is not normally distributed, the researcher must perform a nonparametric test (Wallnau & Gravetter, 2013). The following are the results of the normality test that has been carried out.

Table 2. Results of Normality Test of Research Variables

	Saphiro-Wilk	
	Statistic	**Sig.**
Parental Monitoring	.941	.000
Substance Use Behavior	.759	.000
Premarital Sex Behavior	.619	.000
Criminal Behavior	.918	.000

Table 2 is a table of the results of the normality test for research variables. The Saphiro-Wilk significance value that needs to be fulfilled so that the data can be said to be normally distributed is p> .05 (Gravetter & Wallnau, 2013). Based on this test, it can be concluded that parental monitoring data, substance use behavior, premarital sex behavior, and criminal behavior are not normally distributed, so that the Spearman correlation technique will be used to examine the relationship between parental monitoring and substance use behavior, premarital sex behavior, and criminal behavior.

Table 3. Correlation Results of Spearman Parental Monitoring and Risk Behavior

		Parental Monitoring
Parental Monitoring	*Correlation Coefficient*	1.000
	Sig. (2-tailed)	
Substance Use Behavior	*Correlation Coefficient*	-.623**
	Sig. (2-tailed)	.000
Premarital Sex Behavior	*Correlation Coefficient*	-.620**
	Sig. (2-tailed)	.000
Criminal Behavior	*Correlation Coefficient*	-.659**
	Sig. (2-tailed)	.000

***Correlation is significant at the 0.01 level (2-tailed)*

Based on Table 3 above, it can be seen that the perception of parental monitoring has a significant relationship with the behavior of substance use in middle adolescence, rs(103) = -.623, p<.05; premarital sexual behavior, rs(103) = -.620, p<.0.5; and criminal behavior, rs(103) = -.659, p<.05, r2 = .08 middle adolescence. Keijers (2015) explains that the Parental Monitoring Questionnaire which is adapted from Stattin and Kerr (2000) can be used by researchers with the use of a full scale or only part of the dimensions of the scale, adjusted to the research objectives (Racz & McMahon, 2011). Therefore, in this study, researchers will also look at the relationship between the dimensions of parental monitoring and risky behavior. The aim is to find out what dimensions of parental monitoring have the largest and smallest correlation coefficients.

Table 4. Correlation Results of Spearman Dimensions of Parental Monitoring and Risk Behavior

		Substance Use Behavior
Parental Knowledge	*Correlation Coefficient*	-.619**
	N	105
Adolescence Disclosure	*Correlation Coefficient*	-.607**
	N	105
Parental Control	*Correlation Coefficient*	-.649**
	N	105
Parental Solicitation	*Correlation Coefficient*	-.506**
	N	105
		Premarital Sex Behavior
Parental Knowledge	*Correlation Coefficient*	-.617**
	N	105
Adolescence Disclosure	*Correlation Coefficient*	-.644**
	N	105
Parental Control	*Correlation Coefficient*	-.591**
	N	105
Parental Solicitation	*Correlation Coefficient*	-.522**
	N	105
		Criminal Behavior
Parental Knowledge	*Correlation Coefficient*	-.668**
	N	105
Adolescence Disclosure	*Correlation Coefficient*	-.638**
	N	105
Parental Control	*Correlation Coefficient*	-.654**
	N	105
Parental Solicitation	*Correlation Coefficient*	-.497**
	N	105

***Correlation is significant at the 0.01 level (2-tailed)*

Based on Table 4 above, the researcher found that the parental control dimension is one of the dimensions of parental monitoring that has the greatest correlation coefficient with substance use behavior in middle adolescence. ($r_{s(103)} = -.649$, $p < .05$). Meanwhile, the dimension that has the smallest correlation coefficient with substance use behavior is the dimension of parental solicitation ($r_{s(103)} = -.506$, $p < .05$). Researchers also found that the dimension of disclosure adolescence is one of the dimensions of parental monitoring that has the greatest correlation coefficient with premarital sex behavior in middle adolescence. ($r_{s(103)} = -.644$, $p < .05$). Meanwhile, the dimension that has the smallest correlation coefficient with premarital sex behavior is the dimension of parental solicitation ($r_{s(103)} = -.522$, $p < .05$). Finally, on criminal behavior, researchers found that the parental knowledge dimension is one of the dimensions of parental monitoring that has the greatest correlation coefficient with criminal behavior in middle adolescence. ($r_{s(103)} = -.668$, $p < .05$). Meanwhile, the dimension that has the smallest correlation coefficient with criminal behavior is the dimension of parental solicitation ($r_{s(103)} = -.497$, $p < .05$).

Based on the research results that have been presented, it is known that 102 (97.14%) of the study participants were adolescents at risk because they had committed at least one form of risky behavior. So it can be concluded that risky behavior in adolescents aged 15-17 years is quite common in adolescents who are participants in this study. The risky behaviors that are often carried out include: Substance use behavior, premarital sex behavior, and criminal behavior. Researchers assume that the high number of adolescents, who engage in risky behavior in this study, can be caused by the researchers controlling the factors that can cause adolescents to engage in risky behavior, such as age, gender, education, and area of residence. Efforts are needed to prevent adolescents from engaging in risky behavior. One of them is through family-based interventions, especially parents who are the first and foremost figures in influencing children's growth and development, which can be done by doing parental monitoring.

The results showed that parental monitoring had a significant relationship with risky behavior, both substance use behavior, sexual behavior, and criminal behavior. Furthermore, the researchers found that there was a significant negative relationship between parental monitoring and risky behavior, both substance use behavior, sexual behavior, and criminal behavior carried out in middle adolescence. Based on these results, the researchers concluded that parental monitoring can be used as an effort to minimize risky behavior. This is also found in other research on parental monitoring which explains that parental monitoring with risky behavior itself can be negatively related, meaning that adolescents with high parental supervision engage in less risky behavior and vice versa, adolescents who lack supervision tend to be antisocial, involved in delinquency, and acting criminally (Tralle in Suwarni, 2009; Huang, Murphy & Hser, 2011; Racz & McMahon, 2011; Sasson & Mesch, 2014).

Researchers assume parental monitoring and risky behaviors have a significant negative relationship because parents use direct strategies that adolescents realize when doing parental monitoring, such as limiting adolescent actions with rules and asking where adolescents are. Parental monitoring carried out by parents is perceived by teenagers as a form of support that provides comfort because someone cares and cares for them. On the other hand, Sieverding, Adler, Witt, and Ellen (2005) argue that a higher level of parental monitoring can be associated with a lower level of risky behavior because: First, parental monitoring is perceived and perceived by adolescents, with the aim of limiting the scope of opportunities available for adolescents to engage in risky behavior. Second, parental monitoring creates an environment, where there is pressure on adolescents, so that adolescents obey what parents expect. Third, parental monitoring limits the scope of adolescents to their high-risk peers' social environment, so as to minimize adolescent perceptions of risky behavior that their peers might consider normal.

Diclemente, Wingwood, Crosby, Sionean, Cobb, Harrington, and Oh (2001) explained that parental monitoring which is negatively

related to risky behavior makes adolescent's willingness to disclose information to parents tends to be high. This statement is supported by Stattin & Kerr (2000) in their research, which also argues that the four domains of parental monitoring are parental knowledge, adolescence disclosure, parental control, and parental solicitation. Adolescence disclosure is a dimension of parental monitoring that has the greatest correlation coefficient with risky behavior.

This does not really agree with the results of the additional analysis that the researchers conducted. Based on the results of additional analysis between the dimensions of parental monitoring and aspects of risky behavior, the adolescence disclosure dimension has the greatest correlation coefficient only with premarital sex behavior. However, this does not happen for other risky behaviors, such as substance use behavior or criminal behavior. However, adolescence disclosure still has a large correlation coefficient with other risky behaviors.

On the other hand, parental solicitation is a dimension of parental monitoring that has the smallest correlation coefficient with risky behavior. Parental solicitation is related to how parents seek information about their children through various sources. The way parents seek this information can be done secretly, without permission or knowledge, such as eavesdropping on teenagers' conversations with other people, opening messages without permission, checking things secretly, or asking teenagers directly. The unbalanced and inaccurate way in which parents seek information about their child can frustrate teens because they lose control of their own privacy and cause feelings of discomfort. As a result, adolescents tend to complain because their parents are too involved in their lives and make them more likely to close themselves.

The explanation above shows that the creation of good parental monitoring can be done through cooperation between parents, families, and us. So it can be concluded that the success of parental monitoring does not only come from the active role of parents, but teenagers themselves can also contribute to the success of parental monitoring by choosing what information they want to disclose or tell parents. The openness of children to parents will help parents to have knowledge about the whereabouts and activities of their children.

There are deficiencies that may be corrected in future studies. First, the use of questionnaires via google form which is considered practical and can reach a wider variety of participants. In practice, there are several things that cannot be controlled if data collection is carried out using Google Form, such as whether or not the participant completes the questionnaire with the specified characteristics, as well as the situation and condition when the participant takes the test. Second is the lack of participants. Barlett, Kotrlik, and Higgins (2001) explain that the calculation table for the minimum number of samples taken in a population of over 10,000 is 119 people. In this study, researchers only managed to collect 105 participants. Third, the researchers did not consider asking some demographic data that might affect such as the occupation of parents, dating history, ethnicity, and the frequency of time adolescents spend doing activities with their families, especially their parents.

Conclusion

Based on the analysis of data collected from 105 participants regarding the relationship between perceptions of parental monitoring and risk behavior in male middle adolescence, the following results were obtained: (1) There is a significant relationship between parental monitoring and substance abuse behavior carried out in middle adolescence; (2) There is a significant relationship between parental monitoring and premarital sex behavior carried out in middle adolescence; (3) There is a significant relationship between parental monitoring and criminal behavior carried out in middle adolescence. There are methodological suggestions that can be made in further research. First, further research is expected to be able to take research samples randomly and in larger numbers, so that the research results can represent the population being studied. Second, further research is expected to include several broader and more complex aspects so that the results obtained can be more varied,

such as comparing parental monitoring carried out by fathers and mothers, or testing the effect of parental monitoring and peer behavior with risky behavior, which one gives greater influence for adolescents. Finally, consider controlling for some of the characteristics of participants that might influence the study results, such as parental occupation, dating history, ethnicity, and family situation.

There are practical suggestions that can be made based on this research. First, parents are expected to be the main role models who are considered more experienced to be able to provide direction and support that helps adolescents solve problems, such as providing emotional support when adolescents are experiencing stress or when adolescents are having difficulty preventing adolescents from doing risky behavior. Second, parents are expected to cooperate in supervising their adolescents as early as possible. Not only by knowing and monitoring activities, but also conveying clear rules and boundaries. Finally, adolescents are expected to be able to open up with their parents, because good parental monitoring can be done through cooperation between parents, families, and ourselves. By opening up to parents, parents can always monitor and direct their adolescents when engaging in risky behavior.

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The Early Vigilance of Dengue Hemorrhagic Fever Outbreak in the Community

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Abstract

Early Awareness of Extraordinary Events of Dengue Hemorrhagic Fever (DHF) was asked to community (n= 130). Precautions were measured based on community knowledge, attitudes, and behavior. Knowledge, attitude, and behavior are constructs (in the form of a composite variable) from an early awareness of DHF outbreak. The result showed that the knowledge related to the transmission factor and the proliferation of dengue disease was quite good (72.3%). The DHF risk control was also good (93.9%) while the dengue fever eradication was still poor (67.7%). However, the attitude showed that it is still not ready to act on the basis of consciousness. Meanwhile, the results of the data analysis identified that the model of the early awareness measurement on DHF outbreak which consisted of construct variables (knowledge, attitude, and action) were a perfect fit. Based on the measurement model, the level of community awareness on DHF disease can be measured. This showed that the level of early awareness of DHF disease was good 76.2% and only 3.8% were less alert. This means although the less alert percentage is quite small, if people have an attitude of indifference to the prevention of DHF then the impact will affect a wider community.

Introduction

The community knowledge about dengue hemorrhagic fever (DHF) is already good, yet the case of DHF is still high. The cases is frequent occurrence of sporadic at urban area (Bhatt et al., 2013). The research evidence showed that there is a relationship between knowledge, attitudes, and actions related to dengue disease (Febryana et al., 2010; Pujiyanti and Trapsilowati, 2010; Shuaib et al., 2010; Aryati, Sali and Aryasih, 2014; Lontoh, Rattu and Kaunang, 2016; Kenneson et al., 2017; Harapan et al., 2018; Ghani et al., 2019) and is determined by ability a vector to transmit a pathogen (Zaki et al., 2019).

The dengue fever cases in some districts and cities in East Java has continue to increase. In the Pasuruan city, the spread of dengue fever case has increased. This situation caused Pasuruan City in 2010 amounted to 85.3% (29 urban villages out of 34 urban villages) are DHF endemic village. These areas are Karangketug, Gadingrejo, and Sekargadung. So, among 8 Public Health Center, almost all (70%) have endemic villages. Public Health Center in Trajeng and Kandangsapi is the only area that does not have endemic villages. In addition, the indicator of free number of larvae in all working areas of Public Health Center in 2013 is still below target (Dinas Kesehatan Pasuruan, 2015). Early awareness of DHF is the vigilance to potentially extraordinary diseases (outbreak) by applying epidemiological surveillance that is utilized to improve preparedness and response

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stance quickly and appropriately. The quick and responsive attitude of the community is very important to monitor the possibility of DHF outbreaks (Eldigail et al., 2018).

The eradication of infectious diseases is still a threat to human life. Given the problem of dengue fever is still increasing, early vigilance against dengue fever is needed; and for it to be reliable, it requires psychological measurement models. Psychological measurements include knowledge, attitudes and behaviors that are extracted based on indicators developed in the community. Knowledge of dengue fever, awareness and preventive measures are strategies for early vigilance. To be able to conduct early vigilance, one's need to understand the disease symptoms and risk factors; have the willingness/ability to act; and observe restrictions and controls. Furthermore, the measurement model can be used to obtain information on eradicating disease.

The objective was to create an early vigilance measurement model for DHF described as a dimension of the psychological function (knowledge, attitude and behavior/ action). The expected benefit of the citizen who has a high level of vigilance was that they tend to proactively respond to the environment that has dengue disease potential. The opinions of the community on the concept of vigilance can affect the psychological function in a positive or negative manner.

Method

This research was an observational research conducted by cross-sectional. The sample was a family in Pasuruan. The technique used to take the data was cluster random sampling technique and the sample was 130 families. Data was collected through interviews using structured questionnaires. Operational definition: 1) Knowledge of DHF risk is a community understanding of the symptoms and risk factors for dengue transmission. Indicators used include the factors of dengue fever transmission, dengue fever reproduction area, and disease control measures. The measurements used Likert scale 1= do not know anything - 5= know very well about the risk of DHF. Interval data scale; 2) Attitude to DHF is something that is in the mind related to the dengue disease. The indicators used include how to respond to DHF. The measurements used Likert scale 1= unresponsive - 5= highly responsive. Interval data scale; 3) Practice of DHF is an action that is done related to risk control (cleaning mosquito breeding place) and eradication of DHF (efforts to eliminate mosquitoes). The measurements used Likert scale 1= very inaction - 5= very good acts to control / eradicate dengue. Interval data scale; 4) Early vigilance is measured by psychological function. The results of the total score are then categorized (1= less, 2= enough, 3= alert, 4= very alert). Ordinal data scale.

Data analysis procedures in this study were carried out in several stages. There are 3 parts: to describe descriptively by exposing the characteristics of society using frequency distribution table. Pearson correlation analysis were used to test the validity and reliability of the instrument. The Second-Order Confirmatory Factor Analysis (2ndCFA) to get the model measurement. The results of testing the validity and reliability of the instrument; Validity of data was measured by looking at Pearson correlation coefficient. If the value r> 0.6, it is not negative and meaningful with p value< 0.05. The data reliability was measured by looking at Chronbach alpha> 0.6 indicating that the instrument was reliable. The Pearson correlation results showed that the relationship between item-total scores in each factor (knowledge, action) was valid (r> 0.6). The value of Chronbach alpha> 0.6 indicated that the instrument was reliable. While the attitude that was only measured on a single item considered as valid and reliable.

Table 1. Validity and Reliability of Psychological Functions on Early Awareness of DHF Outbreaks

	Item-total score (p value)	Reliability	Explanation
Knowledge		0.662	Valid
Factors of transmission	0.905 (0.0001)		Reliable
Breeding	0.772 (0.0001)		
How to control the disease	0.766 (0.0001)		
Attitude*	-	-	Valid Reliable
Behavior / action		0.641	Valid
Risk control	0.892 (0.0001)		Reliable
Eradication	0.874 (0.0001)		

*measured on 1 single item

Analysis of 2ndCFA to get the model measurement of early awareness of DHF outbreak by taking into account overall model testing, measuring model validity and model reliability. Overall model matching test, indicating that the value of Goodness-of-Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), dan Comparative Fit Index (CFI) was good (≥ 0.9), RMR≥ 0.5. The validity of the measurement model, the standard factor load value≥ 0.5, then all factors in the model were fit. Reliability of measurement model, the standard factor load data, and error could be obtained from the diagram. The values of Construct Reliability (CR)≥ 0.7 and Variance Extracted (VE) ≥0.5 indicated that the reliability of the measurement model was good.

Result and Discussion

Community characteristics are measured based on sociodemographic variables, namely age, sex, and education. The average age of the community is 41.8 years with an age range of 21-77 years. By the age group, most of the correspondence is at the age of 41-50 years (36.2%). Most of the correspondence is women with 125 people (96.2%) and the men are 5 people (3.8%). Most of them are an unemployed housewife that is 98 people (75.4%). According to the level of education, 32.4% have completed primary school education and 31.5% have completed high school education while 10% do not finish primary school. Education level identifies that most people have basic education.

The results of identification showed that the average age of 41.8 years was a mature age. This means that people had a good ability in thinking and acting in order to overcome the extraordinary events of dengue in the community. Basic education is very important for someone to be able to read and write. People who can read and write are assumed to have a good understanding and have a positive attitude and can deal with a certain case in order to involve in a simple DHF eradication program.

Table 2. Distribution of Age and Education Level of Community in Pasuruan City

Variable	Frequency (n=130)	Percentage (%)
Age group (years old)		
21-30	23	18.0
31-40	35	27.3
41-50	47	36.2
51-60	21	16.4
>60	4	3.1
Education level		
Unfinished elementary school	13	10.0
Elementary school	42	32.4
Junior high school	23	17.6
Senior high school	41	31.5
University	11	8.6

Sociodemographic characteristics provide an important role in involvement in disease control. Based on age, psychologically mature age groups are more able to receive health information and have management of ways to prevent disease. Basic education that has been undertaken in most societies within this mature age groups can be oriented to positive health problems. They can also make efforts to control disease. Control is carried out not only at home but also the environment around where they live. Evidence shows that there is a positive relationship between education and knowledge about dengue (Zameer et al., 2013). Meanwhile, the results of other studies show that people who have knowledge will be able to make a difference as the beginning of making a change (Lacsina, Caranto and David, 2015).

This research shows that the majority of public opinion is correct regarding mosquito breeding and mosquito habitat. Community understanding about the symptoms and risk factors of dengue fever was quite good at 72.3% while the number of people who did not completely understand about this issue was less than 17.7% and only 10% of community has good knowledge. The community knowledge about the breeding of mosquito eggs to mosquito larvae varied between 1-30 days (98.4%) while those who did not know was 1.6%. The knowledge about larvae transformation to mosquitoes varied between 1-30 days (97.7%) while who said do not know was 2.3%. The knowledge of mosquitoes transformation into adult mosquitoes laying eggs varied between 1-60 days (97.7%) and who said that they did not know was 2.3%.

Furthermore, the understanding of the mosquito hiding place was in the hidden place like below the chair or bed (41%), in the dark place was 7 people (5.5%), in the sewer or the puddle was 12 people (9.4%), in the flower vase was 4 people (3.1%), and the rest of correspondence mentioned other places such as shoe rack, leaves, and shrubs was 20 people (15.6%), and as many as 44 (34.4%) said that they did not know. The results of the interviews showed that the community's understanding of the causes of DHF was a less clean environment. This unclean environment was caused by scattered waste and unavailability of trash cans.

> " The lifestyle that is not clean ..... dispose of waste inappropriately." (U)
> "Throw garbage recklessly, lots of stagnant water. That is because of faith factor. "(G)

Garbage was also discharged into rivers and sewers causing ditches and rivers to be inundated. Moreover, SPAL (water drainage system) that was not routinely cleaned exacerbated environmental conditions in Pasuruan. The garbage causing the drains or water channels clogged so that puddles arose that became a breeding ground for mosquitoes. In addition to household waste, residents often dispose livestock manure in the river. In addition to clogging the flow of the river, this dirt also causes odor. Moreover, some residents still defecate in the river causing pollution and unpleasant odors. This situation is exacerbated by the unspecified time of garbage worker in collecting the garbage. In fact, mostly, it takes a long time to finally transport the garbage. As a result, there are a lot of garbage piles and more mosquitos in this place. In addition to waste disposal behavior, the behavior of put items in the house that is not tidy, like hanging clothes also become one of the factors causing the number of Aedes Aegypti mosquitoes in Pasuruan. Here are the interview results:

> "The most difficult is the habit of hanging clothes ....." (N)

Hanging clothes are identified as behaviors that are perceived as common and often done by the population. This lack of precaution has been shown to be at risk for mosquito breeding (Pratamawati, 2012). There is no relationship between knowledge and attitudes towards prevention and no relationship between knowledge and behavior on the prevention of DHF (Pujiyanti and Trapsilowati, 2010). The house arrangement that was less clean and neat was also pointed out as the cause of the number of mosquitoes nesting and hiding. Often the house was not designed in such a way that allows sunlight to enter. Damp and no light causes mosquitoes to stay in the house. Moreover, the residents resided together with a high enough density. This level of density causes the structuring of the environment is not tidy and mosquito can create nest easily. Some residents also became

collectors of scrap. These items are widely used by mosquitoes to hide. Especially if the home owner does not care about health or hygiene. In fact, population density has been associated with dengue transmission (Schmidt et al., 2011; Padmanabha et al., 2012; Pratamawati, 2012; Prasetyani, 2015).

Public understanding of the symptoms and risk factors of transmission and the way of dengue fever breed was quite good. People also understand about mosquito hiding places. However, this understanding was not followed by good attitude and behavior. Based on the empirical evidence there were still many people who did not keep the environment clean, including outside or inside their house. Moreover, based on the evidence, the link between knowledge and attitude or knowledge and behavior showed that there was no significant difference (Pujiyanti, Pratamawati and Trapsilowati, 2016; Kurniawan et al., 2017).

Knowledge is still considered as an important factor to understand ways to reduce the increase and control of disease vectors. Even knowledge is predicted as an advantage in taking preventative action (Al-Dubai et al., 2013; Ho et al., 2013). The attitude of the community is measured in the form of responses on how to respond to DHF. Community attitudes in the prevention of DHF were still limited to government programs. For example, citizens only do DHF prevention if there was instruction for community services.

"....., there are funds from PNPM (governance) to close all of the open ditch ..... Advice from the city mayor." (F)

The results of identification showed that people were not ready to act on the ground of consciousness despite knowing the risks posed by this disease. Attitude is a response to conditioned social circumstances. Individual knowledge and attitudes reveal outputs that can identify one's vulnerability to be infected by a virus. Individual attitudes cannot be seen but can be presented in the form of a willingness to act. Furthermore, good knowledge and a positive attitude are forms of action to control the disease. The condition of endemic areas is also a factor that must be considered as a strategy to control the viruses with the aim of reducing the risk of contracting. According to research evidence, one way that can help to reduce vulnerability is by allocating resources and considering the location of the environment (Castro et al., 2013).

Risk control is an effort to take action. Community actions in cleaning breeding sites and trying to eliminate mosquitoes. Most communities (66.9%) had open containers that can hold water and 33.1% did not have open containers. For the frequency of the community in cleaning up places that were considered as a breeding ground for mosquitoes, 93.9% said that the bathroom tub was cleaned between every day to once a week. And 6.1% said that they clean the bathroom tub between two weeks to once a month. The disease may reflect the diverse socioeconomic of the populations (Torres et al., 2017).

Table 3. The Distribution of Risk Control Measures and Dengue Eradication in Pasuruan City

Behavior / Action	**Frequency (n=130)**	**Percentage (%)**
Risk control		
Less	8	6.1
Good	122	93.9
Eradication of DHF		
Less	88	67.7
Enough	32	24.6
Good	10	7.7

The results showed that the community's actions in controlling the mosquito breeding by cleaning the place or container that can be used as a breeding mosquito have been very good. However, this was not an easy task for most people so more than half of the community did not routinely clean the mosquito reservoir container. This has been supported by the research that the vector control by the community was still low (Waris and Yuana, 2013; Alma, 2014; Pujiyanti and Pratamawati, 2014; Suryanegara, Suparmi and Setyaningrum, 2018).

According to research evidence, ecological changes can be seen from mosquito breeding sites, developing social culture, people's behavior and lifestyle (Vijayakumar et al., 2014). Therefore, this requires preventive measures. This risk control is a community

behaviour to manage the environment and try not to let it become a breeding ground for mosquitoes. Community action in eradicating disease is done through family efforts to reduce the number of mosquitoes and spraying. The efforts by the family to eliminate mosquitoes was less than 67.7% and the family action in the eradication of DHF was only 7.7%. Through a deep interview, community action toward DHF cases showed that when people were affected by DHF, people had a quick respond to hospitalization. They also reported to local cadres.

> "Every case of Dengue Fever directly informs the cadres ... .. it will be followed up by reporting to the community health center and the community health center will follow up by reporting to the Health Office." (NH)

The results of identification proved that despite the society already had a good knowledge about mosquito breeding but they still had improper attitude in controlling mosquitoes. Things that play an important role in this negative attitude come from their own personal character and society. From their own character, Most of people were lazy to tidy up their stuff while the society itself tend to be ignorant with the environment. Taking action in risk control and dengue eradication was not easy. The research evidence suggested that preventive efforts (implementing mass spraying prior to the season of transmission of Dengue Hemorrhagic disease at the endemic areas) were in fact being overshadowed by outbreaks of DHF (Tairas, Kandou and Posangi, 2015). In addition, the effect of increasing individual mobility between regions, or the rapid expansion of disease vectors in areas previously thought to be non-endemic areas, requires action to improve disease control and observation programs. The study states that the effective measure to control dengue still lies in precautions taken by individuals (Cheng et al., 2018).

A lot of effort need to be done to be free from the DHF risks. In addition, extra time and funds is needed to clean the open shelter. It can be assumed that it is almost impossible for residents living in slums to do all of that effort. With a life that is far from decent, dengue control is not a priority. So, Community believes that the eradication of DHF is the government responsibility (health sector). Research evidence shows that control of dengue fever is the responsibility of the government (Zameer et al., 2013; Otu et al., 2019). In addition, the evidence from the study of the relationship between disease vectors and the environment, especially the container where mosquitoes breed, is basically strongly influenced by socioeconomic conditions, shelter and individual behavior such as water storage practices (Tun-Lin et al., 2009; Banu et al., 2011; Quintero et al., 2014; Overgaard et al., 2017).

Community vigilance is a responsive attitude and fast action in the prevention of DHF. Level of vigilance was seen from the total score of the psychological function. The data showed that the level of DHF awareness was good enough at 76.2%, the percentage of people who had good vigilance level was 7.7%, very good vigilance level was12.3%, and the less-vigilance community was only 3.8%. Although less vigilance percentage was quite small if these community groups had a reluctant attitude toward prevention of DHF, for example, if they were uncaring with the environment then it will impact the wider community.

The obstacles in tackling dengue found from the interviews were some obstacles in dealing with dengue problems. Among this problem was incomplete Community Health Center equipment so that the public must relay to the Hospital. There was also a Community Health Center that was only for treatment and can not diagnose whether someone had positive or negative DHF. The issue which was not less important was the length of case reporting from the hospital to the health office and then from the health office to the Public Health Center so that the handling of the outbreak seems to be slow.

> "In some cases, communities are quite responsive by directly doing hospitalization for high fever patient. Communities hope the Health Department to act immediately for fogging." (T)

In the 2nd CFA analysis, the hypothesized

model is the early awareness of DHF outbreak as the main construct. This construct has three sub-constructs namely knowledge, attitude and action. Here are the results of the analysis: 1). Overall model matching test, shows that GFI value = 0.96, NFI = 0.96, AGFI = 0.88, CFI = 0.97 is good (≥ 0.9), RMR = 0.5, 2). The validity of the measurement model shows that the standard factor load value ≥0.5. This means that then all factors in the model are fit, and

Table 4. The Results of Validity and Reliability of Early Vigilance Measurement Model

Variable	Standard Factor Load ≥0.5	Error	Reliabilities		Explanation
			CR ≥0.7	VE ≥0.5	
1st CFA					
Knowledge			0.86	0.67	Good reliability
Transmission factor	0.73	0.47			Validity is good
Breeding	0.88	0.23			Validity is good
Disease proliferation method	0.84	0.30			Validity is good
Attitude	1	0.00			Valid & Reliable
Behavior / action					Good reliability
Risk control	0.81	0.35			Validity is good
Eradication	0.58	0.66			Validity is good
2nd CFA					
Early precautions			0.76	0.52	Good reliability
Knowledge	0.72	0.49			Validity is good
Attitude	0.72	0.48			Validity is good
Behavior / action	0.72	0.48			Validity is good

3). Reliability of measurement model, standard factor load data, and error can be obtained from the diagram. The values of CR≥ 0.7 and VE≥ 0.5. This indicates that the reliability of the measurement model is good.

Figure 1. It shows the fit between the final model and the empirical data. This model illustrates that the early awareness of DHF outbreaks has three constructs namely knowledge, attitude and behavior. Knowledge has three dimensions (the factors of transmission, breeding, and breeding method); Attitudes have one indicator and the behavior has two dimensions (DBD risk control and DHF eradication).

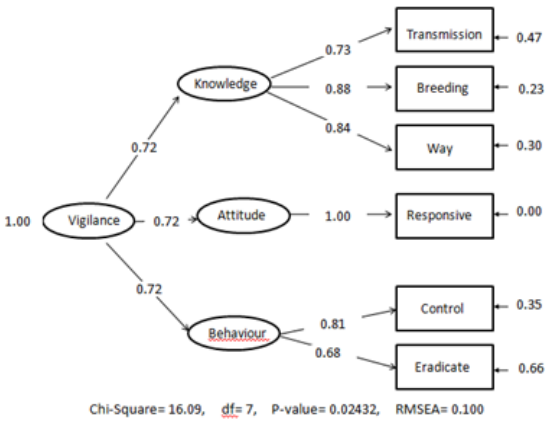

Figure 1. Early vigilance measurement model of extraordinary incidence of DHF

Based on the results, there was difference opinion between the program managers and the community. As a result, community tend to be apathy in responding to dengue case. Fogging as the solution when there was dengue case was contrary to the program (considering the mosquito will be adaptable and resistant to the drug). In fact, based on the research, one of the causes of the high rate of dengue fever was due to the weak early awareness system (Pratamawati, 2012) and the awareness of outbreaks of DHF should be implemented by supervising the implementation of duties and authority of health officials at central and local government level (Sinaga, 2015).

So based on the empirical results, it indicates that the desire of the community is a curative action while the government related to the preventive aspects. Based on these circumstances, it is necessary for the government to provide information related to drug resistance if given continuously (on every case) or excessively. Without controlling and maintaining good environmental conditions, dengue cases will continue to be a public health problem. In the end, the community

itself must have a positive attitude towards the environment by maintaining the environment. Information needs to be given in preventing dengue fever either for the community or health care (Lacsina, Caranto and David, 2015). The primary public health intervention is the reduction in mosquito breeding habitat and through a public education program (Guerdan, 2010; Yussof et al., 2017). Another effort to consider by the government is by developing a geographic information system to control outbreaks of DBD.

The model illustrates that the early awareness of DHF outbreaks has three constructs namely knowledge, attitude and behavior. The theory of health behavior states that the knowledge obtained about a disease gives benefits to individuals to have positive attitude. This is an initial advantage in preventing the disease. Next step is to act by paying attention to the social and health point of view, which involves the community to actively participate in controlling dengue fever. Several studies have suggested that community participation is a strategy in prevention and control (Arunachalam et al., 2012; Dick et al., 2012; Tapia-Conyer, Méndez-Galván and Burciaga-Zúñiga, 2012; Dhimal et al., 2014; Fernández-Salas et al., 2015; Alvarado-Castro et al., 2017). Whereas several other studies have found conflicting results between the incidence of dengue and the knowledge, attitude and behavior of a population. Nevertheless, the relationship in psychological theory must still be built as a prevention strategy (Bowman, Runge-Ranzinger and McCall, 2014; Carabali et al., 2015; Telle et al., 2016; Fuentes-Vallejo, 2017).

Conclusion

Knowledge was measured by 3 indicators, attitudes were measured by one indicator and behavior was measured by 2 indicators and it was a valid and reliable measure. The community understanding on the factors of transmission and dengue fever was quite good. Action on risk control was also good (93.9%) but dengue eradication was still less good (67.7%). Attitudes showed that they were not yet ready to act on the basis of consciousness. The psychological function was the component of early awareness of DHF outbreaks. The results of the measurement model showed a significant statistical value. The vigilance level of DHF outbreaks was sufficient.

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The Impact Langgam's Music Instrumental of Javanese Style to Reduce Anxiety and Labor Pain

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Abstract

Anxiety is a psychological factor that contributes to labor pain. The prevalence of mothers who experience anxiety before labor is 10-50%. Intervention to reduce anxiety and increase relaxation by listening to music. The research purpose is to analyze labor anxiety and pain to the group given intervention Langgam, music instrumental of Javanese style, with midwifery care routine. The research method used by Randomized Controlled Trial Experimental is an experimental study using random procedure to allocate various research factors to the research subject, so only the chance factor places the research subject into the intervention or control groups. There are 60 research subjects, the primiparous mothers, in the labor phase in Surakarta Hospital from December 2nd, 2019 - February 27th, 2020, with simple random sampling. Data analysis by Mann Whitney test and independent simple T-test. Result: For anxiety level, there is a significant difference between Javanese style Instrumental music (mean: 33.9) and midwifery care routine (mean: 37.9) with p value = 0.000. For labor pain, there is a significant difference between Javanese style Instrumental music (mean: 64.83) and midwifery care routine (mean: 76.13) with p value = 0.000. Conclusion: Langgam Music Instrumental of Javanese Style can reduce labor anxiety and pain in primiparous mothers in the first phase of active labor.

Introduction

Childbirth is a beautiful thing and is an important event and will probably be memorable for every woman. Normal childbirth is a labor contraction, which is a process of cervical dilatation and opening. And this natural process causes labor pain for every woman who will give birth. The labor pain is physiological. And this is not a sign of danger of labor(Aksoy, 2016). The prevalence of normal delivery process is around 85-90%. Only 10-15% of deliveries end in a cesarean section. Based on WHO data, about 40% of the cesarean sectio reason is experiencing labor fear and pain. Each mother has a different body response to the perception of labor pain. Mothers who experience excessive anxiety and stress during the labor process will harm the delivery process and the baby being born. Mother's anxiousness will flow through the placenta and cause fetal distress of the baby being born. So the baby has a low Apgar score(Abbasi, 2020).

Some birth mothers will feel fear and anxiety during labor. The high anxiousness experienced by birth mothers will improve responsiveness to labor pain. Even experienced postpartum depression (Floris, 2017). Anxiety during pregnancy has many side effects, both for the mental health of the mother and the outcome of delivery, as well as being a risk factor for postpartum depression. Anxiety and stress during pregnancy are associated with fetal heart rate and motor activity, preterm delivery, and infant behavior. Postpartum anxiety is linked to low self-esteem in the mother, and can have long-term negative consequences leading

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to delayed mental development in the child (Rados, 2018). Fear of childbirth is commonly framed as a phenomen on within the domain of anxiety, and clinical descriptions of childbirth fear are often characterized by symptom expressions resembling those of various emotional disorders. The physiological aspects of fear and anxiety include responses such as palpations, hyperventilation, dizzinessetc (Rondung, 2016). Based on research data (Floris, 2017), the prevalence of mothers who experience anxiety and fear before birth there are about 10-50%. This figure is not slight. So that intervention is needed so that mothers feel relaxed and calm in the face of labor that would not affect the complications of the delivery. Poor fetal wellbeing condition can even lead to postpartum depression. This labor pain will occur during the active phase of labor. As time passes, more cervical opening, thus the intensity of pain will be more frequent, and the duration will be longer. So we need skills in how to transfer labor pain and anxiety that occur by doing other activities. We expect maternity mothers can enjoy the process of delivery in a comfortable, relaxed manner so that labor can take place quickly, smoothly, and naturally (Surucu, 2018).

Mothers who experience excessive anxiety and fear of childbirth will increase the risk of postpartum depression and post-traumatic stress syndrome and will experience an increased response to labor pain compared to women who can undergo labor in a calm and relaxed manner. These will impact the labor progress, furthermore, the welfare of the fetus in the womb. Various factors such as physiological, psychological, and even environmental conditions affect women's labor pain perceptions. Physiological factors can be in the form of uterine contractions and cervical dilatation. Psychological factors such as anxiety, fear, community culture, and myth will affect the birth mother's psychological condition (Akadri, 2018). Women who can regulate their emotions and breathing well during labor will increase oxygenation to the fetus in the womb. Mother will feel comfortable, relaxed, confident, and believe the labor process will be smooth, convenient, natural, and normal. However, to transfer the pain of labor to other things and distract the mother's focus on the pain and labor contractions that come is not easy. Various interventions are needed to distract the mother from pain and labor contractions that come (Boaviagem, 2017): (Koelewijn, 2017).

Interventions are applied to reduce anxiety in the birth process. Among them is by listening to music Listening to music will divert the birth mother from the pain, the feeling of labor contractions that come, and the stress they experience by listening to the notes with a gentle and harmonious rhythm. Music can improve mood and reduce anxiety. Music can also cause physiological changes (decrease heart rate and breathing), increase relaxation. When the birth mother is happy and relaxes, the body will produce the endorphin hormone. Endorphine is a chemical such as morphine that can be produced naturally by the body. It has a role in helping to reduce pain and trigger positive feelings(Dolker, 2019). Given the limited options for pharmacological interventions for pregnant women, alternative, low-risk approaches to positive anxiety and stress are needed. In this case, the positive effect of music on anxiety and stress is an alternative that is often used (Hepp, 2018). The kind of music that can be used for therapy is gentle and regular music. One of which is instrumental music. Java-style music is one of the instrumental. The keroncong music genre is widely sung in the form of campursari and generally enjoyed as entertainment. Java-style has a tempo of 60 beats per minute. According to experts and researchers, the music or song with 60 beats per minute gives a relaxing effect.

Research related to Java-style musical influences on anxiety and pain in the active phase of the labor first stage is rare. An almost similar study has been done about the java music effect to decrease anxiousness in the elderly. The result is that there is a decrease in anxiety at 8:58 point (with a p-value of 0.000 / $p > 0.05$) between before given music style Java (mean 25.33) and after a given intervention (mean 16.8). Novelty freshness of this research is the method using the randomized controlled trial. The research objective was to analyze the effect of Java-style instrumental music on maternal anxiousness and pain in the labor primiparous active phase.

Method

This research is an observational analytical research experiment with approaches randomized controlled trial (RCT). The design used was a completely randomized experimental design. In this design, all the subjects are directly allocated randomly into treatment or control groups. The population in this study are all the primiparous women giving birth in the active phase labor at Surakarta Hospital in September 2019-February 2020. There are 60 mothers giving birth. The sampling technique using randomization (simple random sampling). Subjects calculation in this study using a rule of thumb or 30 subjects each group (Murti, 2013). This study used 60 samples with a classification of 30 research subjects in each group given intervention Javanese style instrumental music and routine controlled by obstetric care. They are all maternal primiparity in the active phase of labor in Surakarta Hospital. The whole subjects have an equal opportunity of being selected into intervention and the only factor that determines the odds. Inclusion criteria for this study are pregnancy and childbirth in physiological conditions, labor active phase with the opening of ≤ 4cm to 7cm, not hear-impaired, and do not use anesthesia during labor to reduce the pain of childbirth.

The data collection in anxiety measurement of mother postpartum is by STAI scale (The Spielberger State and Trait Anxiety Inventory). STAI is a measuring tool used to assess anxiety and validated for use in perinatal populations that began trimester during pregnancy up to 2 to 8 weeks postpartum visits. This instrument measures the separately momentary anxiousness (A-state) and basic anxiousness (A-trait) (Cox, 2015). STAI categorizes Anxiety into low and high. If the results of STAI ≤ 40, then it is low. But if the results of STAI> 40 belongs to the category of high anxiousness. The researcher uses Visual Analog Scale (VAS) scaling 0-100 mm ratio to measure Labor pain. VAS scoring is indicated by the distance between the tip line indicating no pain, to the point indicated by birth mothers. This scale gives full freedom to birth mothers to identify the severity of pain. Then researcher recorded the measurement results in the observation sheet.

Results and Discussion

The research subjects characteristics in Table 1 show that 30 research subjects in the intervention group given Javanese style music listening while 30 took routine midwifery care. The description of the variables is by characteristics, criteria, frequency, and percentage. In the group who listen to the music styles of Java and routine midwifery care, most respondents aged 20-35 years, for the group given the Javanese music as many as 29 respondents (96.7%), and the routine midwifery care group were 28 respondents (93.3%).

In the group given the Java-style music intervention, most respondents were elementary and junior high, respectively 19 respondents (63.3%). For the occupation characteristics, most respondents were workers as many as 17 respondents (56.7%). In the group given midwifery care routine, most respondents did not work as many as 18 respondents (60%). For the Java-style music experience, most respondents had never listened to Java-style music. Whether in the group given the Java-style music intervention nor the group given the midwifery care routine intervention. Each as many as 24 respondents (80%).

Table 1. Characteristics of Research Subjects

Characteristics	Criteria	n	%	n	%
Age	<20 years	1	3.3	1	3.3
	20-35 years	29	96.7	28	93.3
	> 35 years	-	-	1	3.3
Education	Elementary-Junior High	19	63.3	19	63.3
	≥ High School	11	36.7	11	36.7
Profession	Does not work	13	43.3	18	60
	Work	17	56.7	12	40
Javanese style listening experience	Has never been	6	20	6	20
	Ever	24	80	24	80

The independent variable in this study is Java-style instrumental music, while the dependent variable is anxiety. Based on normality test data using the Kolmogorov-Smirnov test, the p-value is 0.016 (abnormal data distribution), so that the statistical tests used are different Mann-Whitney Test. Based on the difference between the group who listen to Java-style instrumental music with the group receiving routine midwifery care showed that p 0.000> 0.05 with a mean / average anxiety in those who listen to music at 33.9 Javanese style. While the mean value / average anxiety in the group given routine midwifery care higher at 37.9.

Table 2. Man Whitney Test Anxiety in the Group who Listen to the Java- style Music and Midwifery Care Routine

Variable Groups	n	mean	median	SD	p
Anxiety (STAI)					
Javanese style instrumental music	30	33.9	34.00	2.70	0000
Midwifery care routine	30	37.9	38.00	1.68	

The independent variable in this study was the Javanese style instrumental music. Meanwhile, the dependent variable was labor pain. Based on the data normality test using the Kolmogorov-Smirnov, the p-value was 0.200 (normal data distribution), so the test statistic used was the Independent Samples T-Test. Based on the different tests between the groups given the Javanese style instrumental music and routine midwifery care, refer to labor pain during the active phase of the first stage, is obtained that sig. levene's test for equality of variances is equal to 0435> 0.05. It showed that the data variance between groups that listen to music instrumental style in Java with midwifery care group is homogenous or same routine.

Values of significance between the group given Javanese style instrumental music therapy with routine midwifery care was the p-value of 0.000> 0.05. The average value/mean of labor pain in the group given the Javanese music style intervention was equal to 64.83. The average value/mean of labor pain was higher in the group given routine midwifery care. It was 76.13. It shows a significant difference and significant impact on labor pain between the group given Javanese style music listening intervention with a given group of midwifery care routine.

Table 3. Test Independent Samples T-Tests Labor Pain in Those Who Listen to the Music Style of Java and Midwifery Care Routine

	Group	mean (Mm)	mean Difference	median (Mm)	SD	t	p
Labor pain in the active phase of the first stage of maternal primipara	Java-style music treatment	64.83	-11.30	65.5	8.99	-4.54	0000
	Midwifery Care Routine	76.13		77.0	10:23		

Pregnant women who experience anxiety during childbirth used to be caused by fear. Fear of the stages in the process, pain during contractions, fear the delivery process will be long, and fear of the hospital environment. Anxiety increased when labor mothers would not get any touch, attention, and maternity care assistance (Floris, 2017). The high anxiousness experienced by the mother will have a direct impact on labor pain. The cortisol hormone is the stress hormone that affects the pain more intensely because of the inhibited secretion of endorphins (hormones that make mothers relaxed and calm and cozy).

One non-pharmacological therapy that can reduce anxiety during labor even until later during childbirth and prevent postpartum depression is music therapy. Music plays a significant role in human life. Music and music therapy contribute positive effects

to a physiological condition, psychological, social, and emotional for those who listen. Appropriately selected music can reduce anxiety, promote relaxation, and relieve pain. Other effects are increase confidence and performance of health workers (Gokyildiz, 2018). The results showed a significant difference between the group given the java-music style intervention with the group given routine midwifery care only. The difference in mother's anxiety in the first stage of the labor active-phase can be seen from the anxiousness mean/average value of 33.9 in the group given the Java-music styles intervention. While the routine midwifery care results mean/average of 37.9 and the significance p-value 0.000> 0.05.

Music is a natural and convenient complementary therapy that can reduce labor anxiety and pain. It affects the nervous system of the right brain and causes psychophysiological responses through the limbic system. Physiologically, this mechanism can reduce the perception of labor pain because the body produces the hormones enkephalin and endorphin. Waves that occur in the brain can be accelerated and slowed by using music. Mothers who listen to music during the active phase of labor can help coordinate muscle tension and movement and create anxiolytic effects so that mothers will feel more comfortable and relaxed(Çelebi, 2020).

Music is the most delicate art form, yet very influential on the physical center and nerve tissue. It also affects the nervous system or the parasympathetic nervous system automatically, either directly or indirectly. Mozart's classical music has proven as a safe and effective therapy. Traditional Javanese gamelan music has a regular rhythm and soothing at 60-90 beats per minute. It is similar to the classical music of Mozart.

The characteristics of this type of music that can increase relaxation include having a regular speed of fewer than 80 beats per minute, dynamic music tone, the melody of the sound produced is smooth, soft, and flowing like instrumental music using the piano. Javanese music is a type of music that has soft tones and rhythms. This type of music rhythm has a variation of 60-75 beats per minute, has low to moderate notes, has a smooth and flowing melody, and has a soft tone quality. And based on the research results, listening to music can increase relaxation is in a minimum duration of 20-40 minutes. It should be consistently applied so that it will produce a far more optimal effect (Gonzalez, 2018).

Music with a regular rhythm has a calming effect on the soul, reduces stress, and distracts the pain and anxiety experienced during labor. Mothers who listen to music during labor can affect the nerve centers that regulate blood circulation and vasodilation. So this will have an impact on placental and uterine circulation which affects the well-being of the fetus. Based on research results(Dolker, 2019), the duration of time in listening to music effective to reduce anxiety and stress is at least 30 minutes. Pregnant women who listen to regular and gentle rhythm music will have a stable psychological and emotional condition. Her anxiousness and fear of childbirth decrease because music can affect the mother's breath and heart rate. The results are consistent with research about the decline in the level of anxiety in the elderly through the Javanese style of music therapy. There are significant differences between the groups listened to music style Java ($p = 0.00$, $\alpha = 0.05$), with a decrease in mean 8:58 or 14.3%, and a significant reduction in the group not given java-style music intervention ($p = 0:01$, $\alpha = 0.05$), with 2:04 mean reduction or 3.4%.

Aligned with research titled "The effect of music on pain and anxiety of women in labor during reviews their first pregnancy, a study from Turkey" showed that after hours the first in the group given the music shows that statistically reduced pain compared with the group not given music therapy. Anxiety scores in the group given the music therapy after the exercise, the average score of anxiety becomes lower than the group who were not given and statistically has significant correlation (Surucu, 2018). Musical expression is closely related to "emotions, culture" such as movement, speech, and gestures. Because "emotional culture" is different, the relationship between the various elements of particular musical stimuli is also different. Javanese are tribes in Indonesia which is famous for its people calm demeanor and politeness are high. Javanese gamelan

music player includes mental stability along with the audience, the beauty of this music lies in the music sounds pleasant and regularity of the rhythm. Music is a non-pharmacological therapy that is cheap, easy, not risky, and does not require special training so that the expectation of mothers who listen to music with regular rhythm will be able to help divert the pain of labor contractions so that fear and anxiety will decrease and the process of labor takes place smoothly and quickly (Redding, 2016)

Labor pain is affected by various factors. Among them are physiological factors such as uterine contractions, cervical dilatation, distention of the vagina, and perineum. Women who undergo induction in the delivery process will increase the pain response in the body. Factors such as age, parity, and gestational age at birth influence the perception of pain. Psychosocial factors i.e: culture, ethnicity, education level, and childbirth experience, can affect the response to pain. While anxiety, fear, and stress levels experienced by women even in the face of labor are no less important factors that affect pain in the respective ladies. In addition to factors related to the physiological and psychosocial of health service providers are very care and care in providing non-pharmacological therapy to help reduce the pain of childbirth include being a determining factor for a birth mother to feel comfortable during labor (McCauley, 2018),

Among the non-pharmacological therapies suggested for women in a giving-birth process to reduce their pain is traditional music therapy. Traditional music is ethnic music coming from every region and even tribes. This music has a regular rhythm so that it can create a state of relaxation and optimal rest. One of the traditional music with a relaxation effect is Java-style music. It is Java community music with a slow, soft tempo, and relaxed, to induce a calm feeling, and reduce muscle tension. The results showed no significant difference from the average/mean value between the group given the intervention of Java-style music has an average/mean labor pain value that is 64.83. This value is lower than the group receiving the midwifery care routine intervention 76.13. These results were confirmed by the difference value of average/mean significant views of the p-value 0.000> 0.05.

Results are in line with research McCaffrey et al (2020) conducted based on the systematic review of 931 articles. The 24 were reviewed (12 of them by RCT, nine quasi-experiment, three research qualitative), where the research quality is quite good. Those articles showed music application during labor affecting pain, anxiety, psychological support, and accelerate the process (McCaffrey, 2020).

Another research conducted by (Rossi, 2018) mentioned that music affects the pain perception in the newborns' health status. In the study, 80 newborns in the hospital got three different interventions (three different types of music played). Meanwhile, 1 group was not. The result was that all three groups of babies who listened to music with these types of pauses (Mozart's sonata, Beethoven moonlights sonata, heartbeat sound recording) increased oxygen saturation, the heart rate became stable compared to the control group. With the statistical results F = 6.40 with a p-value of 0.001. Music stimulation performed on newborns for 2-3 days affected the baby's heart rate increase, respiratory rate, oxygen saturation, and reducing pain perception.

The music affects labor pain. The brain acts to change the physical condition of the body in response to the music. In relaxation music, the rhythm guides the body into breathing more slowly and deeply. So that it can provide a calming effect. Heartbeat and blood pressure also can respond to the music you listen to. Mental effects also depend on the type and the kind of music. Music can sharpen mental acuity or aid in relaxation. The music on human can affect the atmosphere better and help make the body move. The variety of music Psychiatric allows user to create a soothing feeling. Listening to music by using an audio recorder provides benefits to improve the health and welfare of the soul of the things that can suggest negative and positive effects to increase the physiological response (McCaffrey, 2020),

As described above, music makes women in the active phase of labor first stage enjoy it when the music played is proper. In acute and chronic pain, the psychological and

emotional atmosphere gives a strong influence on the perception of pain is generated and the ability to cope. At the time listening to music will stimulate the pituitary gland to release endorphins to reduce pain. But it can change the negative perception about a process filled with traumatic childbirth.

Conclusions

Javanese style instrumental music therapy is effective in reducing maternal anxiety to primiparous active phase of the first stage of labor. The results of the analysis using a different test Man-Whitney significant difference and significant anxiety among the group given the music intervention style java compared with midwifery care routine with the results of significance p-value 0.000> 0.05 with a mean / average anxiety in those who listen Javanese style of music at 33.9. lower dibanidngkan with the group given routine midwifery care that is equal to 37.9. There are significant differences with p-values of 0.000> 0.05 for the pain of labor between the group given Javanese style instrumental music therapy with the one given routine midwifery care. The average/mean value of labor pain in the group given Java-style music intervention low at 64.83, compared with the average/mean value in the group given routine midwifery care which is 76.13. Characteristics of research subjects the majority of respondents aged 20-35 years. So most respondents are within reproductive age and safe for pregnancy and give birth.

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Fertility in North Sumatera: Why is it not declining?

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Abstract

The results of the Indonesia Demographic and Health Survey (IDHS) in 2017 confirm that although the prevalence of contraception is quite high, the fertility rate in North Sumatera Province is still high. Fertility decomposition analysis has been used extensively to identify changes in fertility in various countries. This study was conducted to determine the pattern of changes in fertility decomposition in North Sumatra by using IDHS data in 2002/03 and 2017. The total fertility rate (TFR) from 2002 to 2017 in this province relatively remains the same, which is around 3 children per woman. There was a change in the proximate contribution of the determinant of fertility. Contraceptive use and effectiveness are the main contributors affecting the fertility rate in North Sumatra Province. The contribution of breastfeeding patterns has increased and marital patterns have decreased over a period of 15 years. The implementation of population and family planning programs in North Sumatra Province needs to be continuously improved to reach a TFR of 2.1 children per woman by 2024. Promotion of exclusive breastfeeding needs to be encouraged to extend the birth interval and reduce natural fertility. Prevention programs for child marriage and teenage pregnancy should be promoted.

Introduction

The family planning program in Indonesia has succeeded in reducing the fertility rate massively (Angeles, Guilkey and Mroz, 2005). In the period 1971-2000 there was a consistent decline in fertility from 5.6 to 2.34 children per woman (Central Statistics Agency, 2016). However, after 2000, the fertility rate in Indonesia experienced stagnation (stalling fertility). Results of the Indonesia Demographic and Health Survey (IDHS) shows that the birth rate is stagnant at 2.6 children per woman according to the 2012 IDHS results (BPS et al., 2013).

The budget allocation for population and family planning (KB) programs has been increased in response to the stagnation of fertility in Indonesia. IDHS results in 2017 show that the total fertility rate has decreased to 2.4 children per woman. This confirms that the birth rate in Indonesia must continue to be managed through population development and family planning, not only to reduce the birth rate but also to maintain the fertility rate to support long-term development (Samosir, 2019). Trends in fertility rates vary at the provincial level, which indicates the need for population and family planning development planning in accordance with regional conditions. In this regard, it is important to understand the proximate determinants of fertility, namely marital behavior, contraception, abortion, and breastfeeding, which have a direct contribution to the fertility rate.

The results of previous research conducted by Samosir in 2019 on the fertility decomposition analysis based on the IDHS results in 2017 which show that the main factors among the proximate determinants that affect fertility rates are the use and effectiveness

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of contraception. This means that in general the fertility rate in Indonesia is still very dependent on the presence of population management programs, especially the family planning program. North Sumatra Province is a unique region because the fertility rate in the province is still quite high, although in general the rate of contraceptive use is high. With an area of 72,981 km2, this province has a geographical condition that varies from mountainous areas, beaches, lowlands, and small islands separated from the main island. This creates challenges in providing access to health services and others. In addition, this province is inhabited by various ethnicities such as the Batak, Javanese, Chinese, Malay, Nias, and several other ethnic minorities, which causes a variety of cultures to live in the people of North Sumatra.

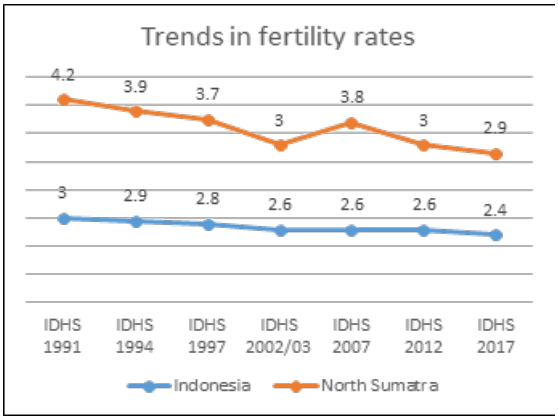

Figure 1. Trends in Fertility Rates, IDHS 1991-2017

Figure 1 shows a declining trend in the fertility rate in North Sumatra, but is still higher than the national fertility rate. The fertility rate of North Sumatra Province is 2.9 children per woman and the contraceptive prevalence rate is 59 percent. This phenomenon is associated with low long-term contraceptive use and high rates of contraceptive withdrawal (Wilonoyudho and Prajanti, 2018). The results of previous research indicate that socio-cultural factors in North Sumatra Province greatly influence the fertility preferences of the people (Sitorus, 2020). The Batak tribe in North Sumatra Province is known for its community customs which regulate the path of descent from the father's side (patrilineal). This study is different from previous studies, because it compares between two different data sources and performs projections of fertility decomposition factors. This research focuses on changes in the fertility decomposition pattern in North Sumatra Province. This is interesting, because the analysis of fertility decomposition using IDHS data in 2002/03 and 2017 in North Sumatra Province has never been done before.

Metode

The data sources in this analysis are the results of IDHS in 2002/03 and IDHS in 2017 with the unit of analysis being the aggregate data of women of reproductive age is 15-49 years old in North Sumatra Province. The data used were IDIR41FL and IDIR71FL which were downloaded from the dhsprogram.com website. The research variables included total fertility rate (TFR), total marital fertility rate (TMFR), and total natural marital birth rate (total natural marital fertility rate / TNMFR), total fecundity rate (TF), marital index (Cm), non-contraceptive index (Cc), abortion index (Ca), and infertility index during breastfeeding (Ci).

The analysis in this study is divided into 3 parts. In the first part, the analysis focuses on the fertility decomposition based on the IDHS 2002/03. In this case, the context of the analysis will be linked to population and family planning programs in the early days of decentralization. In the second part, the analysis will focus on the results of the fertility decomposition based on the results of IDHS in 2017 as a reflection of the 15 years of decentralization of population and family planning programs. In the third part, the analysis is focused on the comparison of the fertility decomposition of North Sumatra Province based on the results of IDHS in 2002/03 with the results of IDHS in 2017. In addition, an analysis of the policy direction for the decline in the fertility rate is also carried out. This research framework refers to the framework of Davis and Blake's fertility theory developed by Bonggarts so that it can be operationalized mathematically (Bongaarts, 1978; Hobcraft and Little, 1984). This theoretical framework has been used extensively to identify reasons for decreased fertility (Samosir, 1994; Das et al., 2013; Rutayisire, Hooimeijer and Broekhuis, 2014; Rutaremwa et al., 2015; Chola and

Michelo, 2016; Lailulo and Sathiya Susuman, 2018; Jiang et al., 2019), using the following equation:

$$TFR = Cm \times Cc \times Ca \times Ci \times TF$$

Results and Discussion

The results of the calculation of research variables and indexes (TFR, TMFR, Cm, fy, fm, e, Cc, APK, TNMFR, i, Ci, and TF) of North Sumatra Province based on IDHS in 2002/03 and IDHS in 2017 are presented in table 1. Fertility decomposition based on IDHS in 2002/03. In the era of decentralization, district / city governments are required to be able to manage resources independently. Most district / city governments are still faced with the problem of low regional income and limited quality of human resources. In addition, strengthening family planning institutions in the regions is also one of the goals of revitalizing the Population and Family Planning program which has decreased since regional autonomy. IDHS results in 2002/03 can be used as an illustration of the achievements of the population and family planning program in Indonesia.

The results of data processing show that the estimated TMFR of North Sumatra Province is 4.70 children per married woman, meaning that the pattern of marriage in North Sumatra Province causes the fertility rate in marriage (TMFR) to be around 1.7 children per woman when compared to the rate of births overall (TFR). The marriage index based on the results of IDHS in 2002/03 shows that in North Sumatra Province is 0.64. This implies that women spend about 64 percent of their reproductive years in married status with the possibility of bearing children.

The annual contraceptive failure rate in North Sumatra Province is based on the IDHS results in 2002/03 by 4 percent and the monthly contraceptive failure rate was 0.34 percent. Furthermore, the contraceptive effectiveness rate in North Sumatra was 96.59 percent. Based on the contraceptive effectiveness figure, the North Sumatra non-contraceptive index is 0.41. This indicates that the fertility-reducing effect of contraceptive use and effectiveness in North Sumatra is 41 percent. This also means that 59 percent of women of reproductive age who are married and are not sterile are protected by contraception and are 100 percent effective.

Based on the non-contraceptive index above, the natural fertility rate (TNMFR) in North Sumatra is 11.41 children per married woman. The pattern of contraceptive prevalence and effectiveness resulted in currently married women in North Sumatra having fewer births, namely 6.71 births (TNMFR-TMFR = 11.41-4.70 = 6.71). The prevalence and effectiveness of contraception has resulted in a sizable difference between TMFR and TNMFR of around 7 children per currently married woman. In this case, the prevalence and effectiveness of contraception in North Sumatra can significantly reduce fertility rates.

IDHS results in 2002/03 also shows that the median infertility during breastfeeding (i) in North Sumatra is 2.7 months. This value of i produces an infertility index value during breastfeeding (Ci) of 0.94. This means that the fertility-limiting effect of breastfeeding patterns in Indonesia is 94 percent. Based on the infertility index value during breastfeeding above, the fertility rate in marriages without contraception, intentional abortion, and breastfeeding (TF) in North Sumatra is 12.1 children per currently married woman. This also means that the pattern of breastfeeding has resulted in married women in North Sumatra having fewer TF-TNMFR = 12.10-11.41 = 0.68 births.

Table 1. The Results of the Calculation of Research Variables and Indexes for North Sumatra Province Based on the Results of the IDHS in 2002/03 and the IDHS in 2017

Variable / Index	**IDHS in 2002/03**	**IDHS in 2017**	**Unit**
Total fertility rate/TFR	3,00	2,93	children per woman
Total marital fertility rate/TMFR	4,70	4,67	children per married woman
Marriage index (C_m)	0,64	0,63	
Contraceptive failure rate at 12 months (f_y)	4,00	2,60	percent per year
Contraceptive failure rate per month (f_m)	0,34	0,22	percent per month
Contraceptive effectiveness (e)	96,59	97,79	Percent
Non-contraceptive index (C_c)	0,41	0,33	**t**
contraceptive prevalence rate/CPR	51,6	58,0	percent
Total natural marital fertility rate/TNMFR	11,41	14,12	children per married woman
The median duration of infertility after giving birth (i)	2,70	4,10	month
Infertility index during breastfeeding (C_i)	0,94	0,88	
Total fecundity rate/TF	12,10	15,96	children per married woman

Results of the IDHS in 2017 in this study assumed to be a reflection of the implementation of decentralization of population and family planning programs for about 15 years. Changes towards increasing the implementation of population and family planning programs nationally were made during this period. These changes include an increase in the budget and implementation strategies for population and family planning programs in the field lines. The fertility rate of North Sumatra Province is based on the IDHS results in 2017 was 2.93 children per woman. In this case, it can be said that there has been no significant change from the results of the population and family planning programs which are reflected in the achievements of the TFR in North Sumatra during the period 2002 to 2017.

After the decentralization of population and family planning programs for about 15 years, the fertility rate of North Sumatra Province is based on the IDHS results in 2017 it is still included in the category of areas with high fertility rates (3 children per woman). The results of data processing show that the estimated TMFR of North Sumatra Province in 2017 is 4.67 children per married woman, meaning that the pattern of marriage in North Sumatra Province causes the rate of fertility in marriage (TMFR) to be around 1.7 children per woman compared to the number overall birth (TFR). The marriage index based on the IDHS in 2017 is 0.63, meaning that women in the province of North Sumatra spend 63 percent of their reproductive years in married status and are exposed to the possibility of giving birth to children.

The annual contraceptive failure rate in North Sumatra Province is 2.6 percent and the monthly contraceptive failure rate is 0.22 percent. Furthermore, the contraceptive effectiveness rate in North Sumatra is 97.79 percent. Based on the contraceptive effectiveness figures, the North Sumatra non-contraceptive index (Cc) is 0.33. This shows that 67 percent of women of reproductive age who are married and are not sterile are protected by contraception which is 100 percent effective.

Based on the non-contraceptive index above, the natural fertility rate / TNMFR in North Sumatra is 14.12 children per married woman. This means that the pattern of contraceptive prevalence and effectiveness has resulted in currently married women in North Sumatra having fewer births, namely 9.45 births. The effect of reducing fertility (fertility-reducing effect) in North Sumatra with Cc = 0.33, which means that the prevalence and effectiveness of contraception has resulted in a sizable difference between TMFR and TNMFR,

around 9 to 10 children per married woman. In this case, the prevalence and effectiveness of contraception in North Sumatra has significantly reduced the fertility rate in North Sumatra. The results of the IDHS in 2017 show that the median infertility during breastfeeding (i) in North Sumatra is 4.1 per months. This value of i results in an infertility index value during breastfeeding (Ci) of 0.88. This means that the effect of fertility-limiting from breastfeeding patterns in Indonesia is 88 percent. Based on the infertility index value during breastfeeding above, the fertility rate in marriages without contraception, intentional abortion, and breastfeeding (TF) in North Sumatra is 15.96 children per married woman. This also means that the pattern of breastfeeding has resulted in married women in North Sumatra having fewer TF-TNMFR = 15.96-14.12 = 1.84 births.

During the 15 year period from 2002 to 2017, the total fertility rate in North Sumatra did not change significantly, namely around 3 children per woman. Theoretically, the direct factor of fertility is influenced by several indirect factors, including social, demographic, economic and cultural factors. North Sumatra with its Batak ethnicity is known as one of the regions in Indonesia that holds tightly to patrilineal culture (paternal lineage), meaning that the presence of sons is an important thing in the family (Gultom, 2017) Batak tribal communities, in terms of the number and sex of children, greatly affect the fertility rate in North Sumatra (Sitorus, 2020). Figure 3 shows the change in fertility measures in North Sumatra based on the IDHS results in 2002/03 and IDHS in 2017. Contraceptive use and effectiveness factors remain the factors that have the greatest influence on the decline in fertility compared to marriage patterns and breastfeeding patterns.

In 2017 the pattern of contraceptive use and effectiveness has succeeded in preventing the birth of as many as 7.38 children per woman. There was an increase of 0.67 children per woman compared to the condition in 2002/03. This resulted from an increase in the contraceptive prevalence rate by 6.5 percent in the same year period (from 51.6% in 2002/03 to 58% in 2017). In other words, an increase in contraceptive prevalence by 6.5 percent was only able to prevent birth by 0.67 children per woman. The total fecundity rate increased from 12 children per woman in 2002 to around 16 children per woman in 2017. Furthermore, the factor of infertility after childbirth has also increased. The change in index from 0.94 in 2002 to 0.88 in 2017 shows that there has been an improvement in breastfeeding patterns and has a direct impact on decreasing the fertility rate in North Sumatra.

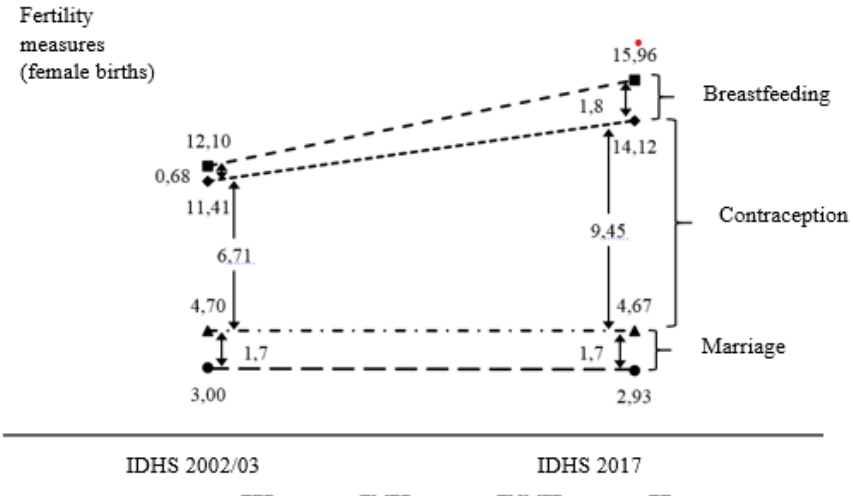

Figure 2. Change in Fertility Measure for North Sumatra Province
Source: IDHS data in 2002/03 and 2017 (processed)

The marriage index in North Sumatra also did not change significantly. The results of data processing show that over the past 15 years from 2002 to 2017, the marriage index was relatively constant at 0.63. This means that about 63 percent of the woman's reproductive period is in married status. Figure 2 also illustrates that efforts to reduce TFR by increasing the prevalence of contraception are quite optimal. This can be seen based on the results showing that prevented births as a result of contraceptive use and effectiveness increased significantly from 6.71 to 9.45. However, the impact is less significant for the decrease in TFR. This is likely closely related to the influence of other factors such as cultural factors in the local community regarding the preference for the number and sex of children (Samosir et al., 2018; Sitorus, 2020). In this case, the possibility of using contraception is more intended to space births and not to limit births. In addition, it is necessary to study further regarding the dropout rate and long-term use of contraception (Wilonoyudho and Prajanti, 2018). The last thing is closely related to access to contraceptive services, especially in areas with unfavorable geographical conditions (Paulus and Lette, 2019).

Table 2. Prevented Births and the Percentage Relative to Each Index in North Sumatra Province

Indexs	Prevented birth		% Relative	
	2002/03	2017	2002/03	2017
Ci, breastfeeding patterns	0.68	1.84	7.5	14.1
Cc, contraceptive patterns	6.71	9.45	73.8	72.5
Cm, marriage pattern	1.70	1.74	18.7	13.4
Total (TF-TFR)	9.09	13.03	100.0	100.0

Source: IDHS data in 2002/03 and 2017 (processed)

Total prevented births (TF-TFR) in 2002 were around 9 births, while in 2017 it was 13 births. The effect of contraceptive use patterns and effectiveness on the decline in fertility rates is the highest compared to other proximate determinants of fertility (Table 2). This is experienced by almost all countries in Southeast Asia and South Asia, where contraceptive use is strongly influenced by the family planning program (Yeung, Desai and Jones, 2018). Overall contraceptive use and effectiveness patterns contributed around 73 percent to the decline in fertility rates in North Sumatra. The contribution of breastfeeding patterns to the decline in fertility rates increased quite significantly in the period 2002-2017. This increase is indicated by the change in its relative percentage from 7.5 percent in 2002 to 14 percent in 2017.

The contribution of the marriage pattern to the fertility rate in this province has decreased slightly, from 19 percent in 2002 to 13 percent in 2017. The contribution of the marriage pattern to fertility is not only related to the proportion of women with married status but also related to the age of first marriage. (Bongaarts) , 1982; Islam, 2017; Jiang et al., 2019) Both of these are strongly influenced by the socio-economic level of society and the opportunity to work for women (Jones and Gubhaju, 2011; Utomo, 2012; Correia, Rodrigues and Barros, 2014; Majumder and Ram, 2015; Yeung, Desai and Jones, 2018).

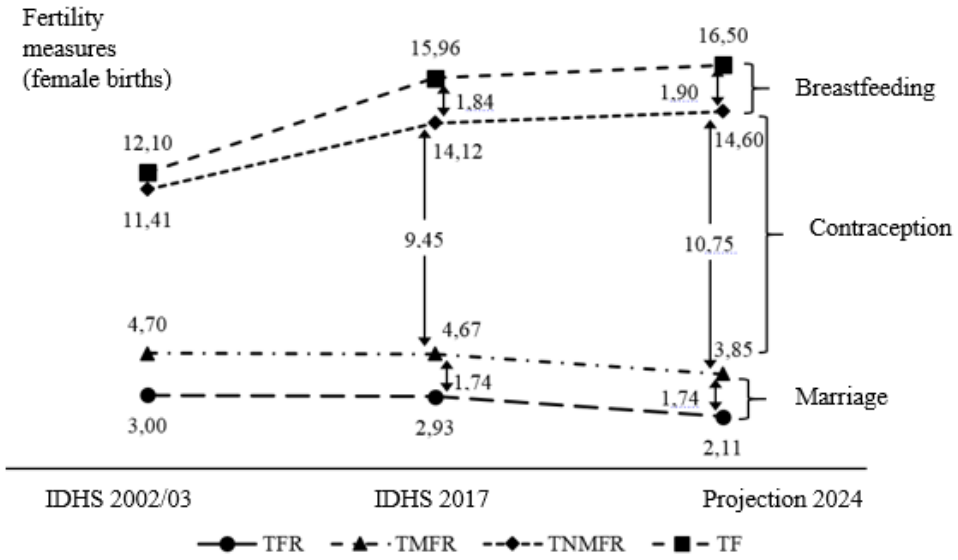

Figure 4. Changes and Projections in Fertility Measures for North Sumatra Province
Source: IDHS data in 2002/03 and 2017 (Processed)

The TFR target for North Sumatra Province in 2024 as stated in the planning document is 2.11 children per woman. Based on the TFR target for 2024 and other assumptions for changes in fertility measures, the TMFR, TNMFR and TF follow a linear pattern. From this assumption, the marriage index, non-contraception index and breastfeeding index can also be calculated. Changes in the fertility decomposition pattern between the two IDHS periods and the projection for 2024. indicate that contraceptive use and effectiveness patterns are still the main contributing factors in reducing birth rates in 2024 (Figure 4). The minimum contraceptive prevalence rate that must be achieved is around 64 percent which will affect around 11 births prevented by 2024. If the contraceptive prevalence can exceed this target, the number of births that can be prevented will also increase. The infertility index during breastfeeding in 2024 is projected to be 0.88 which contributes to preventing 1.9 births with the median infertility during breastfeeding being 4.1 months. The long duration of breastfeeding has the effect of inhibiting ovulation and thereby extending the birth interval. So that, a longer duration of breastfeeding will directly affect the decrease in fertility rates (Bongaarts, 1982; Bongaarts and Potter, 1983; Sipsma, Bradley and Chen, 2013; Malarcher et al., 2016).

Table 3. Proximate Index Projection of Determinants, Prevented Births and Relative Percentage in North Sumatra Province

Index	Projection in 2024	Prevented birth	% Relative
Ci, breastfeeding patterns	0.88	1.90	13.2
Cc, contraceptive patterns	0.26	10.75	74.7
Cm, marriage pattern	0.55	1.74	12.1
Total (TF-TFR)		14.39	100.0

Source: IDHS data in 2002/03 and 2017 (processed)

The contribution of the three proximate determinants of fertility affected 14.4 births prevented. The factor with the highest contribution in reducing births was still the pattern of contraceptive use and effectiveness, namely around 75 percent, followed by breastfeeding around 13 percent and marital patterns at 12 percent. Therefore, these findings further emphasize the importance of government programs and commitments at all levels to control fertility rates (Rutayisire, Hooimeijer and Broekhuis, 2014; Jiang et al., 2019). However, in the future it is possible that the contribution of non-contraceptive factors will be more prominent than the use of contraception (Das et al., 2013; Majumder and Ram, 2015; Islam, 2017; Lailulo and Sathiya Susuman, 2018; Jiang et al. , 2019). The

pattern of contraceptive use and effectiveness remain the main determinants of fertility in North Sumatra. This shows that the use and effectiveness of contraceptives has the greatest contribution to reducing fertility. The effect of breastfeeding patterns on fertility has increased. In contrast, the effect of marriage patterns on fertility has decreased over a period of 15 years.

Conclusion

During the period 2002 to 2017 there has been a change in the proximate pattern of determinants of fertility in North Sumatra, but has not been able to significantly reduce the TFR. Contraceptive use and effectiveness remain the main determinants of fertility in North Sumatra. To achieve the TFR target of 2.11 children per woman by 2024, it must prevent 14 births per woman from a TF of 16.50. This can be achieved if the CPR target of 64 percent is met and encourages long-term use of contraceptives. Married women should still be encouraged to use contraception as part of efforts to plan a family and create a quality family. The quality of contraceptive services needs to be improved to ensure its effectiveness and to maintain and increase contraceptive use. Strengthening information services on women's health and reproductive rights with the aim of being able to determine the number of children desired in the family.

The contribution of marriage patterns in reducing fertility has decreased, so that programs to delay the age of marriage and the prevention of teenage pregnancy must be promoted. Conversely, the contribution of the breastfeeding factor has increased. Therefore, it is important to maintain the promotion of breastfeeding for a longer period. In addition to getting the benefits of meeting the nutritional needs of the baby, breastfeeding can also widen the distance between births, thereby reducing fertility. In an effort to reduce fertility in this province, apart from the use and effectiveness of contraceptives, the factors of marriage and breastfeeding still need consideration.

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Low and High Glycemic Load Diet on Immune Responses of Adolescent Football Athletes

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Abstract

High-intensity physical exercise causes physical stress that will suppress immune system in athlete's body. Decreased immune system function can cause physiological and pathological changes such as fatigue, reduce athlete performance, and increase risk of infection. Regulation diets of glycemic index (GI) and glycemic load (GL) are known to help control blood glucose during exercise so the immune system can be maintained.The purpose of this study was to determine differences effects of low and high glycemic load diets on immune responses in adolescent football athletes. This study was a quasi experimental with multiple time series design, conducted on 22 adolescent football athletes aged 15-17 years old. The subjects were divided into two groups, low GL diet group was given carbohydrate-source foods with GL 9.15, high GL diet group was given foods with GL 27.29. Diet was given once in the morning and 2 hours later subjects doing RAST (Running-based Anaerobic Sprint Test) to trigger physical stress. Immune response was measure using total leukocytes and leukocytes differential count. There were no significant differences in blood glucose levels, leukocyte counts, and leukocytes differential count between low GL and high GL groups ($p>0.05$). Low GL diet causes an increase in blood glucose and total leukocytes smaller than high GL diet.

Introduction

Football is a high-intensity endurance sport that lasts for 90 minutes (Kirkendall, 2011). High intensity exercise can cause physical stress and lead to immunodepression in athlete's body (Gleeson, 2007; Gunzer, Konrad and Pail, 2012). Decreased immune function result in increase risk of infection in athletes so that it can interfere the recovery process and reduce performance during the next competition or training (Gunzer, Konrad and Pail, 2012). Previous studies have shown that some aspects of immune function do not return to normal until several hours after exercise so that it has implications for the susceptibility of upper respiratory tract infections (Kakanis et al., 2010). Other studies conducted on soccer athletes report that salivary immunoglobulin A (s-IgA) concentrations are significantly lower after high intensity exercise rather than low intensity exercise. s-IgA is a marker to predict the risk of infection in endurance athletes, decrease s-IgA concentration can increase the risk of infection in athletes (Owen et al., 2016).

Immune responses that occur due to physical exercise are increase of leukocytes, neutrophils, monocytes, lymphocytes and natural killer cells (Maughan and Gleeson, 2010). Previous study have reported that leukocytes, neutrophils, lymphocytes, eosinophils, monocytes, basophils increased after high intensity exercise (75% Maximum heart rate) (Abdossaleh et al., 2014). Impaired immune function because of pphysical exercise

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caused by an increase levels of stress hormones such as cortisol and catecholamine (Gleeson, 2007; Maughan and Gleeson, 2010). Increased cortisol not only occurs during exercise with high intensity but also depends on blood glucose availability. Low blood glucose will increase blood cortisol levels (Nieman, 2008).

The strategy of providing good nutrition to athletes can maintain immune system condition (Gunzer, Konrad and Pail, 2012). One of the nutrients that is important to maintain the immune system is carbohydrate (Karacabey and Ozdemir, 2012). Providing of appropriate carbohydrates will maintain the availability of blood glucose during training or competition (Burke et al., 2011). Sufficient carbohydrate availability and stable blood glucose levels can reduce stress hormone responses, provide glucose as an energy substrate for immune cells and maintain immune system (Gleeson, 2006). Adequate intake of carbohydrates is a major factor to maintain athlete performance (Gunzer, Konrad and Pail, 2012).

In recent years athletes have been introduced to provide carbohydrates by regulating the glycemic index. Glycemic index (GI) is a number that shows the increase potential of blood glucose from carbohydrate contents in a food (Beavers, Kristen M., Leutholtz, 2008). Previous studies have shown that consumption of high carbohydrates foods with low GI can maintain blood glucose stability during exercise (Wong et al., 2008). The stability of blood glucose can reduce levels of stress hormones such as cortisol, so that the immune system is maintained (Nieman, 2008). The glycemic index only indicates the type of carbohydrate, without considering the total amount of carbohydrate contents in a food, which can also have an impact on blood glucose (Beavers, Kristen M., Leutholtz, 2008). The GI is perfected by the glycemic load (GL). GL is the amount of carbohydrate and IG in a food, which will affect the blood glucose level after consuming it (Augustin et al., 2015). GL can more accurately describe the effect of food on blood glucose levels (Beavers, Kristen M., Leutholtz, 2008). A study conducted on adolescent soccer athletes showed that consumption low GI and low GL diet 2 hours before exercise will stimulate smaller metabolic changes, it causes blood glucose are more stable during exercise (Siwi, Dieny and Fitranti, 2017).

Previous studies aimed to examine the effect of GI and GL diets on immune responses in running athletes. As a result, consumption low GI and a low GL diet of 2 hours before exercise causes smaller changes in leukocytes, neutrophils, and lymphocytes than consumption high GI and low GL diet (Chen et al., 2008). Other studies stated that there is no effect of consumption carbohydrate-containing foods with diffetence of GI and GL 2 hours before exercise on immune function (Li, 2015). The immune response is influenced not only by nutrient intake, but also by age, sex, stress conditions (physical and psychological stress), sleep disturbance, duration, frequency, and intensity of exercise (Gleeson, 2006; Walsh, 2018). The purpose of this study is to analyze the difference effect of high glycemic load diet and low glycemic load diet of 2 hours before exercise on leukocytes and leukocytes differential count (neutrophils, lymphocytes, eosinophils, monocytes).

Method

This research was conducted at the Terang Bangsa Semarang Football School. This research was a quasi experimental, multiple time series design with 2 treatment groups. Each group consisted of 11 people chosen through simple random sampling. The inclusion criteria of subjects was men aged 15-18 years, join in football club for at least 1 year, minimum follow 90% attendance of physical training in the last 12 weeks, not consume carbohydrate-based supplements or sports drinks, coffee, and tea 24 hours before the study, not smoking and consume alcohol, not being sick, injured, or in the care of a doctor, not do high intensity physical exercise 24 hours before the intervention.

The subjects in this study were divided into two groups: group 1 was given a low GL diet and group 2 was given a high GL diet. The low GL group was given carbohydrate-source foods with a glycemic load of 9.15, while the high GL group was given carbohydrate-source foods with a glycemic load of 27.29 (Table 1). Diet was given once at 2 hours before training. Two hours after eating GL diet, subjects did

RAST (Running-based Anaerobic Sprint Test) exercise to trigger physical stress in athlete's body. RAST method is performed by subjects being asked to six times sprints run on a 35 meter straight track with maximum speed with a 10-second pause between each repitition.

Table 1. Nutritional Composition of Preexercise Meals

	High GL (Medium GI – High GL/ M-H)	Low GL (Low GI – Low GL/ L-L)
Energy	391,53 kkal	400,18 kkal
Carbohydrate	45,57 g (47%)	28,77 g (30%)
Fat	19,47 g (45%)	20,66 g (46%)
Protein	9,09 g (8%)	23,56 g (24%)
Estimated mix GI	59,86	31,79
Estimated mix GL	27,29	9,15
Food contents	Boiled corn (100 g)	Boiled spaghetti (90 g)
	Sweetened condensed milk (40 g)	Srambled egg (50 g)
	Cheddar cheese (20 g)	Corned beef (25 g)
	Margarine (10 g)	Palm oil (10 g)

Subject characteristics data including name, age, and date of birth were taken using a questionnaire. Body Mass Index (BMI) data were measure using the Bioelectric Impedance Analyzer (BIA). Physical activity data was measured using the Physical Activity Level (PAL) form. Data of the last 24-hour meal intake was measured using a 24-hour recall form. VO2max data was measured using a bleep test. Data on stress conditions (psychological stress) athletes were measured using the The Perceived Stress Scale (PSS) questionnaire. Sleep quality data were measured using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. All this data was taken the day before the study was conducted.

Blood samples were taken to measure blood glucose levels, total leukocytes, and leukocytes differential count. Blood samples were taken 3 times, those are before the intervention, immediately after the RAST, and 1 hour after the RAST. Blood glucose levels are measured using a glucometer from a peripheral blood vessels at the fingertips. Blood samples from veins were taken to measure the total leukocytes and leukocytes differential count, then the blood samples was analyzed in the laboratory. Statistical analysis in this study was using the independent-t-test if the data was normally distributed and Mann-Whitney test if the data was not normally distributed. The statistical analysis was used to examine the difference of blood glucose level, total leukocytes, leukocytes differential count, and other variables before the intervention, immediately after the RAST, and 1 hour after the RAST between two groups.

Table 2. Subject Characteristics and Adequacy Level of Nutrient Intake in Both Groups

Subject Characteristics	Low GL (n=11)			High GL (n=11)			p
	Mean±SD	Min	Max	Mean±SD	Min	Max	
Age (year)	16,00±0,77	15	17	15,91±0,83	15	17	0,78[b]
BMI (kg/m^2)	21,02±1,64	18,40	23,50	22,84±2,49	19,10	26,30	0,06[a]
VO_2max (ml/kg/minutes)	48,93±3,58	44,65	57,46	45,80±4,84	37,10	54,10	0,09[a]
Physical activity (kcal/hour)	1,54±0,25	1,24	1,88	1,53±0,25	1,13	1,88	0,85[a]
Stress condition (score)	6,55±2.02	3	10	7,27±2,05	4	11	0,41[a]
Sleep quality (score)	15,18±3,60	8	19	15,91±4,16	10	22	0,67[a]
Adequacy Level of Nutrient Intake	**Low GL (n=11)**			**High GL (n=11)**			**p**
	Mean±SD	**Min**	**Max**	**Mean±SD**	**Min**	**Max**	
Energy intake (%)	75,78±23,93	44,92	116,67	75,19±21,78	41,63	116,82	0,95[a]
Carbohydrate intake (%)	67,27±20,78	36,38	106,79	62,91±16,69	31,43	91,07	0,59[a]
Fat intake (%)	96,37±33,74	48,69	153,41	98,7±24,37	65,01	132,92	0,86[a]
Protein intake (%)	73,93±28,55	32,99	133,58	73,85±22,73	40,08	120,41	0,99[a]

Vitamin A intake (%)	301,75±101,17	132	488,87	339,93±70,72	212,7	478,7	0,32[a]
Vitamin B6 intake (%)	79,02±26,89	46,15	138,46	88,11±20,46	61,54	123,08	0,38[a]
Vitamin C intake (%)	22,9±28,79	0,67	89,89	15,31±19,08	0	65,22	0,67[b]
Vitamin E intake (%)	0,36±1,00	0	3,33	0,48±1,61	0	5,33	0,62[b]
Zinc intake (%)	50,16±18,32	27,65	87,06	53,2±9,82	37,65	66,47	0,61[a]
Iron intake (%)	50,42±21,58	29,33	103,33	53,39±9,66	40	70	0,24[b]

[a]Independent-t-test, [b]Mann-Whitney

Adequacy level of nutrient intake including energy, carbohydrate, fat, protein, vitamin A, B6, C, E, zinc and iron intake showed no significant differences between two groups (p>0.05) (Table 2). Energy, carbohydrate, and protein intake of the two groups lower than their needs (<80%). However, mean value of carbohydrate intake level was higher in the low GL group than the high GL group. Mean value of blood glucose levels before the intervention were 95.09 mg/dL in the low GL group and 89.55 mg/dL in the high GL group. There were no significant differences in blood glucose levels before intervention between the two groups (p>0.05) (Table 3). This shows that the condition of two groups before intervention was in the same condition.

Table 3. Blood Glucose Level in Both Groups according to Three Times

Type of Diet	Blood Glucose Level (Mean±SD)		
	Before intervention	Immediately after exercise	1 hour after exercise
Low GL	95,09±15,93	97,00±14,18	87,55±6,23
High GL	89,55±8,42	93,64±9,55	87,00±6,96
p	0,32[a]	0,52[a]	0,85[a]

[a]*Independent-t-test*

This study showed no significant differences in blood glucose levels immediately after RAST exercise test and 1 hour after RAST exercise test (recovery period) between low GL dan high GL groups (p>0.05). Previous study also showed the same results that there was no difference in blood glucose levels immediately after 2400 meters running between the low GI-low GL group and the low GI-high GL group (Siwi, Dieny and Fitranti, 2017). That might happen because carbohydrate content in this study was too low, only 30% in the low GL group (Table 1). Other study have suggested that consuming high carbohydrate diet with low GI can increase muscle glycogen stores and provide fuel for high intensity exercise (Little et al., 2010). Previous study have shown that consuming low GI-low GL meal with a high carbohydrate content (66%) can reduce carbohydrate oxidation and provide the blood glucose during exercise (Chen, Wong and Wong, 2008). Low carbohydrate content in the low GL group may cause earlier remove muscle glycogen stores during RAST exercise and lead to increased carbohydrate oxidation.

There was no difference in blood glucose levels at all three times between the two groups, but an increase of blood glucose levels from before intervention to immediately after exercise was lower in low GL group (Δ = 1.91 mg/dL) than high GL group (Δ = 4.09 mg/dL) (Figure 1). These results was similiar with previous studies which showed the increase of blood glucose levels in the low GI-low GL diet group occurred slowly for 2 hours after eating and during exercise (Chen, Wong and Wong, 2008). Decrease of blood glucose levels after 1 hour exercise (recovery periode) in the low and high GL group because the decrease of muscle glycogen immediately after exercise. Low carbohydrate content in diet of both groups (<50%) causes the use of blood glucose for glycogen re-synthesis and causes blood glucose decrease in both groups during recovery periode. (Figure 1) (Rollo, 2014)

Table 4. Total Leukocytes And Leukocytes Differential Count in Both Groups according to Three Times

Variable	**Mean**±SD		*p*
	Low GL Diet	**High GL Diet**	
Total Leukocytes			
Before intervention	7,37±1,28	7,32±1,94	0,95[a]
Immediately after exercise	10,07±1,01	11,17±3,91	0,67[b]
1 hour after exercise	6,98±1,02	8,12±2,83	0,25[b]
p	0,00[c]	0,00[d]	
Neutrophils			
Before intervention	50,55±5,65	55,09±8,75	0,16[a]
Immediately after exercise	44,73±9,37	49,18±11,33	0,33[a]
1 hour after exercise	55,59±5,79	63,09±8,51	0,03[a]
p	0,00[c]	0,00[c]	
Lymphocytes			
Before intervention	39,9±6,56	33,82±7,48	0,05[b]
Immediately after exercise	46,00±9,12	40,82±10,30	0,23[a]
1 hour after exercise	35,55±5,39	28,00±7.00	0,01[a]
p	0,00[c]	0,01[d]	
Monocytes			
Before intervention	7,45±1,44	8,09±2.47	0,71[b]
Immediately after exercise	7,82±1,17	8,09±1.76	0,81[b]
1 hour after exercise	7,09±1,14	7,64±2.42	0,84[b]
p	0,03[d]	0,27[d]	
Eosinophils			
Before intervention	2,09±1,04	3,00±1.41	0,10[a]
Immediately after exercise	1,45±0,69	1,82±0.87	0,26[b]
1 hour after exercise	1,45±1,04	1,27±0,90	0,78[b]
p	0,00[d]	0,00[d]	

[a]Independent-t-test, [b]Mann-Whitney, [c]Repeated ANOVA, [d]Friedman

Total leukocytes and leukocytes differential count (neutrophils, lymphocytes, monocytes, eosinophils) at all three times between low GL and high GL group showed no significant difference ($p>0.05$), except neutrophils and lymphocytes 1 hour after exercise showed significant difference between two groups ($p<0.05$) (Table 4). These results differ from previous studies which showed that there were significant differences total leukocytes and neutrophils between the low GI-low GL diet group and high GI-low GL diet group (Chen et al., 2008). There was no difference between two groups in this study probably because of differences physical stress exposure from the exercise compared to previous study. Exercises in previous study was constant running at 70% VO2max for 1 hour and then followed by 10 km running (Chen et al., 2008). So, besides the intensity of the exercise, the duration of the exercise also affects changes in the body's immune system (Terra et al., 2012; Palmowski et al., 2019). Impaired immune function after exercise is greater when exercise occurs continuously and prolonged (1.5 hours), with moderate to high intensity (VO2max 55-75%) (Gleeson, 2007). Long duration intensive exercises such as marathon or ultramarathon can suppress immune system function (Palmowski et al., 2019).

Carbohydrate intake of subjects 1 day before intervention were less than normal

requirements in both groups. This may be another reason there is no difference in total leukocytes between two groups. Low carbohydrate intake causes a lack of muscle and liver glycogen stores. Lack of glycogen stores can reduce the rate of ATP regeneration and release of Ca2+ in the sarcoplasmic reticulum during exercise, so the muscles are not able to provide enough energy for muscle contraction during exercise (Ortenblad, Wasterblad and Nielsen, 2013). Adequate carbohydrate intake can increase the availability of blood glucose during exercise and prevent an increase cortisol levels so the function of immune cells is maintained (Ziaolhagh and Naghibi, 2012).

This study showed that an increase of total leukocytes before intervention and immediately after exercise between two groups. That was similiar with previous study, there was an increase of total leukocytes after 10 km running on subjects given GI and GL diets (Chen et al., 2008). Other study also showed an increase of total leukocytes after playing football and running. This happens because high intensity exercise produces high physical stress, causing changes in total leukocytes (Cenikli, 2016).

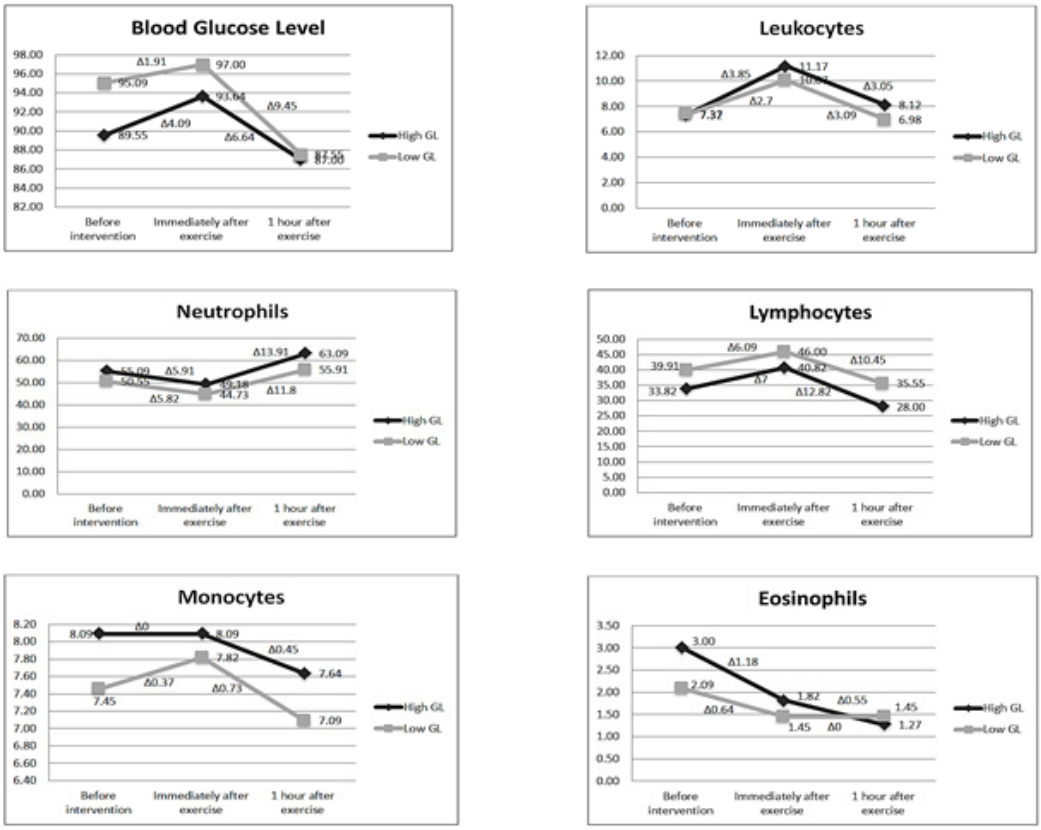

Figure 1. Graph of Change Blood Glucose, Leukocytes, Neuthrophils, Lymphocytes, Monocytes, and Eosinophils Level in Both Groups According to Three Times

Although total leukocytes at three times showed no difference between low GL and high GL groups, the increase of total leukocytes before intervention to immediately after exercise was lower in the low GL group (Δ = 2.7x103 µL) than high GL group (Δ = 3.85x103 µL) (Figure 2). That was probably because the diet in the low GL group contained low GI food. Consumption of foods with low GI before exercise has more potential to maintain the availability of blood glucose during exercise (Wong et al., 2008; Little et al., 2010). Stable blood glucose can prevent the increase in stress hormones and maintain immune system function. (Nieman, 2008; Gleeson, Bishop and Walsh, 2013).

Changes in total leukocytes and leukocytes differential count can occur due to

the short-term (acute) effects of high-intensity exercise. These changes occurred immediately after exercise until 2 hours after exercise (Neves et al., 2015). In this study an increase of leukocytes, lymphocytes, monocytes, and a decrease of neutrophils and eosinophils after exercise between both groups. Previous studies have shown that there was an increase in leukocytes, neutrophils, lymphocytes, and monocytes immediately after 10 km running on subjects who were given a carbohydrate diet with the regulation of GI and GL (Chen et al., 2008; Li, 2015).

The increase in leukocytes (leukocytosis) due to acute exercise is temporary because the amount will return to the resting value 6-24 hours after exercise. Leukocytosis from physical exercise is caused by mobilization or changes in the number of neutrophils and lymphocytes, as well as the small contribution of monocytes. High-intensity exercise that lasts briefly (several minutes) can cause an increase in neutrophils to 2 times more, while endurance training that lasts long causes an increase in neutrophils to 3-4 times more (Gleeson, Bishop and Walsh, 2013).

There are several limitations in this study, such as no data about muscle glycogen stores and blood cortisol levels. Muscle glycogen will affect blood glucose levels during exercise so it will affect the hormone cortisol and cause changes in the immune system. In addition, this study did not directly test the glycemic index of food on blood glucose levels, only through the calculation of various references. Even though there is no standard for the glycemic index of food so the values are different and make the glycemic load of food also different.

Conclusion

There was no difference effect of high and low glycemic load diets of 2 hours before Running-based Anaerobic Sprint Test (RAST) on the immune response of adolescent football athletes characterized by no differences in total leukocytes and leukocyte differential count (neutrophils, lymphocytes, monocytes, and eosinophils). However, increases in blood glucose levels and total leukocytes after RAST were lower in the low GL diet group. High-carbohydrate diets (> 60%) with low GI and low GL can be used to high intensity exercise.

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Environmental Sanitation, Personal Hygiene, STH Co-infection in TB Patients

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Abstract

Globally, helminthiasis is one of the infectious diseases that are often associated with the incidence of tuberculosis. Helminth co-infection modulates the immune system of TB patients by reducing Th-1 response that functions as protector against Mycobacterium tuberculosis. This condition disrupts the process of eliminating bacteria so that its development becomes more progressive. The impact is the activation of latent TB and the success of TB treatment. A Soil-transmitted Helminth (STH) is a group of intestinal worms that often infect humans. Previous studies prove that environmental sanitation and personal hygiene are risk factors associated with STH infection. The study to determine the relationship of environmental sanitation and personal hygiene with the incidence of STH co-infection in TB patients at Puskesmas Puger, Jember in September until December 2019. This study uses a cross-sectional design. The sampling technique uses total sampling. A total of 32 TB patients met the criteria as study sample. The data analysis uses Fisher Test. Results showed the prevalence of STH co-infection was relatively low (18.8%); most of the respondents had good environmental sanitation and personal hygiene conditions. Bivariate analysis showed p-value (0,476) for environmental sanitation and p-value (1,000) for personal hygiene. This study concludes that there is no correlation between environmental sanitation, personal hygiene, and STH co-infection in TB patients at Public health center in Puger.

Introduction

Indonesia has a burden in dealing with tuberculosis cases. The number of TB cases in East Java increased significanly from 2015-2017. Success rates for TB treatment have tended to decrease since 2008-2017 (Indah, 2018). Jember Regency is second-ranked with TB cases that are still high. TB cases are evenly distributed in 31 districts, such as Puger District (Hikma et al., 2015). Public health center in Puger is one of the health service facilities located in Puger District. The overall number of TB cases in Public health center in Puger has increased by 50% from 2015-2016. Based on Public health center in Puger's data, TB patients were 361 patients during the 2016-2019 period. Some cases include recurrence and drug resistant cases.

Low host immunity is one of the factors that can influence the development of Mycobacterium tuberculosis (Chandrasekaran, et al., 2017). This is associated with chronic infections that accompany the disease such as helminthiasis. Studies in Ethiopia shows that 50.5% of 257 TB patients suffer from helminthiasis. Helminth co-infection greatly influences the increase of morbidity and decreases the effect of treatment (Kassu, et al., 2015). Based on epidemiological studies that have been carried out in several countries, intestinal helminth infections in TB patients are found in developing countries (Gashaw et

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al., 2019; Wong et al., 2019). TB and chronic helminth co-infection interact actively in modulating the immune system. The previous study stated that TB patients who had intestinal helminth co-infection had CD3 +, CD4 +, CD8 +, IL-2, Th-17, Natural killer cells, and IFN$_\gamma$ levels lower than TB patients who did not have co-infection (Babu & Nutman, 2016). Low immune cell production weakens the process of destruction of intracellular bacteria, such as M. tuberculosis. Helminth co-infection increases the host Th-2 and T-reg response actively and triggers the production of IL-4, IL-5, IL-10. This condition weakens the Th-1 response to M. tuberculosis so that bacteria become more progressive and TB patients are more difficult to healing (Alemu & Mama, 2017). Previous research stated that intestinal helminth infections also interfere with iron absorption. Iron deficiency decreases hemoglobin levels and the formation of body defense cells, such as macrophages and T cells (Li et al., 2015).

Most helminthiasis in Indonesia is caused by Soil-transmitted Helminth (STH) group with a relatively high prevalence of 20-86%. STH can infect children to adults with different types of helminths and intensity in each region. STH infections with mild severity often do not show symptoms. Symptoms occur in severe infections and chronically, such as anemia, indigestion, respiratory problems, and cognitive decline. The previous study conducted in Jember Regency stated that STH prevalence was still high, namely above 25%. Based on Central Statistics Agency's data, Puger District has an area consisting of rice fields and coastal regions, so fishers and farmers are most occupations. The average air temperature is 27-29oC with reasonably high rainfall. This condition is very beneficial for STH's development. Three species of STH that often infect humans are Ascaris lumbricoides, hookworm, and Trichuris trichiura (Apriyan & Song, 2018)

Environmental sanitation and personal hygiene are two crucial factors that can support helminthiasis. Environmental sanitation is defined as the way to create healthy environment so that the transmission of infection can be reduced, such as hepatitis, helminthiasis, diarrhea and others. Personal hygiene is the way to break the cycle of disease transmission. STH transmission from the environment to humans through contact with the soil while personal hygiene facilitates the transmission of disease through oral-fecal (Martila, et al., 2016).

Method

The study uses an observational analytic with cross sectional design. The research was conducted at TB Poly, Public health center in Puger and Parasitology Laboratory, Faculty of Medicine, Jember University. The sampling technique uses total sampling. Total sampling is used in populations of less than 100 people. The population was 40 TB patients who were undergoing active treatment during September-October 2019 and only 32 patients met the criteria. They are patients who are agree to fill an informed concent, collect feces, answer questionnaires, and not including the exclusion criteria. Data sources of this study are primary data and secondary data. Primary data were obtained from respondents. Meanwhile, secondary data was obtained through the patient's medical record (TB status, organs affected, treatment category, and patient's HIV status). The independent variable is environmental sanitation and personal hygiene that were obtained through questionnaires with interview techniques. The dependent variable is STH co-infection that were obtained through feces examination with flotation and sedimentation methods. The questionnaire contained several questions about environmental sanitation and personal hygiene. Environmental sanitation includes feces disposal facilities (latrine ownership); clean water sources, and the type of house floor. Personal hygiene includes defecation habits (BAB), habits of cutting nails, eating habits (consumption of raw food), washing hands habits (before work, after defecation, and before eating), and using PPE habits (footwear or gloves). The tools used for feces examination are feces, lugol solution, MgSO4 salt solution, 10% formalin, microscopes, centrifuges, objects glass, tube racks, centrifuge tubes, beaker glass, pipettes, sticks, stopwatches, scales, and markers. The data analysis uses univariate and bivariate Fisher.

Result and Discussion

Feces are examined and identified at Parasitology Laboratory to determine the presence of STH eggs or larvae. Examination results obtained as many as 6 (18.8%) TB patients had STH co-infection, and 26 (81%) other patients did not have STH co-infection, as shown in Table 1.

Table 1. Results of Respondent's Feces Examination Tables

Feces Samples	Frequency	Precentage (%)
Positive	6	18,8
Negative	26	81,3
Total	32	100,0

Source: Primary data, 2019

The incidence of STH co-infection at Public health center in Puger was relatively low, at only 18.8%. Low prevalence was also shown in previous study that only 7.14% of 28 samples were helminthiasis (Ayu Parweni, et al., 2019). STH species that infect TB patients at Public health center in Puger are Ascaris lumbricoides and hookworm. The prevalence of A. lumbricoides is higher than hookworm prevalence. This is supported by other research that the incidence of A. lumbricoides infection are higher than hookworm (Eryani, et al., 2014; Syahrir & Aswadi, 2016). Respondents who were infected by A. lumbricoides have a low education. This is related to the level of knowledge possessed. The personal hygiene of respondents is still relatively low such as eating and using PPE habits. The garbage scavengers were infected by A. lumbricoides do not get used to washing hands, do not use PPE, and carry out their activities in poor working environment so that it supports oral infection (Ruhban & Rahayu, 2018). Hookworm is the second type of STH that infects TB patients at Public health center in Puger. Their job's activities related to soil. Land in agriculture or plantation areas is loose and full of topsoil because it is managed properly. Hookworm requires sandy soil, many pores (free) soil to develop into an infective. This soil type supports hookworm to get more oxygen (Hairani, 2015).

Table 2. Species of STH through Feces Examination

Soil-transmitted Helminth	N	Percentage (%)
Ascaris lumbricoides	4	66.7
Hookworm	2	33.3
Total	6	100,0

Source: Primary data, 2019

The general characteristics of respondents in this study show that the male respondents are more numerous, namely 18 patients (56.3%). This gender difference may not affect the incidence of STH co-infection in TB patients at Public health center in Puger. The same study stated that there is no significant results between genders and STH infections but males at risk 1,27 times than females (OR = 1.27) (Sandy, et al., 2015). Most respondents are 26 and 46 years over. Respondents who experienced STH co-infection are from the adult (26-45) and elderly (≥46). Adulthood is often associated with the type of work that has the possibility of ground contact, while the elderly is associated with job history or the ability to maintain personal hygiene which has decreased (Chairil & Hardiana, 2017; Kusumawardani, 2018). Other reviews mention that STH infections may affect all age groups, especially on environmental sanitation or personal hygiene in poor conditions (Erna & Mukono, 2015). The highest education level of respondents is from elementary school graduates (50%). Respondents who had STH co-infection at most primary school graduates. Educational degrees related to person's knowledge. Low level of knowledge causes a person not knowing how to keep environmental cleanliness and personal hygiene so as not susceptible to disease, especially helminthiasis (Marlina & W, 2012). The study in East Pontianak mention that there was no significant correlation between the level of education with STH co- infection (Lestari, 2014). Respondents who worked as farmers had the greatest prevalence, namely 15 patients (46,9%). Six od them was infected

by STH co-infection. STH infection occurs in work activities related to soil. People who works in mining, plantation, and agriculture are more easily infected because their activities support helminth's development. All types of work can be risk of being infected by STH if they do not adopt a clean and healthy lifestyle (Sandy et al., 2015). The data shown in Table 3.

Table 3. General Characteristics of Respondents

Characteristics of Respondents	Positive		Negative	
	N	%	N	%
Gender				
Male	4	12.5	14	43.8
Woman	2	6.3	12	37.5
Age				
≤11	0	0	0	0
12-25	0	0	5	15.6
26-45	3	9.4	10	31.3
≥46	3	9.4	11	34.4
Education degrees				
No school	0	0	1	3.1
Primary school	5	15.6	11	34.4
Junior high school	0	0	10	31.3
Senior High school	1	3.1	2	6.3
Diploma III	0	0	1	3.1
Bachelor	0	0	1	3.1
Profession				
Does not work	0	0	8	25
Farmer	4	12.5	11	34.4
Fisherman	0	0	2	6.3
Labor	1	3.1	2	6.3
Private sector worker	1	3.1	2	6.3
Civil servants	0	0	1	3.1

Source: Primary data, 2019

The characteristics of respondents as TB patients show that most respondents who participated are from new cases (84.4%) and are received KAT 1 treatment, as many as 27 patients. Respondents suffering from pulmonary TB recorded more than extrapulmonary with a ratio of 7: 1, as shown in Table 4. In theory, TB patients who had STH co-infection have a lower Th-1 cell response so that M. tuberculosis' development becomes more progressive. This conditions trigger the growth of latent TB into active TB Patients with active TB are symptomatic and can be diagnosed clinically, as in new cases (Alemu & Mama, 2017). Meanwhile, patients with relapsing cases who are infected by STH may never be diagnosed clinically so they are not treated. Prolonged STH infection weakens the patient's immune system and making it difficult for patients healing (Alemu et al., 2019; Gashaw et al., 2019). The number of respondents who suffered from pulmonary tuberculosis is seven times more than extra-pulmonary TB patients because they have seeking treatment at the Public health center in Puger.

Table 4. Characteristics of Respondents as TB Patients

Characteristics of Respondents	Positive		Negative	
	N	%	N	%
TB Status				
New Cases	4	12.5	23	71.9
Relapse Cases	2	6.3	1	3.1
Disconnect Drugs	0	0	0	0
MDR	0	0	1	3.1
Etc	0	0	1	3.1
Organ Affected				
Lung	6	18.8	22	68.8
Extrapulmonary	0	0	4	12.5
Category Medicine				
KAT 1	4	12.5	23	71.9
KAT 2	2	6.3	2	6.3
KAT Modifications	0	0	0	0
MDR	0	0	1	3.1

Source: Data of Public Health Center, 2019

Based on the score calculation, each element of environmental sanitation is grouped into two categories, as shown in Table 5. The latrine ownership components are categorized as no (not having) and yes (having). There are 6 from 31 respondents (97%) who already had latrines/toiles are infected by STH. This is in line with the previous research that as many as ten respondents infected by STH already have latrines at home (Kusmi, et al.,2015). The possibility of respondents who have toilets not diligently cleaning toilets and not washing their hands after defecation increases the incidents of STH infection.

The clean water sources components are categorized as river water and dug well water / municipal water work or known as PDAM / others. All respondents have used dug well water / PDAM / others. A total of 6 from all respondents who used dug well water / PDAM / others as water source had STH co-infection. This result is same with the research that the correlation between clean water facilities and STH infection on elementary school students was not significant (p = 0.109) (Nur, et al., 2013). Someone who already uses dug well water or PDAM can be at risk for STH infection if the water is not cooked properly because the water can be contaminated by helminth's eggs or larvae through dirty shelter.

Type of house flooring components are categorized into soil and plaster / ceramic. A total of 29 respondents (91%) already had plaster / ceramic floor. Five of them infected by STH. These results are in line with Kartini's research that as many as 24 people (14.3%) whose floors are made of tiles / ceramics suffer from helminthiasis (Kartini, 2016). This can be caused by other factors, such as broken cement floor, not diligently cleaning the floor, not washing hands or feet after work, and not diligently using footwear.

Table 5. Category of Respondents' Environmental Sanitation Conditions

Environmental Sanitation	Positive	Negative	N
Latrine Ownership			
a. No	0	1	1
b. Yes	6	25	31
Clean Water Source			
a. River	0	0	0
b. Dug Well/PDAM/others	6	26	32
Type of House Floor			
a. Soil	1	2	3
b. Plaster/Ceramic	5	24	29

Source: Primary data, 2019

Based on the score calculation, each element of personal hygiene is grouped into two categories. The components of nail cutting, hand washing, eating, and using PPE habits are categorized as bad and good. The component of defecation habits is categorized in gardens / rivers and latrines / toilets. A total of 23 respondents (72%) had good nail cutting habits, it means respondents diligently maintain cleanliness of the nails and cuts the nails once every 2 weeks. As many as three respondents who experienced STH co-infection have bad nails cutting habits. The pervious study showed that STH eggs or larvae can be stuck between long and dirty nails. Someone who accidentally puts his hand in his mouth can be infected by STH through oral route. Healthy nails means short and clean from the black dirt so that STH is not contaminated (Legese & Ambelu, 2014)

All respondents who are infected by STH already have a habit of defecating in the latrine / toilet. This result in line with study which states as many as three samples (9.3%) who have been infected by STH already had defecation habits in toilet (Liena, 2013). Respondents who have defecation habits in the latrine / toilet can be infected by STH if the latrine does not meet health requirements.

A total of 23 respondents (72%) had a habit of washing their hands properly, it means respondents wash their hands using soap and water. All respondents who had STH co-infection have good hand washing habits. This is not in line with other research that someone who good hand washing properly will be not infected by STH (Irawati, 2013). Respondents may have other bad habits such as eating raw food, not using PPE when their contact with soil, or not being diligent in maintaining nail hygiene.

As many as 17 respondents (53%) had good eating habits, with details of not being accustomed to eating fresh vegetables, raw meat, and peeling or washing fresh vegetables before consumption. A total of four respondents who have poor eating habits had STH co-infection. If vegetables are watered and treated by fertilizer that contaminated feces, they can contain eggs or STH larvae so they must be washed or peeled before consumption. Meat that is not cooked until cooked also becomes a parasitic nest. Meanwhile, two respondents who were infected by STH already had good eating habits. This may be triggered by other factors, such as not washing their hands before eating, or unclean eating environment.

A total of 20 respondents (63%) had the habit of using PPE well, it means respondents wear footwear and gloves when dealing with the ground. A total of four respondents who had STH co-infections still did not use PPE well. This is in line with pervious study that between using PPE badly and helminthiasis are significantly related. The use of non-routine footwear increases STH infection. STH through the soles between the toes, especially hookworm larvae. Workers who do not wear gloves at risk of STH infection are 8,8 times greater than those who wear gloves (Baidowi, et al., 2019).

Bivariate analysis used Fisher's Test because expected count of less than 5 by 50% (> 20%). Environmental sanitation and personal hygiene variables are obtained through a questionnaire. STH co-infection are obtained through stool examination. The data analysis

results are p = 0,476 (p> 0,05) for environmental sanitation and p = 1,000 for personal hygiene which means there is no significant relationship between environmental sanitation and personal hygiene with STH co-infection events, as shown in Table 7.

The correlation between environmental sanitation with STH co-infection was obtained p = 0.476 (p> 0.05) which means there was no significant correlation between environmental sanitation and STH co-infection. This analysis are same the research that found no association between environmental sanitation and STH infection (Nugraha, et al., 2019). Most of respondents who experienced STH co-infection already have the right environmental sanitation conditions. The right environmental sanitation conditions may cause the actual results were not significant.

The correlation between personal hygiene and STH co-infection was obtained p = 1.000 (p> 0.05), which means there was no significant correlation between personal hygiene and STH co-infection. The results are in line with the study that there is no significant relation between personal hygiene and the incidence of STH infection (p = 0,615) (Arifin & Umiyarni, 2018). The same results were also proven on Adiningsih (2017). Respondents who experienced STH co-infection as many as three people already have good personal hygiene conditions and three others still have poor personal hygiene conditions. This comparison shows equal value so that it can cause no statistically significant differences.

Conclusion

The conditions of environmental sanitation and personal hygiene of TB patients are good. There is no significant correlation between environmental sanitation, personal hygiene, and STH co-infection in TB patients at Public health center in Puger, Jember (p>0,05).

This study are not analyzing other risk factors that might support STH infections, such as socio-economic conditions, temperature, soil moisture, lighting, bathing habits, sewage irrigation, feces irrigation, animal waste disposal facilities, and garbage disposal facilities. Filling in the questionnaire with interview technique is less sensitive because the possibility of the respondent's answer does not match with the reality and is only based on the respondent's memory. In addition, the researcher did not observe the respondents' daily activities to see the personal hygiene conditions and did not observe the respondents' environmental sanitation conditions.

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The Correlation between Caries and Quality of Life of Mentally Disabled Learners

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Abstract

Introduction. Mentally disabled learners have dental problems 30% more complex than the ordinary toddler. It is because they have intellectual function disorder and adaptive behavior. This condition caused limitations in cleaning teeth optimally. So it will increase the risk of caries. This study objective is to find the correlation between the quality of life and dental caries at mentally disabled learners. Method. An analytical observational study with a cross-sectional approach to 118 learners in Sidoarjo, Indonesia, by total sampling. The variables in this study were quality of life (was measured with WHOQL-BREF index) and dental caries (was measured with DMF-T index). Tools and materials used are dental kids, alcohol 70%, cotton pellet, cotton roll, tampon, and WHOQL-BREF sheet. The data were presented descriptively in the form of a frequency distribution table, continued by Spearman Correlation test to analyze the correlation between the quality of life and dental caries at mentally disabled learners. Results. Most of the respondents are male (61%), with a range of age is 16-20 years old. The average quality of life for mentally disabled learners is the moderate category (65%). The average dental caries is considered as high. Spearman correlation shows $p \leq \alpha(0,05)$ means there is a correlation between dental caries and quality of life. Conclusion. There is a correlation between dental caries and the quality of life for mentally disabled learners.

Introduction

The results of 2018 Riskesdas (Basic Health Research) data stated that the number of Indonesians with disabilities was 3.3% at the age of 5-17 years and 22% at the age of 18-59 years, while at the age of 60 and over at 26% they had severe disabilities and total dependence. Meanwhile, the National Socio-Economic Survey (SUSENAS) conducted by the Central Statistics Agency (BPS) mentioned that there are 6,008,661 people with disabilities in Indonesia. Oral hygiene and periodontal disease are the main problems for people with disabilities. A person who has mental retardation tends to have poor oral hygiene and plaque control. It causes the case of dental caries is improving rather than average. Stefanovska et al (2015), researched the children in the range of 9 – 16 years old in Skopje Macedonia, involving 100 respondents. The result showed the oral hygiene overall level was 2.46, categorized as bad (Stefanovska et al., 2010). The other research was conducted by Peter et al (2017) on children aged 12 – 18. The participants were 361 toddlers included 84 normal children, 68 children with disabilities, and 206 children with mentally disabled. The result showed the average level of tooth decay caused by caries at

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mentally disabled is 4.38, which categorized as bad (Peter et al, 2017). Research in Madurai, India showed that of 133 respondents who were mentally disabled, 31.6% experience periodontal disease, 49.6% experience dental caries, 39.1% having poor dental and oral hygiene (Dheepthasri et al, 2018). Azzahra et al (2014) research at SDLB C Dharma Wanita Persatuan in South Borneo showed that oral hygiene index of mentally disabled at range 8 – 15 years old were good (29,1%), medium (66,7%), and bad (4,2%) (Azzahra et al., 2014). The concept of health-related quality of life (HRQoL) concerns the ability to perform daily activities and considers subjective aspects such as happiness, social well-being, and emotional well-being. Likewise, OHRQoL concerning the impact oral health or disease causes on an individual's daily functioning, well-being, and quality of life (Akhter et al, 2019).

American Dental Association or ADA (2015) revealed that tooth brushing is the simplest preventive activity in maintaining dental quality and oral health. Although it is not the only factor, good dental health can maintain health and increase life quality. However, it is hard to be fulfilled by mentally disabled children. Because they have resistance in mental and intellectual development, causing difficulties in their adaptive behavior (ADA, 2005). Quality of life is measured with WHOQOL-BREF. It is a questionnaire asking about physical health, psychological, then social and environmental relations. Based on the description, then the researcher wants to analyze the correlation between dental caries and life quality for mentally disabled learners.

Method

Analytical observational study with a cross-sectional approach in August 2018 at SLB in Sidoarjo (SLB-AC Dharma Wanita, SLB-C Dharma Wanita Lebo, SLB Cita Hati Bunda, SLB Putra Mandiri Lebo, SLB Harmoni, and SLB Negeri Gedangan Sidoarjo). The research samples were 118 learners (72 male and 46 female). The sampling technique was using total sampling. The variables were dental caries and quality of life. The measurement of dental caries was using def-t index (Decay, Extraction, and Filling-teeth) for deciduous teeth, and DMF-T (Decayed, Missing Filling-Teeth) for permanent teeth. The score was obtained by summing up the all components. Quality of life was measured with WHOQOL-BREF which was a questionnaire asking about physical health, psychological, then social and environmental relations using the Indonesian version with 26 questions. The data analysis was using descriptive continuing with Spearman Correlation. This research has had ethical committee approval at the Faculty of Dentistry in Jember University with number 823/UN25.8/KEPK/DL/2019.

Result and Discussion

Research on the relationship of dental caries with the life quality of mentally disabled learners at SLB in Sidoarjo (SLB-AC Dharma Wanita, SLB-C Dharma Wanita Lebo, SLB Cita Hati Bunda, SLB Putra Mandiri Lebo, SLB Harmoni, and SLB Negeri Gedangan Sidoarjo). Frequency distribution based on gender is in the following table 1.

Table 1. Respondent Frequency Distribution Table Based on Gender

No	Gender	Frequency	Percentage (%)
1	Male	72	61
2	Female	46	39
	Total	118	100

Source: primary data (2019)

From table 1, of 118 mentally disabled learners, 72 are male (61%) when 46 are female (39%). More male than female because the location of the mental retardation gene is on the X chromosome, where there is Fragile X syndrome, which is an X-chromosome abnormality in the q27 band. This kind of disorder is an X-linked, which is carried by the mother. It occurs when the last chromosome of 23 chromosome pairs attach to several blood cells. As a result, if an anomaly occurs that causes gene mutations on the X chromosome, a male who has one X chromosome and one Y chromosome will have a more severe impact than a female who has two X chromosomes since if one X chromosome damaged, it still can be repaired immediately (M, Doukource, 2020; Sanchis-Juan et al, 2019).

Based on age, the frequency distribution is in Table 2 below.

Table 2. Respondent Frequency Distribution Table Based on Age

No	Age	Frequency	Percentage (%)
1	6-10	15	12,71
2	11-15	39	33,05
3	16-20	56	45,46
4	21-25	5	4,24
5	26-30	3	2,54
	Total	118	100

Source: primary data (2019)

Table 2, resulted at range 6 – 10 years old are 15 learners (12,71%), 11 – 15 years old are 39 learners (3,05%), 16 – 20 years old are 56 learners (45,46%), 21 – 25 years old are 5 learners (4,24%), and 26 – 30 years old are 3 learners (2,54%). Most respondents are 16 – 20 years old (45,46%). Meanwhile, the least range of age is 26 – 30 years old (2,54%). The most respondents is 16 – 20 years old (45,46%) (Table 2). Research conducted by M, Doukoure et al (2020) shows that the 15-19 year age group suffers the most from mental retardation. It is due to the lack of early detection or effective management of disability (M, Doukoure et. al, 2020). The average dental caries and the life quality of mentally disabled learners are in Table 3 below.

Table 3. The Mean of Quality of Life and Dental Caries at Mentally Disabled Learners

No	Variable	Mean
1	Quality of Life	65
2	Caries	4,51

Source: primary data (2019)

In table 3, the average quality of life for mentally disabled learners is 65 (medium/ impact quality of life category), while the average of dental caries is 4.51 (high). The quality of life for mentally disabled learners using WHOQOL – BREF is 65%. Thus, it is categorized as medium or quit impacted (Table 3). The mentally disabled children have mental and intellectual development resistance. So it is affecting their cognitive and adaptive behavior. Like they cannot focus their mind, unstable emotion, introvert, and sensitive to light (Azzahra et al, 2014; Jawed et al, 2020). Mentally disabled learners have difficulties in adaptation. They are more vulnerable to small changes that occur. It is combined with the difficulty to adapt to small changes in themselves. This problem puts them at greater risk of changes that occur in their lives. Mentally disabled learners tend to have a quality of life problems. Mentally, socially, economically, and educationally. It is because the ability to meet basic needs independently is limited. According to WHOQOL-BREF, quality of life is assessed from 4 dimensions namely: physical health; psychological health; social relations, and the environment. In the physical health dimension, mentally disabled learners have a physical appearance like usual learners but are weak in sensorimotor abilities. The mentally disabled learners' psychological characteristics are: difficulty to think abstract and logically, lack of analytical, poor associations, low imagination, less ability to control feelings, easily influenced by personality, less harmonious because they are unable to judge whether good or bad. Social and environmental characteristics of mentally disabled learners usually require more time to adapt to the new environment, they cannot carry out activities for long periods. So mentally disabled learners need special services from parents, families, and people around them.

The average of dental caries is 4,51% (high categorized) (Moreno-Quispe et al, 2018) (Table 3). In the same research by Joki et al (2007), the average def-t index in disabled children is 3.42 for deciduous and 5.24 for mixed dentition, whereas, in healthy children, the average dhft index for deciduous dentition is 1.43 and 5.1 for mixed dentition. Referring to the recent findings, the prevalence of caries in children with special needs was very high when the number of children with good oral hygiene status was very low (Jokić et al, 2007). This study was supported by research by TRENTIN et al, (2017) and Chauhan et al, (2020), where dental caries in mentally disabled learners are higher than non-disabled learners. Individuals with disabilities generally have more dental caries problems than individuals without disabilities. Survey results in India, Italy, Ethiopia, and Biruktawit stated that individuals with

disabilities had significantly more teeth lost yet fewer teeth treatment or patched compare to individuals without disabilities (Lee et al, 2019).

Difficulties in doing activities make it difficult for children with physical and mental disabilities to maintain their teeth and mouth hygiene. Mentally disabled learners naturally have limited cognitive abilities and mobility, impaired behavior and muscles, gag reflexes, and uncontrolled body movements. These conditions limit children with special needs to be able to do optimal tooth cleaning. Further, the mouth cavity condition of mentally disabled learners is worse than usual learners of his age. Mentally disabled learners are hard to take care of themselves and lack the knowledge and the role of parents in maintaining the oral health of children with intellectual disabilities (Jawed et al, 2020; Permatasari et al, 2016). Mentally disabled people find difficulties in dental hygiene maintenance, poor muscle coordination, muscle weaknesses that interfere with routine in maintaining their oral hygiene, difficulty concentrating, and lack of motor skills. It causes a higher prevalence of caries than usual people (Moreira et al, 2012; Peter et al, 2017). The reduction of saliva flow most happening in some mentally disabled people. It may cause hypofunction in the salivary glands. Then affect xerostomia, a significant factor of dryness at the oral mucosa until caries. The increasing plaque and bacteria accumulation (streptococcus mutants) can aggravate the oral cavity state in mentally disabled children. Then caries will occur. (Moreira et al, 2012). Decreased saliva flow in patients with a mental disability can also be caused by the use of antipsychotics so that the appearance of plaque is the main factor in the formation of dental caries (Djordjević et al, 2016). Table 4 shows the result of the Spearman Correlation test. The quality of life and dental caries at mentally disabled learners.

Table 4. Spearman Correlation Test of Quality of Life and Dental Caries at Mentally Disabled Learners

Variable	P-Value	Note
Quality of Life-Caries	0,037	There is correlation

Source: primary data (2019)

Table 4, Spearman Correlation test p-value is 0,037 <α(0.05), which means there is a correlation between the quality of life and dental caries at mentally disabled learners. The lower their quality of life, the higher their dental caries. There is a correlation between the quality of life and dental caries at mentally disabled learners. The higher the dental caries, the worse their quality of life and vice versa (Table 4). The mentally disabled people's lifestyle influences their oral cavity condition. The poor mouth condition is related to their activity and thoughts limitations. So their life quality is poor. The low quality of life impacts the more vulnerable they are in having dental caries and other oral diseases. According to the theory, mentally disabled people have intellectual intelligence below average, so they are slow in attention, perception, memory, and thoughts. The limitation that they have becomes a barrier for them in understanding how to maintain oral and dental hygiene. For example, mentally disabled people are more difficult to be regulated, like consuming excessive sweet foods and not controlled. Therefore, they have a high risk of having dental caries (Akhter et al, 2019; Cancio et al, 2018; Faker et al, 2018). It is strengthened by (Díaz-Garrido et al, 2016), who emphasize the more sucrose (sugar-caused caries) consumed, the higher risk of dental caries happens. Consumption of sucrose cause biofilm formation containing Streptococcus mutant colony that sticks at the enamel, the outermost layer of teeth.

Dental caries affects the quality of life of mentally disabled learners because they can feel pain, uncomfortable, face profile that is no harmonious, acute and chronic infection, and eating disorders. It also causes speech disorder, disruption in learning activities at school, even sleep disturbance (Martins et al, 2017; Pathway et al, 2015; Permatasari et al, 2016). Oral diseases like dental caries and periodontal diseases are highly prevalent. Oral disease affects the face, confidence, and impaired function. Then the intern affects the quality of life. It is found that the most impact on the performance of daily activities was related to decayed and missing teeth and a higher DMFT. Participants with a higher number of intact teeth presented less correlation to oral health-related problems in

their daily activities (CB et al, 2018). Therefore, mentally disabled children need more attention from their parents and people around them because they cannot independently maintain their oral and dental hygiene themselves (Istiqomah et al, 2016).

Conclusion

There is a correlation between dental caries and the quality of life for mentally disabled learners.

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Liver Function, Leucocyte, and Blood Pressure Levels with Acute Stroke Functional Outcomes

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Abstract

Several studies have shown that there is an increase in bilirubin levels, leukocytes, and blood pressure in acute phase strokes. The purpose of this study was to determine the relationship between liver function levels, leucocytes, and blood pressure with the functional outcome of acute stroke. The method was a cross-sectional study with a sample size of 30 people who were selected by consecutive non-random sampling method, clinically proven acute stroke patients, and computed tomography (CT) scan. They were studied at the General Hospital of the Adam Malik Center. Demographic data were analyzed using descriptive statistics. The results showed that all subjects did not differ in terms of demographic characteristics. This study concluds that there is no relation between liver function (total bilirubin, direct bilirubin, indirect bilirubin, serum glutamic oxaloacetic transaminase [AST], serum glutamic pyruvic transaminase [SGPT], alkaline phosphatase [ALP]), leukocytes, and blood pressure with acute stroke functional outcome. The functional outcome in acute hemorrhagic stroke is worse than acute ischemic stroke. Higher levels of liver function, leucocytes, and blood pressure were found in patients with the worse functional outcome though not significantly associated.

Introduction

Stroke is the second most common cause of death after heart disease and the third most common cause of disability worldwide (Kenmogne-domning et al., 2018). Patients after an ischemic stroke, do movement exercises as early as possible to get optimal improvement. Giving movement exercises to patients should involve the family so that it can be done as often as possible. Movement exercises in stroke patients should be done 6 months after a stroke (Mahmudah, 2012).

There is a strong relation between bilirubin levels and the risk of developing ischemic stroke compared to hemorrhagic stroke. Previous studies suggest that this is due to the atherogenic function of bilirubin (Kimm et al., 2009). High glutamate levels and low glutamate oxaloacetate transaminase (GOT) are associated with poor functional outcome on admission. Higher levels of GOT at admission are associated with a good 3-month functional outcome (Ramos-cabrer et al., 2011).

High alkaline phosphatase (ALP) levels are not associated with cerebral atherosclerosis but are a prognostic factor for long-term functional outcomes after ischemic stroke (Kim et al., 2013). Infection such as pneumonia is the most common complication of ischemic stroke. Several studies have shown that systemic inflammation is also a risk factor for ischemic stroke. More specifically, early leukocytosis and neutrophilia are associated with infarct volume in ischemic stroke patients. Increased levels of

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total peripheral leukocytes and neutrophils are also associated with high rates of recurrence in ischemic stroke (Silver, 2013).

Leukocytes interact with platelets, endothelium, and coagulant factors. Acute leukocytosis will shift the homeostatic balance in the presence of coagulation. And play an important role in restraining bleeding after intracerebral hemorrhage (Morotti et al., 2016). Blood pressure in the subacute phase of stroke can affect the 3-month outcome and variability in blood pressure during this period is an independent predictor of clinical outcome (Havenon et al., 2016; Kang et al., 2018).

Blood pressure that is too high or too low in acute ischemic stroke is not beneficial for the improvement of neurological function. Increased blood pressure in patients with acute ischemic stroke at admission is usually associated with a higher NIHSS score. High blood pressure will cause further nervous system damage (Ji et al., 2016). Hypertension is a risk factor for stroke, especially for the incidence and recurrence of intracerebral bleed. It can also be a predictor of poor outcome in the first 24 hours after intracerebral hemorrhage. Increased variability of systolic blood pressure is a predictor of hematoma development and mortality in patients with intracerebral hemorrhage (Manning et al., 2014).

Method

This research is an analytical descriptive study with a cross-sectional study design from April to September 2019 in stroke patients treated at the Inpatient Care Unit of Rindu A4 Neurology RSUP Haji Adam Malik Medan. The subjects were consecutively taken if they met the inclusion criteria: a) all acute phase stroke patients who were clinically proven to have suffered a stroke and had been confirmed by a CT scan, b) were willing to participate in the study, and there were no exclusion criteria, namely patients with a) recurrent strokes, b) acute stroke in the brain stem, c) stroke with surgical management, d) impaired liver function, e) liver malignancy, f) Sanemia, g) history of alcohol consumption in the last three months, h) history of chronic renal failure, i) history of using non-steroidal anti-inflammatory drugs, j) a history of the previous infection, k) pneumonia, l) elevated blood sugar levels, m) blood malignancies, n) autoimmune diseases.

The collected data was then assessed for its association with the functional outcome of acute stroke based on NIHSS and mRS on day 1 and day 14. Total bilirubin levels in this study were divided into low (<0.2 mg / dl), normal (0.2-1.0 mg). / dl), high (> 1.0 mg / dl) (Harwell, 2013). Direct bilirubin levels are divided into normal (0.0-0.2 mg / dl) and high (> 0.2 mg / dl) (Harwell, 2013). Indirect bilirubin levels are divided into low (<0.2 mg / dl), normal (0.2-0.8 mg / dl) and high (> 0.8 mg / dl) (Harwell, 2013). SGOT levels were divided into normal (<35 U / L in men) and <31U / L in women) and high (≥ 35 U / L in men and ≥ 31 U / L in women) (W and Brickell, 2007). SGPT levels were divided into normal (<45 U / L in men) and <34 U / L in women) and high (≥ 45 U / L in men and ≥ 34 U / L in women) (W and Brickell, 2007). ALP levels are divided into low (<53 U / L in men and <42 U / L in women), normal (ALP 53-128 U / L in men and 42-98 U / L in women), and high (ALP> 128 U / L in men and> 98 U / L in women) (W and Brickell, 2007). Leukocytes were divided into low (<4,000 / μL), normal (4,000-11,000 / μL) and high (> 11,000 / μL) (W and Brickell, 2007). Blood pressure in this study was divided into normal (systole <120 mmHg and diastole <80 mmHg), prehypertension (systole 120-139 mmHg or diastole 90-99 mmHg), stage I hypertension (systole 140-159 mmHg and diastole 90-99 mmHg.), and stage II hypertension (systole ≥160 mmHg or diastole ≥100 mmHg) (Olin and Pharm, 2018).

Result and Discussion

Out of 30 acute stroke sufferers, 18 (60.0%) suffered from an ischemic stroke when 12 (40.0%) suffered from hemorrhagic stroke. Women suffered ischemic strokes more frequently (53.3%) than men (46.7). The mean age for ischemic stroke was 60.1 ± 9.8 years, while for hemorrhagic stroke was 57.4 ± 9.1 years (Table 1). Hypertension is the most common risk factor for acute stroke (table 1). Based on statistical analysis using the Chi-Square test, it showed that there was no significant relationship between liver function, leucocytes, and blood pressure with

the functional outcome of acute stroke based on NIHSS and mRS on days 1 (tables 2 and 3) and 14 (tables 4 and 5).

The mean age in acute ischemic stroke is higher than for acute hemorrhagic stroke. Women suffer from acute strokes more often than men. However, there was no significant difference in the proportion between acute ischemic stroke and acute hemorrhagic stroke based on gender (p = 0.98) (Firoozabadi et al., 2013). The incidence of cerebral infarction and intracerebral hemorrhage was higher in men than in women, although subarachnoid bleeding was higher in women, although this difference was not statistically significant (Appelros, Stegmayr, and Terent, 2009)

Table 1. Demographic Characteristic of Acute Ischemic Stroke and Acute Hemorrhagic Stroke

Characteristic	Acute Ischemic Stroke (n=18)	Acute Hemorrhagic Stroke (n=12)	*P*
Age, average ± SD	60,1 ± 9,8	57,4 ± 9,1	0,332*
Gender, n (%)			
• Male	10 (55,6)	4 (33,3)	0,232**
• Female	8 (44,4)	8 (66,7)	
Tribe, n (%)			
• Batak	11 (61,1)	9 (75,0)	0,577***
• Java	4 (22,2)	1 (8,3)	
• Karo	3 (16,7)	1 (8,3)	
• Aceh	0 (0,0)	1 (8,3)	
Occupation, n(%)			
	4 (22,2)	1 (8,3)	0,011***
• Farmer	2 (11,1)	0 (0,0)	
• Honorary Employee	2 (11,1)	0 (0,0)	
• State Employee	3 (16,7)	0 (0,0)	
• State Employee Ret.	4 (22,2)	5 (41,7)	
• Entrepreneur	3 (16,7)	6 (50,0)	
• Housewife			
Education, n(%)			
• Graduate	4 (22,2)	0 (0,0)	0,141***
• Elementary	0 (0,0)	1 (8,3)	
• Junior HS	2 (11,1)	1 (8,3)	
• Senior HS	12 (66,7)	10 (83,3)	
Risk Factor, n (%)			
• Hypertension	12 (66,7)	10 (83,3)	0,419****
• *Diabetes Mellitus*	4 (22,2)	1 (8,3)	0,622****
• Heart disease	2 (11,1)	2 (16,7)	1,000****
• Smoking	4 (22,2)	1 (8,3)	0,622****

* *t-independent test*, $p<0,05$, **Uji *Chi* Square, *** *Mann Whitney test*, $p<0,05$, **** Fisher's *Exact test*, $p<0,05$.

Source: Primary Data, 2019

Women have a lower incidence of stroke than men. It may be due to genetic factors and the positive effect of estrogen on the cerebral circulation. However, the stroke risk could double after menopause due to reduced estrogen. Lack of estrogen can lead to the development of cardiovascular disease through changes in the structure and function of blood vessels and affects the coagulation pathway (Appelros, Stegmayr and Terent, 2009; Goldstein et al., 2011).

Hypertension is the most risk factor for stroke in this study. There is a significant relationship between obesity and stress and the incidence of hypertension in women aged 40-55 years. Obesity has the risk of developing hypertension by OR = 4.2 times compared to those who are not obese. Stress at work tends to cause severe hypertension. Sources of stress in work include workload, inadequate work facilities, unclear job roles, unclear responsibilities, problems in relationships with other people, and family demands. Health workers should provide health education to the public regarding hypertension on a regular and scheduled basis. Whereas for working women (teachers) are recommended to make lifestyle changes. Namely regular exercise and

consuming healthy foods so that it can prevent obesity, then for those who are obese it is recommended to reduce body weight so that bodyweight can return to normal, for those who are stressed must be able to control the stress. , avoiding problems that can cause stress and not thinking about things that are not stressful by controlling risk factors associated with hypertension and hypertension can be prevented (Korneliani, 2013)

Table 2. Relation of Liver Function Levels (Total Bilirubin, Direct Bilirubin, Indirect Bilirubin, SGOT, SGPT, ALP), Leukocytes and Blood Pressure with Acute Stroke Severity Based on NIHSS Day 1.

		Light Outcome n (%)	Medium Outcome n (%)	High Outcome n (%)	Total	Nilai p
Total Bilirubin	Low	2 (66,7)	1 (33,3)	0 (0,0)	3 (100,0)	0,152*
	Normal	2 (14,3)	9 (64,3)	3 (21,4)	14 (100,0)	
	High	3 (23,1)	5 (38,5)	5 (38,5)	13 (100,0)	
Direct Bilirubin	Normal	0 (0,0)	9 (100,0)	0 (0,0)	9 (100,0)	0,475**
	High	4 (19,0)	10(47,6)	7 (33,3)	21 (100,0)	
Indirect Bilirubin	Low	0 (0,0)	3 (100,0)	0 (0,0)	3 (100,0)	0,358*
	Normal	3 (15,8)	12 (63,2)	4 (21,1)	19 (100,0)	
	High	1 (12,5)	4 (50,0)	3 (37,5)	8 (100,0)	
Male *SGOT*	Normal	3 (25,0)	8 (66,7)	1 (8,3)	12(100,0)	0,163**
	High	0 (0,0)	1 (50,0)	1 (50,0)	2 (100,0)	
Female *SGOT*	Normal	0 (0,0)	8 (88,9)	1 (11,1)	9 (100,0)	0,193**
	High	1 (14,3)	2 (28,6)	4 (57,1)	7 (100,0)	
Male *SGPT*	Normal	3 (23,1)	9 (69,2)	1 (7,7)	13 (100,0)	0,081**
	High	0 (0,0)	0 (0,0)	1(100,0)	1 (100,0)	
Female *SGPT*	Normal	1 (7,7)	8 (61,5)	4 (30,8)	13 (100,0)	0,813**
	High	0 (0,0)	2 (66,7)	1 (33,3)	3 (100,0)	
Male *ALP*	Low	1 (50,0)	1 (50,0)	0 (0,0)	2 (100,0)	0,931*
	Normal	1 (9,1)	8 (72,7)	2 (18,2)	11 (100,0)	
	High	1(100,0)	0 (0,0)	0 (0,0)	1 (100,0)	
Female *ALP*	Low	0 (0,0)	0 (0,0)	1(100,0)	1 (100,0)	0,773*
	Normal	1 (8,3)	8 (66,7)	3 (25,0)	12 (100,0)	
	High	0 (0,0)	2 (66,7)	1 (33,3)	3 (100,0)	
Leukocyte	Normal	2 (15,4)	7 (53,8)	4 (30,8)	13 (100,0)	0,864*
	High	5 (29,4)	8 (47,1)	4 (23,5)	17 (100,0)	
Blood Pressure	Normal	1 (50,0)	0 (0,0)	1 (50,0)	2 (100,0)	0,053*
	Pre Hypertension	1 (25,0)	2 (50,0)	1 (25,0)	4 (100,0)	
	Stage 1 Hypertension	1 (9,1)	8 (72,7)	2 (18,2)	11 (100,0)	
	Stage II Hypertension	1 (7,7)	9 (69,2)	3 (23,1)	13 (100,0)	

**Kruskal-Wallis test, ** Mann Whitney test*

Source: Primary Data, 2019

Hypertension has a risk of stroke by 4.375 times than those without it. High lipid level is not considered as a risk of stroke (OR 1.375, CI: 0.453 - 4.170). Meanwhile, poor smoking habits cannot be considered a risk of stroke (OR 2.333, CI: 809 - 6.730). So, it is necessary to control several risk factors for stroke, including hypertension (Sarini, 2007). Stroke in smokers is associated with morbidity. It is related to the fact that cigarette smoke contains> 4000 different chemicals, including heavy metals and toxins, which trigger the development of free radicals, endothelial dysfunction, and inflammation, causing the atherosclerotic process to continue. Smoking can affect coagulation status. Smoking also causes a reduction in cerebral blood flow, thereby increasing the risk of clot formation and the risk of subsequent strokes through the flow-slowing or static phenomenon (Shah and Cole, 2010).

The greater the amount of nicotine that builds up in the smoker's body, which causes

addiction and a pleasant taste, so he wants to smoke more. Besides, the intention to quit smoking is high, which is shown by the desire to quit smoking that will determine the success of quitting smoking. Efforts to quit smoking will be in vain if not based on strong intentions. Nevertheless, it is affected by social support factors to stop smoking behavior. If the social environment rejects and is not happy with smoking, the individual will be able to realize his intention stronger. Vice versa, if it is fellow smokers, smokers who plan to quit smoking should inform their social environment, especially the closest people, namely parents and friends, so that they will later support and appreciate the smoker's efforts. However, if the social environment around them does not know, they will smoke in front of them. It will make smokers influenced to continue smoking. And their intention to quit smoking is delayed or not at all. Therefore, the best step for smokers who want to stop their smoking habit is to have the will to quit smoking. Thus, determining the intention to quit smoking can predict the chance of success in quitting smoking (Riska, Linna and Zainal, 2012).

Table 3. Relation of Liver Function Levels (Total Bilirubin, Direct Bilirubin, Indirect Bilirubin, SGOT, SGPT, ALP), Leukocytes and Blood Pressure with Acute Stroke Severity Based on mRS Day 1

		Good Outcome n (%)	Poor Outcome n (%)	Total	*p Value*
Total Bilirubin	Low	3 (100,0)	0 (0,0)	3 (100,0)	0,471*
	Normal	5 (35,7)	9 (64,3)	14 (100,0)	
	High	6 (46,2)	7 (53,8)	13 (100,0)	
Direct Bilirubin	Normal	6 (66,7)	3 (33,3)	9 (100,0)	0,236**
	High	8 (38,1)	13 (61,9)	21 (100,0)	
Bilirubin *Indirect*	Low	3 (100,0)	0 (0,0)	3 (100,0)	0,180*
	Normal	8 (42,1)	11 (59,7)	19 (100,0)	
	High	3 (37,5)	5 (62,5)	8 (100,0)	
Male *SGOT*	Normal	7 (58,3)	5 (41,7)	12 (100,0)	1,000**
	High	1 (50,0)	1 (50,0)	2 (100,0)	
Female *SGOT*	Normal	4 (44,0)	5 (55,6)	9 (100,0)	0,633**
	High	2 (28,6)	5 (71,4)	7 (100,0)	
Male *SGPT*	Normal	8 (61,5)	5 (38,5)	13 (100,0)	0,429**
	High	0 (0,0)	1 (100,0)	1 (100,0)	
Female *SGPT*	Normal	5 (38,5)	8 (61,5)	13 (100,0)	1,000**
	High	1 (33,3)	2 (66,7)	3 (100,0)	
Male *ALP*	Low	2 (100,0)	0 (0,0)	2 (100,0)	0,589*
	Normal	5 (45,5)	6 (54,6)	11 (100,0)	
	High	1 (100,0)	0 (0,0)	1 (100,0)	
Female *ALP*	Low	0 (0,0)	1 (100,0)	1 (100,0)	0,197*
	Normal	4 (33,3)	8 (66,7)	12 (100,0)	
	High	2 (66,7)	1 (33,3)	3 (100,0)	
Leukocyte	Normal	5 (38,5)	8 (61,5)	13 (100,0)	0,431*
	High	9 (52,9)	8 (47,1)	17 (100,0)	
Blood Pressure	Normal	1 (50,0)	1 (50,0)	2 (100,0)	0,328*
	Pre Hypertension	2 (50,0)	2 (50,0)	4 (100,0)	
	Stage I Hypertension	5 (45,5)	6 (54,5)	11 (100,0)	
	Stage II Hypertension	6 (46,2)	7 (53,8)	13 (100,0)	

**Mann Whitney test*, ***Fisher Exact test*

Source: Primary Data, 2019

Total bilirubin had no significant relation with stroke severity and functional outcome at baseline (p> 0.05). The mechanisms underlying this are unclear (Pineda et al., 2009). Circulating total bilirubin levels have a negative relationship with the incidence of ischemic stroke. It may be due to the ability of bilirubin as an anti-oxidant, which triggers low-density lipoprotein (LDL) oxidation. (Zhong, You and Chen, 2017) .

Table 4. Relation of Liver Function Levels (Total Bilirubin, Direct Bilirubin, Indirect Bilirubin, SGOT, SGPT, ALP), Leukocytes and Blood Pressure with Acute Stroke Functional Output Based on NIHSS Day 14.

		Light Outcome n (%)	Medium Outcome n (%)	High Outcome n (%)	Total	p Value
Total Bilirubin	Low	2 (66,7)	1 (33,3)	0 (0,0)	3 (100,0)	0,357*
	Normal	2 (14,3)	9 (64,3)	3 (21,4)	14 (100,0)	
	High	3 (23,1)	5 (38,5)	5 (38,5)	13 (100,0)	
Direct Bilirubin	Normal	3 (33,3)	6 (66,7)	0 (0,0)	9 (100,0)	0,072**
	High	4 (19,0)	9 (42,9)	7 (33,3)	21 (100,0)	
Indirect Bilirubin	Low	2 (66,7)	1 (33,3)	0 (0,0)	3 (100,0)	0,209*
	Normal	4 (21,1)	11 (57,9)	4 (21,1)	19 (100,0)	
	High	1 (12,5)	3 (37,5)	4 (50,0)	8 (100,0)	
Male *SGOT*	Normal	5 (41,7)	5 (41,7)	2 (16,7)	12(100,0)	0,593**
	High	1 (50,0)	0 (0,0)	1 (50,0)	2 (100,0)	
Female *SGOT*	Normal	1 (11,1)	7 (77,8)	1 (11,1)	9 (100,0)	0,157**
	High	0 (0,0)	3 (42,9)	4 (57,1)	7 (100,0)	
Male *SGPT*	Normal	6 (46,2)	5 (38,5)	2 (15,4)	13 (100,0)	0,157**
	High	0 (0,0)	0 (0,0)	1 (100,0)	1 (100,0)	
Female *SGPT*	Normal	1 (7,7)	8 (61,5)	4 (30,8)	13 (100,0)	0,655**
	High	0 (0,0)	2 (66,7)	1 (33,3)	3 (100,0)	
Male *ALP*	Low	1 (50,0)	1 (50,0)	0 (0,0)	2 (100,0)	0,758*
	Normal	4 (36,4)	4 (36,4)	3 (27,3)	11 (100,0)	
	High	1 (100,0)	0 (0,0)	0 (0,0)	1 (100,0)	
Female *ALP*	Low	0 (0,0)	0 (0,0)	1 (100,0)	1 (100,0)	0,170*
	Normal	0 (0,0)	9 (75,0)	3 (25,0)	12 (100,0)	
	High	1 (33,3)	1 (33,3)	1 (33,3)	3 (100,0)	
Leukocyte	Normal	2 (15,4)	7 (53,8)	4 (30,8)	13 (100,0)	0,432*
	High	5 (29,4)	8 (47,1)	4 (23,5)	17 (100,0)	
Blood Pressure	Normal	0 (50,0)	1 (50,0)	1 (50,0)	2 (100,0)	0,053***
	Pre Hypertension	1 (25,0)	2 (50,0)	1 (25,0)	4 (100,0)	
	Stage I Hypertension	2 (18,2)	7 (63,6)	2 (18,2)	11 (100,0)	
	Stage II Hypertension	4 (30,8)	5 (38,5)	4 (30,8)	13 (100,0)	

**Mann Whitney test, **Fisher Exact test, ***Kruskal Wallis test*

Source: Primary Data, 2019

The difference in bilirubin levels between men and women may be due to the presence of estrogen, iron stores in men, and high heme oxidation in men. In stressful situations, sexual hormones in men can cause liver function damage while female sex hormones have a protective effect on liver function (Zhong, You and Chen, 2017).

Table 5. Relation of Liver Function Levels (Total Bilirubin, Direct Bilirubin, Indirect Bilirubin, SGOT, SGPT, ALP), Leukocytes and Blood Pressure with Acute Stroke Functional Output Based on mRS Day 14.

		Good Outcome n (%)	Poor Outcome n (%)	Total	p Value
Total Bilirubin	Low	3 (100,0)	0 (0,0)	3 (100,0)	0,471*
	Normal	5 (35,7)	9 (64,3)	14 (100,0)	
	High	6 (46,2)	7 (53,8)	13 (100,0)	
Direct Bilirubin	Normal	6 (66,7)	3 (33,3)	9 (100,0)	0,236**
	High	8 (38,1)	13 (61,9)	21 (100,0)	
Indirect Bilirubin	Low	3 (100,0)	0 (0,0)	3 (100,0)	0,180*
	Normal	8 (42,1)	11 (59,7)	19 (100,0)	
	High	3 (37,5)	5 (62,5)	8 (100,0)	
Male *SGOT*	Normal	7 (58,3)	5 (41,7)	12 (100,0)	1,000**
	High	1 (50,0)	1 (50,0)	2 (100,0)	
Female *SGOT*	Normal	4 (44,0)	5 (55,6)	9 (100,0)	0,633**
	High	2 (28,6)	5 (71,4)	7 (100,0)	
Male *SGPT*	Normal	8 (61,5)	5 (38,5)	13 (100,0)	0,429**
	High	0 (0,0)	1 (100,0)	1 (100,0)	
Female *SGPT*	Normal	5 (38,5)	8 (61,5)	13 (100,0)	1,000**
	High	1 (33,3)	2 (66,7)	3 (100,0)	
Male *ALP*	Low	2 (100,0)	0 (0,0)	2 (100,0)	0,589*
	Normal	5 (45,5)	6 (54,6)	11 (100,0)	
	High	1 (100,0)	0 (0,0)	1 (100,0)	
Female *ALP*	Low	0 (0,0)	1 (100,0)	1 (100,0)	0,197*
	Normal	4 (33,3)	8 (66,7)	12 (100,0)	
	High	2 (66,7)	1 (33,3)	3 (100,0)	
Leukocyte	Normal	5 (38,5)	8 (61,5)	13 (100,0)	0,431***
	High	9 (52,9)	8 (47,1)	17 (100,0)	
Blood Pressure	Normal	1 (50,0)	1 (50,0)	2 (100,0)	0,911*
	Pre Hypertension	2 (50,0)	2 (50,0)	4 (100,0)	
	Stage I Hypertension	5 (45,5)	6 (54,5)	11 (100,0)	
	Stage II Hypertension	6 (46,2)	7 (53,8)	13 (100,0)	

Mann Whitney test, Fisher Exact test, *** Chi Square test*
Source: Primary Data, 2019

There was no significant relation between direct bilirubin levels and the severity of acute stroke on day one and the functional outcome of acute stroke (p> 0.05). Direct bilirubin level is not associated with acute stroke severity on admission (Ms et al., 2019). Bilirubin levels were associated with stroke severity at initial hospital admission but not with the functional outcome on discharge. Stroke severity at initial hospital admission may be a mediator of the relationship between functional outcome at hospital discharge and direct bilirubin levels (Pineda et al., 2009).

Direct bilirubin was not associated with stroke severity or functional outcome. However, the results of this study are not in line with previous studies. High bilirubin levels may be associated with oxidative stress and bilirubin may not have an important role in nerve damage (Ushalakshmi and Ramya, 2019). Indirect bilirubin level was not related to acute stroke severity on day one and functional outcome for acute stroke on day 14 (p> 0.05).

This study is not in line with one by Ushalakshmi et al. stated that indirect bilirubin level is associated with stroke severity and the functional outcome of acute stroke upon hospital admission. It may be due to the study of Ushalakshmi et al. The sample size was more and only patients with an onset of 48 hours (Ushalakshmi and Ramya, 2019). Indirect bilirubin is the end product of heme, so it is

directly proportional to hemoglobin levels. Low levels of indirect bilirubin in acute stroke reflect low hemoglobin levels (Fabbri et al., 2014).

Acute stroke can trigger inflammation in the body. It will disrupt the heme cycle so that there is a reduction in the formation of red blood cells and ultimately reduce the generation of indirect bilirubin (Zhong, You and Chen, 2017). There was no significant relationship between SGOT level in both men and women with acute stroke severity based on NIHSS and mRS on day 1 and functional outcomes of acute stroke based on NIHSS and MRS on day 14. SGOT levels in men and women were not related to acute stroke severity (Ms et al., 2019).

Serum transaminase was not related to ischemic stroke or subarachnoid hemorrhage. But it was strongly associated with intracerebral hemorrhage. This relation was stronger in men, especially heavy alcohol drinkers and low body mass index. The elevated SGOT levels were associated with body mass index, blood pressure, fasting blood sugar levels, total cholesterol, smoking, and alcohol consumption ($p < 0.001$) (Kim and 2005, 2005).

Liver enzymes are usually associated with several cardiovascular factors. Serum transaminase levels are influenced by alcohol consumption that can increase the risk of intracerebral hemorrhage (Kim and 2005, 2005). Women have lower SGOT levels than men. Estrogen has a protective effect on endothelial cells, but testosterone has the opposite effect (Kim et al., 2013). SGPT levels in men and women with severity and functional outcome of acute stroke based on NIHSS and mRS days 1 and 14. SGPT levels in men and women were not associated with acute stroke severity (Ms et al., 2019).

The incidence of intracerebral hemorrhage and mortality are two times higher in men than women and more frequently in Asian population (Kim et al., 2013). Women have lower SGPT levels than men because women have a lower tendency to drink alcohol and smoke than men (Kim et al., 2013). Biological factors such as estrogen may have a sex difference effect on the incidence of intracerebral hemorrhage and the mortality rate (Kim et al., 2013).

In this study, there was no significant relationship between ALP levels in men and women with acute stroke severity based on NIHSS and mRS on day 1 and functional outcomes based on NIHSS and mRS on day 14. However, the underlying mechanism is unclear (Ms et al., 2019). Alkaline phosphatase may be associated with recurrence of vascular disease through vascular calcification and is also an early indicator of molecular marker (Ms et al., 2019). Elevated ALP level is associated with cerebral atherosclerosis, where previous studies stated that the prevalence of coronary heart disease and other peripheral arteries was higher in patients who had elevated ALP or phosphate level (Kim et al., 2013).

Patients who have elevated ALP levels have poorer functional outcome after acute ischemic stroke. However, the increase in ALP levels with this functional outcome is unclear (Kim et al., 2013). Elevated ALP can lead to vascular calcification, myocardial fibrosis, and atherosclerosis. Meanwhile, low serum phosphate levels are associated with hypertension and metabolic syndrome or an increased risk of brain infarction in patients undergoing hemodialysis (Zhong, You and Chen, 2017).

Leukocyte level with severity and functional outcome of acute stroke based on NIHSS and mRS on days one and 14. This is in line with the study of Wicaksana et al., 2017 which stated that there was no significant relation between leukocyte levels and functional outcomes based on NIHSS at admission ($p=1,000$) and discharge from the hospital ($p=0.056$) (Wicaksana, Adrianto and Rehatta, 2017). One of the factors that influence the severity and tissue damage after stroke is the emergence of acute-phase reactants triggering the acute phase response. Stroke severity based on NIHSS involves several other prognostic factors include acute phase reactants consisted of C-Reactive Protein (CRP), TNF-alpha, IL-6, IL-8, and fibrinogen. C-Reactive Protein has a significant relationship with stroke severity compared to leukocytes (Wicaksana, Adrianto and Rehatta, 2017).

There is no consensus that there is a relation between total leukocyte level and prognosis after acute ischemic stroke. However,

several studies have shown that total leukocyte level increases in the incidence of acute stroke (Srinivas and Ha, 2017). Leukocytes play a role in brain parenchymal injury. Including leakage of blood vessels, the release of hydrolytic enzymes, the emergence of free radicals, or the occurrence of thrombosis with clinical manifestations of fever. In this study, the history of previous infection was excluded (Iranmanesh et al., 2014).

The inflammatory and thrombotic components are considered to play a role in increasing levels of leukocytes. There is a hypothesis that markers of inflammation, hypercoagulability, and fibrin breakdown are associated with unstable atherosclerotic conditions that can increase the number of cerebrovascular and cardiovascular events (Iranmanesh et al., 2014). Blood pressure was not significantly related with acute stroke severity and functional outcome according to NIHSS and mRS on days 1 and 14. Patients with both lacunar and non-lacunar strokes had better clinical outcomes with lower NIHSS scores and discharge mRS scores. Blood pressure was not related with functional outcome (Altmann et al., 2015).

Blood pressure at admission is not associated with stroke severity and cannot predict the initial functional outcome in acute stroke survivors. Early neurological improvement occurs at reduced blood pressure, with a mean reduction in systole of about 10 mmHg (Fabbri et al., 2014). The relation between blood pressure and stroke prognosis is not fully explained. Each component of blood pressure affects prognosis (Ji et al., 2016).

The functional outcome of acute stroke is closely related to the type of stroke and initial blood pressure, whereas patients with lacunar strokes and very high blood pressure at admission have a better prognosis (Altmann et al., 2015). High blood pressure is associated with poor short-term outcome. High blood pressure is more related to ventricular system disorders than hematoma volume, thus affecting mortality (Chiquete et al., 2013). Based on research by Bangalore et. al, in 2017, which states that there is a J-shaped / U-shaped relation between systolic blood pressure (below and above 150 mmHg), diastole (below and above 70 mmHg), and mean arterial pressure (below and above 100 mmHg) with death in hospital, not being allowed to go home, and inability to take care of oneself on discharge (Bangalore et al., 2017).

Decreased blood pressure can limit the expansion of the hematoma in patients with intracerebral hemorrhage (Rossi et al., 2011). This study has several limitations. First, things that can affect liver function levels (total bilirubin, direct bilirubin, indirect bilirubin, SGOT, SGPT, ALP), leukocytes and blood pressure were not adjusted. Second, this study only took blood samples for examination of liver function levels and leukocytes during the disease when before the onset of disease were not carried out so that this study could have bias. Third, the sample size is still relatively small to provide representative results.

Conclusion

There was no significant relation between liver function levels, leukocytes and blood pressure with acute stroke functional outcome based on NIHSS and mRS on day one and 14.

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Factors of Organophosphate Pesticide Exposure on School Children in An Agricultural Area, Indonesia

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Abstract

Organophosphate is widely used in agriculture in Indonesia and contributes to a public health problem. However, the risk factors of organophosphate exposure, particularly in children living in the agricultural area, have not been described. The research aimed to assess the risk factors associated with organophosphate pesticide exposure on school children living in the agricultural area. This work was a cross-sectional study in 2017 with 166 school children were selected by simple random sampling. Structured questionnaires identified risk factors. Organophosphate metabolites detected by using LC-MS/MS. While chi-square and binary logistic tests as statistical analysis (α=0.05; 95%CI). In 28.9% of subjects, organophosphate metabolites were detected. Cut the onion leaves (p=0.002, OR=3.33, 95% CI:1.55−7.15), the onion, pesticide equipment, or pesticide in their neighbors (p=0.007; OR=2.67; 95%CI:1.31−5.46) was associated with organophosphate pesticide exposure. Involvement in agriculture activities and the onion, pesticide equipment, or pesticide in the neighbor.

Introduction

The registered pesticides in Indonesia from 2011 to October 2016 tend to increase. The insecticide is the most pesticide registered compare to others (Kementerian Pertanian Republik Indonesia, 2016). Organophosphate insecticide is used to protect the onion crops from pests (Badrudin and Jazilah, 2013) and could be applied up to three times a week during the growing season (Budiyono et al., 2015). Besides farmers and farmworkers, 81.3% of children work in onion plantation activities (Budiyono et al., 2015). Unfortunately, assistance in the informal occupational sector may also increase the risk of pesticide exposure in these children (Gamlin et al., 2007).

The children may be exposed to pesticides in several ways, including their diet, behaviors, and other factors (Quirós-alcalá et al., 2011). Children who live in agricultural communities may be exposed to pesticides from nearby agriculture fields, or parents bring the contaminants to home (Bradman et al., 2011; Curl et al., 2002). One of the effects of pesticide exposure on children is stunted growth (Kartini et al., 2016). Children are more vulnerable than adults to pesticide exposure (Perkins et al., 2016). A previous study revealed that the children who live in agricultural communities have higher organophosphate metabolite levels in the urine (Arcury et al., 2007; Lu et al., 2000; Roberts and Karr, 2012).

Dialkyl phosphate (DAP) metabolites in urine are widely used to analyze the organophosphate pesticide exposure in humans (Bradman et al., 2013; De Alwis et al., 2008). The previous study revealed that DAP metabolites could be detected in 31.25% (Budiyono et al., 2015). However, the risk factors for pesticide exposure in school children remain unclear. Thus, this work seeks to determine which risk factors are related to organophosphate pesticide exposure in school children living in the agricultural area.

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Methods

The research involved a cross-sectional design and required interviews and laboratory analyses. The population is 1017 school children distributed on four elementary schools in Dukuhlo and Luwungragi villages, the district of Brebes, Indonesia. A total of 166 subjects in 4th to 6th-grade children were selected by simple random sampling.

Interviews and observations were conducted by a well-trained surveyor. The variables of interest during the interviews were demographic characteristics, parent's occupation, and potential risk factors of organophosphate (OP) pesticide exposure.

Subjects were asked to collect first-morning void or spot urine samples (Hoppin et al., 2006; Kissel et al., 2005; Oates et al., 2014). Spot urine sample is a reliable sample method, and according to (Bradman et al., 2013) DAP metabolites in single or multiple spot samples are strongly correlated with levels in same-day 24-hr samples. As much as 50–100 ml of urine was collected from each subject. The urine sample was placed in a urine specimen void, sealed, and put back into the plastic bag. They were stored in an icebox (4°C, no preservative agent) (Attfield et al., 2014; Barr et al., 2004; Hoppin et al., 2006) and transported (<24 hours) to the laboratory.

The types and levels of organophosphate pesticide metabolites in the urine (ppm) was examined by high-pressure liquid chromatography-tandem mass spectrophotometry (HPLC–MS/MS (Cartier et al., 2016) AB SCIEX API 4500TM) to detect six DAP metabolites (Barr et al., 2004). The LC-MS method offers high sensitivity for all classes of pesticides (Alder et al., 2006; Margariti et al., 2007). The DAP metabolites which were detected in the urine specimens were diethyl dithiophosphate (DEDTP), diethyl phosphate (DEP), diethyl thiophosphate (DETP), dimethyl dithiophosphate (DMDTP), dimethyl phosphate (DMP), and dimethyl thiophosphate (DMTP). (Barr et al., 2004; Cartier et al., 2016). The result of the analysis is presented in units of ppm. The study design was approved by the Commission on Health Research Ethics of the Faculty of Public Health at Diponegoro University, Indonesia. Participation in the research was voluntary and written informed consent was obtained.

The bivariate analysis used the chi-square test to identify the selected risk factors (of a p-value ≤ 0.25). The selected risk factors were included in the multivariate analysis used the binary logistic test (Li et al., 2014; Sperandei, 2014). The risk factors were considered Exp. B or odds ratio (OR), the 95% confidence interval (CI), and $p < 0.05$. All statistical analyses were done by SPSS statistical software version 20.0.

Results and Discussion

The district of Brebes is the largest onion-producing district that produces onions in Indonesia. This district also is the biggest pesticide-using district in Indonesia. In table 1, all of the subjects lived in an agricultural area. The proportion of males samples was higher than the female. Regarding the subjects' parents' education, mostly (82%) had lower education (no education, no completed elementary school, and completed elementary school). The majority of parents were 60.8% as small traders, civil servants, and construction workers.

Table 1. Socio-demographic Characteristic (n=166)

Variables		n (%)
Sex		
	Male	53.6
	Female	46.4
Place of living		
	Agricultural area	100
	Non-agricultural area	0
Job of the parents		
	Farmer/farm worker	39.1
	Others	60.8
Level of education of the parents		
	No education	0.6
	No completed elementary school	13.9
	Completed elementary school	67.7
	Completed junior high school	10.8
	Completed senior high school	5.4
	Higher education	1.8

Source: Primary data, 2017

Laboratory tests found that organophosphate pesticide metabolites in the urine of 48 (28.9%) school children. In table 2,

the levels of DAP metabolites in 166 subjects ranged from 0 parts per million (ppm) to 0.223 ppm. The type of DAP metabolites detected in the urine were DEP, DETP, and DMTP. As the DEDTP, DMDTP, and DMP were not detected.

Table 2. Levels of the Six DAP Metabolites in the Urine of School Children

DAP metabolites	Mean ± SD (ppm)	Min. (ppm)	Max.(ppm)	n = 166 (%)
DEDTP	ND/0 ± ND/0	ND/0	ND/0	0
DEP	0.00314 ± 0.0075	ND/0	0.036	19.3
DETP	0.00125 ± 0.0027	ND/0	0.018	27.1
DMDTP	ND/0 ± ND/0	ND/0	ND/0	0
DMP	ND/0 ± ND/0	ND/0	ND/0	0
DMTP	0.00417 ± 0.0192	ND/0	0.223	26.5

Source: Primary data, 2017

ND=Not detected, SD=standard deviation, ppm=parts per millions

The average DEP, DETP, and DMTP metabolites were higher in females than in males, although no statistically significant different (Table 3).

Table 3. Mean Levels of Organophosphate Metabolites According to Sex

Sex	Mean±SD (ppm)	p [a]
DEP:		
Male	0.00283±0.00727	0.427
Female	0.00349±0.00789	
DETP:		
Male	0.00125±0.00286	0.558
Female	0.00126±0.00251	
DMTP:		
Male	0.00300±0.01044	0.328
Female	0.00553±0.02587	

Source: Primary data, 2017

[a] Mann-Whitney

In terms of parental occupation, DEP and DETP levels were higher in school children with parents working as farmers or farm workers than in those whose parents had other jobs. The DMTP levels were lower in school children with parents as farmers or farm workers than in children whose parents had other jobs. However, no statistically significant difference in average levels of DEP, DETP, and DMTP based on job classification of parents (Table 4).

Table 4. Mean Levels of Organophosphate Metabolites According to Job of The Parents

job of the parents	Mean±SD (ppm)	p [a]
DEP:		
Farmer/farm workers	0.00442±0.00922	0.138
Others	0.00232±0.00615	
DETP:		
Farmer/farm workers	0.00138±0.00264	0.548
Others	0.00117±0.00274	
DMTP:		
Farmer/farm workers	0.00335±0.01089	0.652
Others	0.00470±0.02303	

Source: Primary data, 2017

[a] Mann-Whitney

Table 5 showed the potential risk factors of organophosphate pesticide exposure to children. Five variables to be involved in the binary logistic model (p-value < 0.25). The variables were: carried onion harvest to other places; seek of the remaining onion harvest in the processing unit field; cut the onion leaves; the presence of onion harvest at their house; the onion, pesticide, or spray equipment at neighbor's house.

Table 5. Potential Risk Factors of Organophosphate (OP) Pesticide Exposure in the School Children

Potential risk factors	OP Pesticide Exposure		p-value	OR	95%CI	
	n=48, %Yes	n=118, %No			Lower	Upper
Parent's job						
Farmer/farm worker	20 (30.8)	45 (69.2)	0.805	1.11	0.68	1.79
Others	28 (27.7)	73 (72.3)				
Played at the farm or processing unit						
Yes	40 (30.1)	93 (69.9)	0.655	1.24	0.64	2.39
No	8 (24.2)	25 (75.8)				
Bought pesticides						
Yes	6 (26.1)	17 (73.9)	0.941	0.89	0.43	1.85
No	42 (29.4)	101 (70.6)				
Formulated pesticides						
Yes	0 (0.0)	4 (100.0)	0.464	-	-	-
No	48 (29.6)	114 (70.4)				
Sprayed pesticides						
Yes	2 (28.6)	5 (71.4)	1.000	0.99	0.29	3.26
No	46 (28.9)	113 (71.1)				
Washed the clothes or spraying equipment						
Yes	5 (35.7)	9 (64.3)	0.781	1.26	0.59	2.66
No	43 (28.3)	109 (71.7)				
Carried onion harvest to other places						
Yes	21 (43.8)	27 (56.2)	**0.012***	1.91	1.21	3.03
No	27 (22.9)	91 (77.1)				
Seek of the remain onion harvest in the field or processing unit						
Yes	27 (39.1)	42 (60.9)	**0.023***	1.81	1.12	2.92
No	21 (21.6)	76 (78.4)				
Cut the onion leaves						
Yes	36 (39.1)	56 (60.9)	**0.002***	2.41	1.35	4.29
No	12 (16.2)	62 (83.8)				
Used pesticide containers as toys						
Yes	11 (32.4)	23 (67.6)	0.777	1.15	0.66	2.01
No	37 (28.0)	95 (72.0)				
Used anti-mosquitos						
Yes	39 (27.5)	103 (72.5)	0.448	0.73	0.41	1.31
No	9 (37.5)	15 (62.5)				
Presence pesticides, spray equipment at home						
Yes	18 (35.3)	33 (64.7)	0.307	1.35	0.83	1.29
No	30 (26.1)	85 (73.9)				
Presence of onion harvest at home						
Yes	19 (38.8)	30 (61.2)	0.104	1.56	0.97	2.51
No	29 (24.8)	88 (75.2)				
Presence of onion harvest, pesticide, or spray equipment at neighbor's home						
Yes	29 (40.3)	43 (59.7)	**0.008***	1.99	1.22	3.25
No	19 (20.2)	75 (79.8)				
Distance from home to onion farm						
≤ 500 m	26 (28.3)	66 (71.7)	0.972	0.95	0.59	1.53
> 500 m	22 (29.7)	52 (70.3)				

Source: Primary data, 2017

The final results of the binary logistic analysis are shown in Table 6. Two risk factors of organophosphate pesticide exposure to the school children included cut the onion leaves (p = 0.002, OR = 3.33, 95% CI 1.55–7.15) and the presence of onion harvest, pesticides, or pesticide application equipment at the neighbors (p = 0.007, OR = 2.67, 95% CI 1.31–5.46).

Table 6. Risk Factors of the Organophosphate Pesticide Exposure in School Children

Risk Factors	B	p-value	Exp. (B)	95%CI for Exp. (B)	
				Lower	Upper
Cut the onion leaves	1.205	0.002	3.33	1.55	7.15
The presence of the onion harvest, pesticides, or pesticide application equipment at the neighbors'	0.984	0.007	2.67	1.31	5.46
Constant	-2.121	0.000	0.120		

Source: Primary data, 2017

We detected DAP metabolites in the urine of school children. It is a result of the metabolism of organophosphate pesticides (Bravo et al., 2002). The DAP metabolites are widely used to assess organophosphate pesticides exposure to humans (De Alwis et al., 2008). Usually via chromatography which presents high accuracy and precision (Bravo et al., 2002) and the LC-MS / MS method is the proper approach to detect a low level of DAP metabolites in urine (De Alwis et al., 2008; Margariti et al., 2007). The DEP, DETP, and DMTP were detected in the urine of subjects, similar to the previous study (Budiyono et al., 2015). The metabolites also provide useful information on the effect of cumulative exposure to organophosphate pesticides (Barr et al., 2004).

Children can expose to the organophosphate pesticides at farmland and home or neighbors. Our study revealed that the chlorpyrifos and dimethoate pesticides were found in the onion farm and at home. These organophosphate pesticides also were confirmed in small pesticide retails in the villages. The farmers or farmworkers after spray their onion plants use to left the container in the field, irrigation channel, or the roadside. They also brought the remains of pesticides to their home and stored them in the kitchen or surround.

The DEP and DETP are metabolites of chlorpyrifos pesticide. As DMTP is a metabolite of dimethoate or chlorpyrifos-methyl (Bravo et al., 2002; Wessels et al., 2003). DETP and DMTP were the most commonly detected metabolites in the subjects. DETP was detected in 27.1% of the subjects, similar metabolites to a previous finding (Kissel et al., 2005). Organophosphate pesticide exposure to schoolchildren might have come from agriculture pesticide use, a residue of pesticide in house dust (Lu et al., 2000), or dust exposure from agriculture products or pesticides from neighbors (Goldmann, 2004a; Suarez-Lopez et al., 2012).

School children may contact pesticides by their agriculture activities, i.e., cut onion leaves, carry the onion harvest, and seek remains onion harvest in the farm that may contain pesticides. The pesticides are then absorbed via skin, inhalation, and digestion (Quirós-alcalá et al., 2011). After being absorbed into the body, organophosphate pesticides are metabolized (Kumar et al., 2013). The time required to dispose of the organophosphate pesticides in humans ranges from 2 hours to 41 hours (Egeghy et al., 2011). However, the peak rate of excretion of these metabolites in urine depends on the route of exposure (Harnly et al., 2009; Meuling et al., 2005). Another study revealed that peak excretion is observed 6–24 hours later or more following dermal exposure compares to the oral route (Krieger et al., 2000). Chlorpyrifos takes a longer time (over 120 hours) for excretion (Meuling et al., 2005). The CDC predicted that the half-lives of organophosphate pesticides do not exceed a week in the human body (Centers for Disease Control and Prevention, 2009).

We took urine samples in the rainy and dry seasons since variation in DAP metabolite concentration is affected by season (Attfield et al., 2014; Quirós-alcalá et al., 2011). Even the previous study revealed that metabolites are

higher in the rainy season than in the sunny season (Lacasaña et al., 2010). The other indicated higher DAP metabolites in the spring and summer months (Quirós-alcalá et al., 2011). The short half-life of organophosphate pesticides in urine as biomarkers depends on seasonal measurements. Repeated measurements can provide more opportunities to identify risk factors (Attfield et al., 2014; Wessels et al., 2003).

The levels of the pesticide metabolites detected may also be influenced by demographic variations. The DAPs levels of this work did not show significant differences between demographic subgroups. Our findings showed that gender was not significantly associated with a status (presence or absence) of organophosphate pesticide exposure. The subjects were living in the same geographical area. There was no different pesticide exposure. Sex and race/ethnicity did not significantly affect DAP levels (Barr et al., 2004; Huen et al., 2012).

The subjects in the study ranged from 8–12 years old. By the age, children 6–11 years of age showed significantly higher DAP levels than adults (Barr et al., 2004; Curl et al., 2002; Perkins et al., 2016). It likely children absorb more pesticides from their environment than adults (Goldmann, 2004). Children are also less able to detoxify their bodies from organophosphate pesticides, which means they are more vulnerable to pesticide exposure (Garry, 2004).

The children could be exposed to organophosphate pesticides through their involvement in farm activities (cut the onion leaves). Neighbors also had a potential source of pesticide exposure. Play in the neighbor's home is also a risk of exposure to pesticides because of the storage of pesticides, the pesticide application equipment, or the onion harvest in the neighbors.

The pesticides residual in the onion were approximately several days to a week (Mahugija et al., 2017). The farmers or farm workers sprayed off pesticide on an onion plant more than three times a week until several days before harvesting. They conducted the activity for protecting the crops and don't want to take any risk of failing harvest like diseases and pests (Mishra et al., 2014). Larvae and mature pests live in the leaf sheath and stalk, causing damage to the crop (da Silva et al., 2015). Farmers generally use organophosphate pesticides (e.g., chlorpyrifos) to eradicate the pest. Farmers or farm workers used more than three types of pesticides. As they believe doing so can ensure the successful control of these pests. These behaviors can make insects more resistant to pesticides (Sarwar and Salman, 2015). The more pesticides are used, the more pesticide residues in the onion plant. The pesticide residues in the onion plant will expose to the children via skin and inhalation when they were in contact with them (i.e., cut the onion leaves with the bared hands and did no use a masker). The activities such as carry the onion harvest, seek the remains of onion harvest in the field or the onion processing unit can produce dust. The dust that may contain pesticides can inhale into the lungs and have potential risks to be exposed to pesticides. Some of the school children participate in onion cultivation when dust exposure can happen continuously.

Neighbors' home is another source of exposure to pesticides in children. On the farm and harvest, farmers sprayed pesticides 1–5 days before harvesting. The pesticides can contaminate the onion crop. Recent studies have shown that the soil in onion crops and onion bulbs contain pesticides (Akan et al., 2013; Aktar et al., 2009; Jamaluddin et al., 2015). The most common pesticides in these materials are dichlorvos, diazinon, chlorpyrifos, and fenitrothion. Farmland is a significant source of pesticide exposure to children (Goldmann, 2004a). Agricultural pesticides are transferred from the workplace to residential environments through the activities of farm workers. This mechanism is called take-home pesticide exposure. It contributes to residential pesticide contamination in agricultural homes where young children are present (Curl et al., 2002). People who live in the agriculture community have the potential to be exposed to pesticides. Organophosphate pesticide metabolites are detected in inhabitants, both farm and non-farm workers, of an agricultural community (Harnly et al., 2009; Huen et al., 2012). Urinary pesticide metabolite levels in the children did not differ across parental occupational categories

(Fenske et al., 2002). The overall level of DEP metabolites was higher in school children with parents as farmers or farm workers than those whose parents held other jobs. Another study revealed that children living with parents that work with agricultural pesticides or who live in proximity to pesticide-treated farmlands are more exposed to pesticides than other children living in the same community (Lu et al., 2000). Because farmworkers are more likely than other workers to be exposed to pesticides. Farmers who mix, load, and spray pesticides can be exposed to spills, splashes, and direct spray contact (Damalas and Koutroubas, 2016). Even the children who do not have parents as farmers or farm workers, the source of pesticide exposure likely from neighbors that stored onion harvest or pesticide spray equipment that contain pesticides. A lack of knowledge may influence the behaviors (Reeves et al., 2003), and nearly 70% of the parents reported an educational level of elementary school (i.e., completed 6 years of formal education). Lower education may influence their behaviors in the pesticide application (Jin et al., 2017).

In general, the farmers store the onion harvest or pesticides or their application equipment in the house, especially on the terrace, in the kitchen, in the living room, and in the yard. They stored onion seeds in the kitchen and mixed them with pesticides to prevent degradation. The behaviors have the potential to expose pesticides. The onion harvest or onion seeds produce dust, which can be inhaled or absorbed through the skin. Drift from onion seeds or pesticides or their pesticide application equipment in the home presents a possible pathway of exposure. Some studies found 2.12 ± 0.10 mg/kg chlorpyrifos pesticides used in fruit, seeds, leaves, and 25% of the sampled onion (Mahugija et al., 2017).

The pesticides and the equipment used to apply them use to be stored in the kitchen. Close to the stove and tableware. Previous work revealed that pesticides were found in application equipment (Damalas and Eleftherohorinos, 2011). Even, the percentage of parents that stored pesticides or application equipment in their home was relatively low (30.7%), these practices still puts children at the risk of pesticide exposure through drift. Pesticide storage in the house is associated with pesticide levels in the dust (Damalas and Eleftherohorinos, 2011). Household dust containing pesticides is significantly associated with dimethyl DAP levels in child urine (Curwin et al., 2007).

Anti-mosquito pesticides (e.g., coils, repellents, sprays) used in the home were another source of pesticide exposure in children (Roberts and Reigart, 2013). A large proportion (85.5%) of the subjects' parents reported using anti-mosquito pesticides at home; however, no significant association between this factor and pesticide metabolite levels was observed in the school children ($p = 0.448$). The pesticide used for anti-mosquitos was a different type of active ingredient from the pesticide metabolites that were detected in the urine of children.

Children can be exposed to pesticides by drift. Pesticide drifts are any airborne movement of pesticides away from the intended target, including droplets, dust, volatilized vapor-phase pesticides, and pesticide-contaminated soil particles (Kegley et al., 2003). The distance from schools to the onion farm is relatively close (approximately 650 m on average). Children who live or attend school near farmlands are particularly vulnerable to pesticides (Damalas and Koutroubas, 2016). Lower organophosphates metabolite levels correlated with increasing distance from farmland (Coronado et al., 2011). In this work, the distance from home to the agricultural area did not significantly influence pesticide exposure (p 0.950). It is likely because the sources of pesticide exposure may not only from the onion field but also from home (Damalas and Eleftherohorinos, 2011; Shalat et al., 2003) and their neighbor (Suarez-Lopez et al., 2012). It revealed that neighbors stored the onion harvest, pesticides, or pesticide application equipment (p 0.007, OR = 2.67) were risk factors of organophosphate pesticide exposure in children.

Children may participate in agricultural work that involves pesticides or contact with pesticide-treated foliage (Roberts and Karr, 2012). Children also work during the planting and harvesting seasons to help their parents and neighbors (Nugroho, 2013). Pesticides present in the soil and onion crops evaporate

with increases in air temperature (Damalas and Eleftherohorinos, 2011), and increasing air temperature from 5 °C to 25 °C can increase dust production by 10%–30% (Løfstrøm et al., 2013). In this work, children who cut onion leaves were 3.35 times more likely to be exposed to organophosphate pesticides than those who did not (p = 0.002).

The farmers and farm workers (71% of 50 respondents) in the area of study usually spray onion crops with pesticides 1–5 days before harvest (Basuki, 2009). The children's activities could have exposed them to pesticides. Pesticides may exist as residues in the foliage of onions when leaves cutting could generate dust. The dust evaporated and dissipated. It is inhaled by the school children involved in onion farm activities, especially those who do not wear masks while working. The vapored pesticide and particulate of soil are easy to inhale.

Conclusion

There were 28.9% of primary school children detected pesticide metabolites in their urine. The type of Dialkyl phosphate (DAP) metabolites detected in the urine were diethyl phosphate (DEP), diethyl thiophosphate (DETP), and dimethyl dithiophosphate (DMTP). Involvement in agriculture activities and the storage of onion, pesticide equipment, or pesticide in the neighbor are risk factors of organophosphate pesticide exposure on school children.

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Determinant Factors of Low Back Pain in Paving Block Workers

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Abstract

Paving block workers are included in the informal sector and have a risk of lower back pain. Documenting the workers' health status in the informal sector has not been done well so that workers do not get protection from the government. Heavy physical work puts pressure on the spine associated with repeated body twisting. This study aims to determine work attitude, length of employment, and exercise habits related to low back pain in Pontianak paving block workers in 2018. This type of research is observational with a cross-sectional approach. Sampling uses total sampling. The research sample of 56 paving block workers in the city of Pontianak, West Kalimantan. Data is processed with a computer program. Data analysis was performed univariate and bivariate and tested using the Chi-square test, with α = 5%. The results showed that there was a significant relationship between the length of the work (p = 0.013), work attitude (p-value = 0.038), and exercise habits (p = 0.003) with low back pain.

Introduction

Occupational health tends to realize optimal work productivity so that every worker can work healthily without endangering himself and the surrounding community (Ndjoulou, Desmarais, and Pérusse 2015; Bhagawati 2015). For healthy and productive workers to make work health care efforts. These services include promotive, preventive, curative, and rehabilitative work against workers (NS 2014; Jonathan and Mbogo 2016). Occupational health care efforts to protect workers against illness and work accidents (NS 2014). Occupational health services need to carry out continuously, both for formal and informal workers (Nankongnab et al. 2015; Bhagawati 2015). It aims to prevent occupational health problems originating from the work environment, work capacity, and work.

Work risk is one of the causes of death and pain. It is estimated that 2.78 million deaths occur every year in all countries associated with employment. Employment-related deaths accounted for 5% of total deaths globally. The largest share of work-related deaths originated from work-related diseases, which accounted for 2.4 million (86.3%) of the estimated total deaths. Fatal accidents accounted for the remaining is 13.7%. The inclusion of Chronic Obstructive Pulmonary Disease (COPD) in the estimation of respiratory diseases, which is 17%, has increased and includes the top three diseases after circulatory disease 31% and malignant neoplasms 26%. Together, it contributes more than three-quarters of total work-related deaths, followed by 14% occupational accidents

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and 9% infectious diseases (Nankongnab et al. 2015; Bhagawati 2015).

Occupational diseases and accidents can occur due to various factors, namely work capacity, workload, and work environment factors. Workers factor, with unsafe work behavior, for example not using personal protective equipment and careless. Poor environmental conditions, namely noise, slippery floors, and low lighting. While work factors (workload) do monotonous work (Weinstock and Slatin 2012; Ulutasdemir et al. 2015; Hämäläinen, Takala, and Kiat 2017). Besides, behavioral factors play a large role in the emergence of accidents and occupational diseases (Swaminathan 2011).

Prevention of diseases and work accidents can be done by controlling these factors through directed and organized work health efforts (Swaminathan 2011; Pillay 2015). Besides, by increasing the active participation of all interested parties. However, although various prevention efforts have been developed due to human limitations and neglect, occupational health problems cannot be avoided (Pillay 2015; Wachter and Yorio 2014). The causes of work-related diseases are physical, chemical, biological, physiological, and psychological factors (Wachter and Yorio 2014; Yang et al. 2016). Among physiological (ergonomic) diseases, namely low back pain (Yang et al. 2016; Marras 2000). Lower back pain occurs due to an incorrect posture at work (Marras 2000; Salvagioni et al. 2017). Low back pain can cause physical fatigue and health problems (Furtado et al. 2014; Allegri et al. 2016). In the long term, material body changes or disability can occur (Allegri et al. 2016; Wong, Karppinen, and Samartzis 2017).

Low back pain is often seen as a disease of the elderly, and it is more common among young people. Trauma and mechanical disorders are the leading causes of lower back pain (Wong, Karppinen, and Samartzis 2017; Furtado et al. 2014). People who are not used to doing muscle work or have not done the job for a long time can cause acute lower back pain (Wong, Karppinen, and Samartzis 2017; Coenen et al. 2014). Especially in people whose age has increased and obesity with muscles and veins has been loosened.

These disorders are often experienced in the workplace, especially workers who move with the wrong body position (Ibrahimi-Kaçuri et al. 2015; Lis et al. 2007). Work with lifting heavy items or jobs with a half-sitting place for a long time can cause back pain. This is due to an imbalance in the strength of the abdominal muscles and waist muscles that support the lumbar bones (Hashimoto et al. 2017; Ibrahimi-Kaçuri et al. 2015; Lis et al. 2007). Almost all workers at one time in their life experience lower back pain. The results of research conducted on several workers found that lower back pain at one time during work often arises and requires medical treatment (Hashimoto et al. 2017; Ibrahimi-Kaçuri et al. 2015).

Risk factors that affect lower back pain incidence or prevalence are environmental, occupational, and worker factors. Environmental factors such as physiology (ergonomics), vibration, heat, and psychosocial. Heavy physical work puts pressure on the spine. Work-related to the movement of bending and rotating the body repeatedly and half standing, and the result is monotonous and does not provide satisfaction. Individual worker factors are related to mechanical back pain, namely, age, gender, body fitness, sports skills, and habits (Yang et al. 2016; Watanabe et al. 2018).

Paving block workers are one of the groups of informal workers who can experience low back pain. The activities are mostly done manually, half standing and sitting. Making paving blocks begins with preparing tools and materials, transporting raw materials, processing raw materials, doing drying, hardening, and removing paving blocks and cleaning equipment (Pokharkar et al., 2017).

Method

This type of research was observational, with a cross-sectional approach, namely analysis to look at the description of the length of work, work attitudes, and exercise habits and at the same time to link with lower back pain in paving block workers. This research was conducted in the city of Pontianak. The sampling technique uses total sampling with a full sample size of 56 paving block workers.

Data collection techniques used in this study are interviews, observation, and examination. Interviews with questionnaires for collecting data on the characteristics of respondents and years of service. Direct observation using the checklist is used for working attitude data retrieval. Physical examination of workers is done for the data collection on symptoms of lower back pain. Data processing using a computer program including editing, coding, scoring, entry, tabulating and analyzing. Data analysis used univariate and bivariate analysis. Bivariate analysis using the chi-square test (X2) with a confidence level of 95% (α = 95%).

Results and Discussion

Based on the results of research conducted by researchers, according to the age of the paving block workers obtained information as found in table 1.

Table 1. Frequency Distribution of Characteristics of Respondents

	Total	%
Age (Years)		
< 35	27	48.2
> 35	29	51.8
Length of work (hours/day)		
≤ 6	25	44.6
> 6	31	55.4
Work Attitude		
Right	47	83.9
Wrong	9	16.1
Sports habits		
≥30 minutes/weeks	27	48.2
Never	29	51.8
Lower back pain		
Mild	30	53.6
Several	26	46.4
Total	**56**	**100.0**

Source: Primary Data, 2018

Table 1 shows that the proportion of respondents based on the age of paving block workers in Pontianak City is > 35 years, as many as 29 (51.8%). Paving block workers' ratio with a long work of > 6 hours/day is 30 (53.6%). Based on observations made on paving block workers, it is known that work attitudes consist of several activities. The work philosophy is the appointment of materials, stirring materials, printing paving blocks, removing printed material, and transfer of material, and the work attitude of storage and transfer of work. The results of the study obtained information that works perspectives (Table 1). Based on table 1, the proportion of paving block workers, who have the right working attitude, is 47 (83.9%).

Based on the research results on sports habits in the paving block, workers obtained information found in table 1. According to exercise habits, which is carried out for at least 30 minutes per week, is 27 (48.2%) (Table 1). Based on the research results on low back pain, paving block workers obtained information as found in table 1. Table 1 shows that paving block workers' proportion based on mild low back pain in Pontianak City is 30 (53.6%).

Table 2. Work Periods and Lower Back Pain in Block Paving Workers

Length Work (Hours)	Lower Back Pain						*P value*[a]
	Several		Mild		Total		
	n	%	n	%	n	%	
> 6	19	61.3	12	38.7	31	100,0	0,013*
≤ 6	7	28.0	18	72.0	25	100,0	
Total	26	46,4	30	53.6	56	100,0	

Source: Primary Data, 2018

[a]Chi Square, α=5%; *Significance (p≤0,05)

Based on table 2, there is a tendency for work periods > 6 hours/day to occur with severe low back pain (61.3%) more significant than the work period of ≤ 6 hours (37.5%). The statistical test results obtained from the calculation showed that there was a meaningful relationship between work periods with low back pain in paving block workers in Pontianak City (P = 0.013)

Based on the table 2, there is a tendency for work periods > 6 hours/day to occur with severe low back pain (61.3%) greater than the work period of ≤ 6 hours (37.5%). The statistical test results were obtained, that there was a significant relationship between work periods with low back pain in paving block

workers in Pontianak City (P = 0.013)

Table 3. Work Attitude and Lower Back Pain in Block Paving Workers

Work Attitude	Lower Back Pain						*P-value*[a]
	Several		Mild		Total		
	n	%	n	%	n	%	
Wrong	20	57.1	15	42.9	35	100,0	0,038*
Correct	6	26.6	15	71.4	21	100,0	
Total	26	46,4	30	53.6	56	100,0	

Source: Primary Data, 2018

[a]Chi Square, α=5%; *Significance (p≤0,05)

Based on the table 3, there is a tendency for wrong working attitudes to occur with fallow lower back pain 57,1% greater than the correct work attitude 26.6%. The statistical test results obtained p-value = 0.038 which means that there is a significant relationship between work attitudes and low back pain in paving block workers in Pontianak City.

Table 4. Sports Habits and Lower Back Pain in Block Paving Workers

Sport habits	Lower Back Pain						*P-value*[a]
	Severe		Mild		Total		
	n	%	n	%	n	%	
Yes	7	25.9	20	74.1	27	100,0	0,003*
No	19	65.5	10	34.5	29	100,0	
Total	26	46,4	30	53.6	56	100,0	

Source: Primary Data, 2018

[a]Chi Square, α=5%; *Significance (p≤0,05)

Based on table 4, there is a tendency for those who do not exercise (doing sports min. 30 minutes/week) with severe lower back pain (65.5%) more significant than those who exercise (25.9%). The statistical test results obtained a p-value = 0.003, which means a substantial relationship between sports habits (exercise) with lower back pain in Pontianak paving block workers. Lower Back Pain is felt in the lower back, whose source is the spinal cord, muscles, nerves, and other structures around the area (Ibrahimi-Kaçuri et al. 2015; Hashimoto et al. 2017; Lis et al. 2007). Several factors occur in low back pain, in addition to individual characteristics, also the workplace and work period (Ibrahimi-Kaçuri et al. 2015; Hashimoto et al. 2017). The research results on low back pain in paving block workers in the city of Pontianak showed that of 56 paving block workers, all of whom provided information had experienced lower back pain at work. Lower back pain in paving blocks workers because most do not pay attention to physiological (ergonomic) work factors (Marras 2000; Yang et al. 2016; Salvagioni et al. 2017). In addition to the working period, lower back pain is aggravated by irregular daily working hours. This is supported by the results of the study, namely workers aged >35 years (51.8%) and the working period >5 hours/day (57.1) with work time per day >7 hours, most experienced back pain, which is 61%.

The statistical analysis results showed a significant relationship between the length of service with low back pain in paving block workers in Pontianak City (p = 0.013). The work period will affect the occurrence of workplace accidents (Pillay 2015). This happens because the longer workers work, the greater the risk of illnesses and occupational accidents at work (Furtado et al. 2014; Wong, Karppinen, and Samartzis 2017). Based on these results, the need for the paving block industry's management to pay attention to the period of work and work time for workers. It's arisen because working for a long time with a monotonous working attitude and the wrong working attitude will cause lower back pain. A wrong working attitude and carrying a continuous load will increase body pressure, especially the lower back pain, and cause disability (Lis et al. 2007; Coenen et al. 2014). It would help if you worked ergonomic attitude, and the burden carried not too heavy to avoid the risk of back pain that will occur to workers.

The results showed a relationship between work attitudes and lower back pain (p <0.05). Attitudes o positions in work (standing, sitting, or other working attitudes/positions), ergonomic considerations related to work positions are fundamental. There are several types of work that require individual attitudes that sometimes tend to be uncomfortable. These conditions make workers in a "strange" attitude and work position. It sometimes lasts for a long time (Wong, Karppinen, and Samartzis 2017), resulting in workers tired quickly, making many mistakes in work, or ends with a disability.

Work attitudes are grouped into six healthy working attitudes, namely work attitude

when lifting sand and cement, lifting material from Molen to the printing machine, suitability of printing machine position, elbow height at work, working attitude when printing paving blocks, working attitude when lifting prints for drying, and work attitude when lifting material (Wong, Karppinen, and Samartzis 2017; Lis et al. 2007; Coenen et al. 2014). There was a significant relationship between work attitudes and low back pain in paving block workers in Pontianak City ($p < 0.05$). Workers lift material with the correct technique while keeping the back straight at an angle of about 15 degrees while lifting weights (Lis et al. 2007; Coenen et al. 2014) to minimize disruption abdomen and pressure on the framework of the lower spine. It is expected that the back takes a load, but the legs are working (Yang et al. 2016; Watanabe et al. 2018). Management can provide transport aids such as strollers as a tool to transport material to ease the burden of lifting (Freitas et al. 2011; Coenen et al. 2014).

When used, the press's position is expected to have a height of 5-10 cm below the elbow height. Besides, the foot of the media must be given a foundation or foundation. To reduce work habits that always bend or stand because the printing machine is too low from the standard (Freitas et al. 2011). Workers who will lift the printout so as not to overdo it. Besides, make sure the technique holds the correct one at the finger and palm (Pillai and Haral, n.d.), This is so that the load carried is more controlled and the pack is more evenly distributed throughout the body. Keep your back straight and upright at an angle of about 15 degrees. Working in a changing position or working attitude between sitting and standing periodically will reduce lower back pain disorders (Pillai and Haral, n.d.; Heneweer et al. 2011).

The results of the analysis showed a significant relationship between workers who had exercise habits (physical fitness training) with low back pain in paving block workers ($p < 0.05$). Lack of physical fitness with exercise is one factor associated with lower back pain (Freitas et al. 2011; Wong, Karppinen, and Samartzis 2017). Workers who have exercise habits can reduce the risk of lower back pain than employees who do not exercise regularly (Heneweer et al. 2011; Niederer, Vogt, and Banzer 2018). Workers who have a habit of physical exercise with a frequency of 3 times/ weeks at least 60 minutes can reduce the risk of lower back pain complaints more significantly than those who do not want physical exercise 3 times/week at least 60 minutes or more.

Conclusion

Based on the description above, it can be concluded that there is a significant relationship between years of service, ergonomic, work attitude, and exercise habits with low back pain in paving block workers ($p < 0.05$)). In this regard, it is recommended that there is a need for the socialization of correct work attitudes to prevent lower back pain in plots workers, which results from wrong working attitudes. Counseling about healthy working attitudes, repair of tools used well, regular exercise habits, and proper working time arrangements will result in optimal work productivity and occupational health.

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Improving Health Behavior Standard Through Modern Islamic Boarding School

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Abstract

The purpose of this study is to explain health behavior standard of modern Islamic boarding school. The sample was determined purposively in Modern Islamic Boarding School in Banten Province, of Indonesia and respondents were 90 people with simple random techniques. This research uses descriptive quantitative method and data from the questionnaires. The results of this research showed that health behavior residents of Islamic boarding schools can be improved by predisposing factors such as (category of fairly good education and good income category), enabling factors (facilities for clinic/poskestren included: room/place, the medical and non-medical equipment and medicines in the good category) and strengthening factors (cadres of Poskestren, management aspect of clinic/poskestren, aspect of observation on the health and from the aspect of healthy behavior in the good category). A dominant factor to improving health behavior residents of Islamic boarding schools is the reinforcing factor.

Introduction

In the constitution number 36 of 2009 concerning health is explained that the definition of health is "a prosperous state of the body, soul, and social which allow every person to live productively socially and economically". Thus, the government has a responsibility to be able to support all Indonesians to live productively in healthy conditions (Kementerian Kesehatan Republik Indonesia., 2009). The educational objectives of Islamic boarding schools, in general, are towards civil society, through education that is civilized, flexible, adaptive and flexible with processes that are open and oriented towards the interests of religion, the world, and the hereafter.

The other side residents culture of Islamic boarding schools (pondok pesantren) that is often overlooked is the health of students (santri), usually, there are still many Islamic boarding schools that preserve traditional cultures in which students in Islamic boarding schools is required to behave according to a traditional lifestyle in order to preserve culture and there are those who already have modern infrastructure, but those who implement modern life-styles are not many in number. In Islam, there is an order to worship, nothing else for the benefit of every Muslim himself. A Muslim who is always worshiping as means to always be close to his God, when he likes and sorrows, because God is a place where people are grateful and to Him, they ask for help (Jauhari, 2011). Besides that, there are also other factors that influence the health behavior of the boarding school residents, among others, health selection of prospective students, health promotion, health knowledge, health facility services, environmental health regulations, health promotion education, and preventive behavior. Fahham (2011) said there are two government policies implemented to help boarding schools out of the sanitation problems they face, namely Health Pesantren Post (poskestren) from the Ministry of Health and eco-boarding schools Ministry of Environment

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Life and Forestry. However, not all pesantren can access one of the policies the. For this reason, the Government needs to increase the reach of the pesantren health post program and eco-boarding schools

Healthy is a complete condition, both physical (physic) or non-physical (mental/ spiritual), reason and social which allows a person to carry out life activities properly. That is, being healthy here is not merely free from various diseases, but emphasizes more about being healthy physically, spiritually, intellectually, and socially (Husan, 2014). Basically there are 4 (four) levels of disease prevention in general, namely: basic level prevention (primordial prevention), first level prevention (primary prevention) which includes health promotion and special prevention, second level prevention (secondary prevention) which includes early diagnosis and appropriate treatment, and third level prevention (tertiary prevention) includes prevention of the occurrence of defects and finally rehabilitation. The four levels of prevention are closely related, so that overlapping conditions often occur (Noor, 2008).

About 66.7% of students receive health education. Significant knowledge in Clean and Healthy Life Program (CHLB) related to education and health class was observed ($P < 0.05$), including in-depth knowledge of measured exercise, weight and height, smoking, and healthy latrines. Meanwhile, there were no significant differences observed between attitudes toward CHLB and health education at different grade levels. Furthermore, CHLB is associated with health education, including exercise practices and the use of clean and healthy toilets. School Health Promotion: A Cross-sectional study on the Clean and Healthy Life Program (CHLB) Behavior among Islamic Boarding Schools in Indonesia (Susanto, et.al., 2016).

The results showed that there was a positive and significant influence on the management of the pesantren's educational environment on the healthy behavior of Islamic students. The creative and proactive efforts needed from boarding schools to improve the effectiveness of boarding schools in managing the educational environment through maintenance of facilities and infrastructure and more focused and innovative Islamic academic development, so that the behavior of Islamic students in boarding schools in Central Java, Indonesia can be improved (Sari, 2016). According to Green and Kreuter (2005), there are 3 (three) main factors in health behavior, namely predisposing factors (attitudes, tradition or culture, value system, education level, economic level), enabling factors (infrastructure, health facilities) and reinforcement factors (attitudes of leaders, teachers, employees, administrators, rules or order.

Method

This research is a quantitative descriptive study, using descriptive analysis or descriptive statistics is a statistic that serves to describe or give an overview of the object under study through sample data or population, without analyzing and making conclusions that apply to the public. The sample used random sampling are Al Hasyimiyah, Daar El Qolam and Darul Qur'an Islamic Moderen Boarding School with the number of respondents each boarding school is 30 people so that the overall respondents amounted to 90 people. Data from questionnaires in this study are quantitative data which will be analyzed descriptively by percentage. To determine the type of descriptive percentage obtained by each indicator in the variable, and the descriptive calculation of the percentage then interpreted into the sentence (Akdon & Ridwan, 2013). Analysis of data to explain the implementation of health standards based on guiding guidelines and the implementation of boarding schools health posts and health behavioral factors, if the average percentage falls into the category of 1% - 50% it is said to be poor and if between the average process enters into 50% - 100% is good.

Results and Discussion

The result of research showed that based on majority of the boarding school residents who were respondents were as follows: male and female santri as many as 49 respondents (54.40%), then employees as many as 17 respondents (18.90%), teacher council or teacher as many as 15 respondents (16.70%)

continued with the manager of poskestren as many as 6 respondents (6.67%) and poskestren coach as many as 3 respondents (3.33%). This can be explained the responden as resident who leaves and interaction everyday in boarding school are employees, teacher, manager and organizer. Based on the level of education that at most the level of education is the level of high school equivalent as many as 62 respondents (68.89%), then undergraduate as many as 15 respondents (16.67%), followed by the level of junior high school equivalent to 8 respondents (8.89%) and postgraduate of 5 respondents (5.56%). The level education of responden majority at high school caused much more the teacher stiil as student in university or as teacher dedication usually ain two or three years.

Based on the level of income that at most the level of income is above Rp.5,000,000 as many as 45 respondents (50%), then between Rp. 3,500,000-Rp.5,000,000 for 22 respondents (24.44%), then between Rp. 1,500,000-Rp. 3,500,000 as many as 15 respondents (16.67%), and between Rp. 500,000-Rp.1,500,000 as many as 8 respondents (8.89%). The income data show that majority of respondent has high income it is convenient as modern Islamic boarding school who attended for teacher and employees welfare. Judging from the self-observation survey indicators conducted by residents of Islamic boarding schools, it was found that as much as health observations in the neighborhood around boarding schools in the good category amounted to 88.11% and as much as 11.89% in the poor category. In the other words that environment at boarding school by residents feel good caused relative atmosphere of the environment and spatial planning are neatly arranged like modern Islamic boarding school in another place.

The healthy behavior of the boarding school residents by 90.67% in the good category and the remaining 9.33% in the poor category, as usually at modern boarding school used internal system how to keep healty and how to outpatien to clinik, poskestren or puskesmas so that all resident quickly prevent if there are are sick. Then in the nutritional aspects, especially the santri in the good category was 86% and the remaining 14% were in the poor category, in every boarding school there is food menu daily and be change every day until everyweek this is intended to combine tastes and tastes so that nutritional needs are met. Generally, the survey observes the residents of Islamic boarding schools in a good category, where they have sufficient awareness to maintain their health and healthy behavior. This fact to be consisten with mission of boarding school that gave good and exellencies to all student for be better in studying and be a good students. In Figure 1, it can be explained that the health behavioral factors of Islamic boarding schools are as follows:

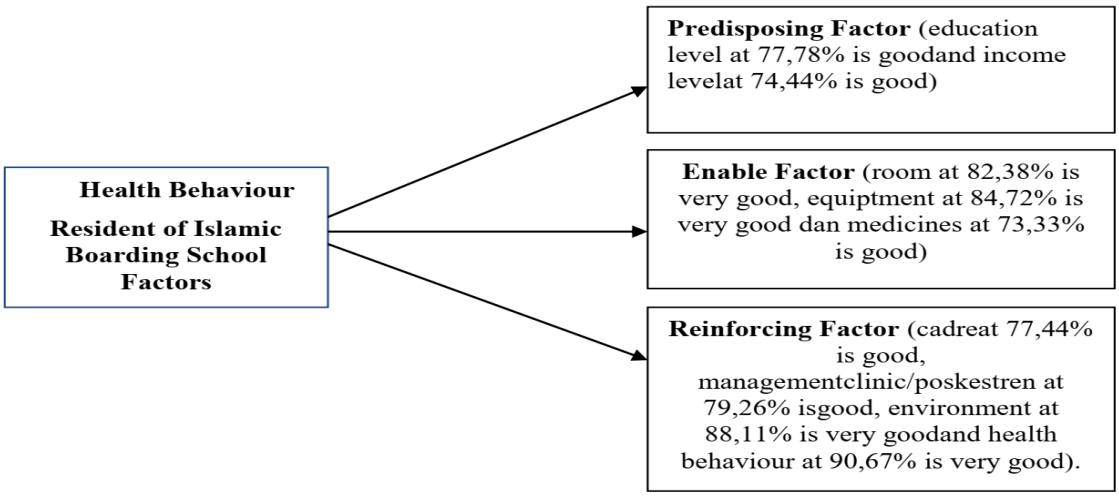

Figure 1 : Health Behaviour Resident of Islamic Boarding School Factors

Predisposing factors (education level of 77.78% of respondents in the category of fairly good education and income level of 74.44% of respondents in the good income category), poor practices on personal and room hygiene among the santris and proposed a training intervention, it is same like an intervening how education and knowledge to be improv for personal healthy behaviour. Overall, there was a significant increase in knowledge and personal behavior after the intervention and room hygiene was significantly improved among boys and those who received leaflets having developed a specific training materials, school-based hygiene training intervention improved knowledge and personal behavior. Its effect on room hygiene particularly for female santris needs further strengthening of the intervention in this Islamic boarding school setting (Widyasari et.al, 2020). Cleanliness is something that is very important for Muslims, the obligation to maintain cleanliness is directed to each individual. Personal hygiene or self-care is one solution in maintaining health for students. Personal hygiene is more influenced by individual values and practices. Other factors are cultural, social, family, and individual factors such as knowledge about health and perceptions about individual needs and comfort. (Hasan, 2016). Most of 67,9% respondents, had a picture of clean and healthy living behaviors that was sufficient. The gradual delivery of information by health workers was necessary to increase the santri's knowledge about PHBS. The involvement of religious teachers and religious teachers is needed in an effort to increase students' awareness of the importance of clean and healthy living behavior. There is a need for directed and continuous planning to improve quality for implementation. Continuous assistance It is important to do with the community in Islamic boarding schools so that the information submitted is in accordance with the established standards. (Bahjatun et,al, 2019)

Enabling factors (room/place clinic/ poskestren as much as 82.38% in good category, then equipment at 84.72% of respondents in good category and medicines as much as 73.33% in good category). That fact same as While students of Islamic boarding school that utilize health care facilities when sick is poskestren (90.20%), the dominant factor influencing the personal behavior of santri of Islamic boarding schools is health services, although the correlation is relatively weak. (Emy et.al, 2019). Reinforcing factors (cadres of poskestren where Islamic students are involved at 77.44% in good category, then from the management aspect of clinik/poskestren at 79.26% in good category, then from the aspect of observation to the health of the pesantren's environment of 88.11% in the good category and from the aspect of healthy behavior by 90.67% in the good category). Salvari et.al, (2019) founded there was a relation of respondent characteristics and air quality to scabies prevalence on students of boarding school. The significant relationship of residential density, ventilation, and age towards the occurrence of scabies should be further investigated in order to prepare for elimination programs. Febrika et.al, (2016) show there is a connection between behaviour and scabies, it can concluded that the level of knowledge, myths, and allowances indirectly affecting scabies through clean living. Having good attitudes and subjective norms to be actively involved in Poskestren. But there are still some respondents with poor behavioral control. The attitude and control variables have a positive relationship with the intention to be actively involved in the Poskestren. Behavioral control and intention also have a direct positive relationship with active behavior in Poskestren. Students also improve the existing subjective norms because they see no relationship between subjective norms and students' intentions to be actively involved in Poskestren. The need for health promotion media in the boarding school dormitory environment to add information to students. (Faishal and Pulung, 2016). Arifa et.al, (2017) said that the health of education treatment gives a change on the female student behavior in their personal hygiene. Knowledge and attitudes are mostly involved in good category while practice is mostly in the medium category.

In generally from the percentage, then it can be seen that the most dominant factor in the behavior of Islamic boarding schools is 83.12% of reinforcing factors, then 79.99% of the enabling factors and 76.11% of the

predisposing factors. Increasing the capacity of the Islamic boarding school, one of its efforts is to conduct routine monthly payments that are paid through monthly contributions submitted to the management of the Islamic boarding school. Where this aims to complete the facilities and infrastructure of existing clinic/poskestren so that this participation is important to be preserved as an effort to joint responsibility. As Zuhriya (2015) have seen how the clean and healthy living behavior (PHBS) of students who are already good, that is, always wash their hands before eating and after defecation and none of the students have ever used drugs, while PHBS for students who lack is the act of avoiding disease transmission.

In an effort to early detection of pesantren residents, in several other pesantrens, they have conducted medical tests before being declared to have entered the Islamic boarding school, of course, this is an early prevention effort for contracting the disease or anticipating certain diseases from the prospective santri. On the other hand, health standards are important in order to realize healthy and intelligent santri, so that diseases that arise mainly from congenital factors can be minimized to contract. The other side, Ikhwanudin (2010) founded that the students response to health is still spared from a modern medical perspective, because pesantren have a different culture from the community outside the pesantren as seen from the first, in health care, students still defend themselves from disease and health in a simple way. Second, in an effort to utilize the health system, students ask for health knowledge that students understand. Third, environmental health problems, santri, environment, and values, culture, and religious values that exist in pesantren.

As an effort to manage household/ domestic waste, both from the activities of bathing, washing, kitchens and so on, especially Islamic boarding schools have not provided special facilities in the form of processing and managing simple waste. So, that the utilization can be felt ecologically and economically, then so that domestic wastewater does not cause water quality the land decreases the Islamic boarding schools have not yet used an efficient (IPAL) system that still uses recharge systems in the soil/is discharged into the soil/dumped into the pond. That it has an adverse impact on the environment such as poor drainage/gutter which often causes mosquitoes or nesting to develop rodents such as mice, snakes, cockroaches, scorpions or millipedes and so on. The boarding schools health infrastructure must be a good condition, Susanna and Sumarni (2014) founded that bacteriological quality of water, clean water facilities, latrines, food management facilities and partial eating areas more than 50% have not yet met the requirements.

Fatmawati and Saputra (2016) said that teacher's role in realizing PHBS in santri can done by providing information regarding PHBS, provides information about the importance of bathing with water clean, and get used to maintaining environmental cleanliness with get used to throwing out trash in place and provide a place adequate garbage disposal. Not to forget also the stool waste produced by Islamic boarding schools periodically has not been scheduled to do cleaning or suctioning periodically so as not to cause pollution (smell) in the Islamic boarding school environment which provides less comfort and development of animal flies or animal carriers and disease spreaders. Giving vitamins and improving nutrition is a necessity that needs to be considered where the age as a santri or student in the growing period so that it requires adequate vitamin and nutritional elements, of course not only rely on nutrition to eat in the kitchen periodically. So, that it can help students to do activities well. As a result of the percentage of indicators available, the self-monitoring survey indicators have the highest percentage of 88.26%, which means that there is a high awareness of the pesantren residents about the health standards in boarding schools so that they are very careful to maintain health and quickly treat if contracting the disease.

Thus, all Islamic boarding school students are expected to transfer online to the post office, so that when there are an examination and treatment, health ansurance funds programe can be optimized so as to minimize santri to go home or hospitalize around his house. Based on a list of types of diseases that are often complained or experienced by residents

of Islamic boarding schools in Poskestren each of the average each month, it is found that the disease experienced by many patients who come and treat headaches/migraines usually indicates a lack of lack of rest time or quality of sleep so that santri insist on thinking and reading precisely this will result in the students' weak eyesight, then the disease of scabies which is still experienced by some boarding school residents is a personal hygiene which is less noticed later on allergies with temperature differences, against water and so on. Herpes is a skin disease that can be quickly transmitted through touch between the skin or other media so that this treatment is carried out quickly and fever is caused by weak body conditions which are preceded by weakness and deep heat.

If seen from the percentage, then it can be seen that the most dominant factor in the behavior of Islamic boarding schools is 83.12% of reinforcing factors, then 79.99% of the enabling factors and 76.11% of the predisposing factors. Virahani and Wulandari (2020) said that one form of government support for the development of poskestren is in capacity building activities poskestren as well as providing assistance for poskestren kit and capacity building of poskestren is intended for Islamic boarding schools. After the improvement activities poskestren capacity is expected to boarding schools actively implementing health programs mandiri accompanied by a public health center.

This indicates that the reinforcing factor is an important factor, because in Islamic boarding schools have a characteristic where the role of administrators/managers of Poskestren has the influence to form certain disciplines, especially maintaining the environment of Islamic boarding schools, pesantren leadership policies given to Poskestren managers become the main focus in solving problems health and environment in Islamic boarding schools, and the role of santri in carrying out the rules / regulations as one of the husada cadres, so that the level of awareness and care about handling health and environmental problems in Islamic boarding schools will be completed independently. Then efforts for healthy behavior among the boarding school residents have been considered but need to be increased again as a more important prevention effort.

Furthermore, enabling factors where facilities and infrastructure need to be repaired and expanded, so that it can serve more patients and isolation or bed space needs to be added, with the hope that all sick boarding school residents go into isolation/inpatient rooms so that they do not have the potential to spread illness to his friend. Then the medicines also need to be added in the poskestren so that the residents of the pesantren are sick to avoid getting drugs installs or outside the poskestren. The predisposing factors, where the level of education and level of income have the carrying capacity for the realization of healthy behavior. Because residents of Islamic boarding schools are located and domiciled in a limited area at the same time, so this factor becomes a less important part because awareness of health behavior in Islamic boarding schools is indeed not seen from the level of education and income. Of course, this is due to the consideration of diseases that are infected in the pesantren environment. As we know, modern Islamic boarding schools have a good level of education, including good income levels, so that counseling and prevention efforts will have a quick response to change their health behavior. On the other hand with a good level of income, it will potentially have a BPJS (Social Insurance Administration Organization) or other health insurance so that Poskestren can work more broadly in order to carry out its business functions properly.

Conclusion

The resident factors of Islamic boarding schools health behavior standard can be improved by predisposing factors, such as; (category of fairly good education and good income category), enabling factors are (facilities for poskestren included: room/ place, the medical and non-media equipment and medicines in the good category) and strengthening factors are (cadres of poskestren, management aspect of poskestren, aspect of observation on the health and from the aspect of healthy behavior in the good category).

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Risk of Pesticide Exposure on Impaired Level of Intelligence (IQ) of Children

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Abstract

The shallot cropping pattern applied by farmers in the village of Pasir Demak is very likely to cause pollution. Pesticide contamination in pregnant women in the first trimester (3 months) can result in fetal death, low birth weight, and impaired intelligence (IQ). Preliminary research conducted in 2016 found that elementary schooler who came from Pasir Village, Demak had low learning achievement. It was an observational study with a cross-sectional approach; the respondents were Elementary Schooler grades 4, 5, and 6 (107 people) and the mothers of the students (107 people). Thus, the total respondents were 214 people. The IQ assessment instrument used the SPM and CPM instruments. The level of pesticide poisoning from the mother was to measure blood Cholin Esterase levels using a tintometer, the data were then statistically analyzed using Chi Square and Odd Ratio for risk factors. There were significant differences on the level of intelligence of children including the planting system p=0.002; room area p=0.047; ventilation area p=0.041; type of pesticide p=0.001; spraying before harvest p=0.007; spraying after harvest p=0.008; storage place for crop yields p=0.039, while the variables that did not show significant difference were the playing environment p=0.848; gestational age p=0.190; contact to pesticides p=0.105 and age p=0.418. Pesticide contamination in pregnant women in the 1st trimester which the time to process formation and development of the brain in the Temporal lobe and Frontal lobe will experience impaired learning and memory (IQ). Keywords : Elementary schooler; Pesticide exposure; Level of intelligence.

Introduction

Organophosphates, which kill pests by attacking the nervous system, have previously been linked to developmental delays and attention problems in children exposed during pregnancy (Grandjean et al., 2006). Currently, researchers in two different sites found that children's IQ tended to decrease proportionally because of exposure to pesticides during pregnancy. This case can have a further impact on decreased children's performance, making them a generation that is not smart and productive and eventually, the contribution of this group to national development declined (Handal et al., 2007).

A study included hundreds of Latin mothers and children in California's Salinas Valley, a commercial farming center. Many women were gardeners or had family members who worked in the agricultural fields. When these women became pregnant, researchers tested their urine for several organophosphate standard chemical products using an exposure measurement tool (Starks et al., 2012). As a result, pregnant women who were exposed to the highest levels of pesticides had children at the age of 7 years with an IQ of seven points lower compared to the mean IQ of children with the same age whose mothers were shallow exposure to pesticides (the mean was 100) (Sánchez Lizardi et al., 2008).

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Organophosphates that 'pass' from the mother to the fetus through the placenta and umbilical cord can be more damaging to fetal development than those directly exposed to children (who they have been born) 5 Researchers describe that similar trends can also be found outside the agricultural community. Pregnant women outside the farming community can also be exposed to high pesticides from the fruits and vegetables they eat. Pesticide exposure to the first trimester pregnant women can interfere with the fetal brain's development, even with a moderate amount. A study conducted in the United States stated that this disorder could affect the intelligence of babies after birth (Bradman et al., 2011, 2015).

A study conducted by the Proceedings of the National Academy of Sciences observed 369 pregnant women exposed to the chlorpyrifos pesticide (CPF), widely used in anti-pest drugs in agriculture and public spaces. This study is a continuation of United States regulations that prohibit CPF substances in housing, although this substance is still used worldwide in agriculture(V. Rauh et al., 2015; Woodruff et al., 2011). Researchers compared the brain health condition of 20 children aged 5-11 years whose mothers, according to test results, were exposed to relatively high CPF level. The study found significant abnormalities in these children's brain structures compared to 20 children whose mothers were not exposed to high CPF levels (Appleton et al., 2016; V. A. Rauh et al., 2012). However, all women from the study were exposed to CPF substances at normal levels, limiting exposure by US regulations regarding exposure to this substance. This problem indicates that CPF exposure in low to moderate amounts can also pose a significant risk to the development of a child's brain (V. A. Rauh et al., 2012, 2015).

Pasir Village in Mijen Subdistrict, Demak District, is one area with a large agricultural area. The main occupation of the community in Pasir Village is a farmer. The main commodity in this village is shallot, and the shallot plants use many pesticides. Based on the initial survey conducted in the Pasir Village, most residents' houses coincide, so each house's space and ventilation were minimal. Many people stored pesticides around the house, and there were some pesticides stored in open spaces so that pesticides could contaminate family members. This pesticide pollution would then affect the growth and development of children. If a pregnant woman in the first trimester (<3 months) stays in a house exposed to pesticides for 24 hours, she can be poisoned, marked by a decrease in cholinesterase levels in the blood than the standard limit. Poisoning is divided into 3, namely: A decrease in cholinesterase levels to be 75%-50% off standard limit: Mild Poisoning; A decrease in cholinesterase levels to be 50%-25% of standard limit: Moderate poisoning; A decrease in cholinesterase levels to be <25% of the standard limit: Severe poisoning. The mechanism of pesticide poisoning in pregnant women is that substances in contact with pregnant women penetrate the placental barrier in the uterus, and harmful substances will poison the fetus to damage the brain and interfere with the growth of the baby at birth. This problem will cause delayed children's growth and development.

Method

The study method used was quantitative with cross sectional design where the variables to be studied were taken at the same time (Sastroasmoro & Ismael, 2011). Dependent Variable was Level of Intelligence (IQ) while the Independent Variables were Type of Pesticides, Pre-Harvest Spraying, Post-Harvest Spraying, Planting System, Storage Place for Crop Yields, Playing Environment, Bedroom Area, Ventilation Area, Gestasional Age, Contact to Pesticide, Age. Population is the whole study object of the objects under study (Sugiyono, 2017). The study population were all students of State Elementary School 1 Pasir in grades 4.5, and 6 (107 people) and the mothers of the students of State Elementary School 1 Pasir in grades 4.5, and 6 (107 people). Thus, the total respondents taken were as many as 214 people.

Research instrument using Standart Progressive Matrices (SPM) and Coloured Progressive Matrices (CPM) are tools or instruments used to measure the intelligence levels in school-aged children. CPM is used for children aged <11 years while SPM is used for children aged > 11 years. This instrument

has been validated and reliable.(Abdel-Khalek, 2005; Bildiren, 2017). The outputs of these instruments are grades consisting of 1 to 5 with different value ranges between SPM and CPM. Bivariate analysis used Chi Square test and Odd Ratio was used to determine the size of risk factors on the intelligence level children.

Result and Discussion

Pasir Village is the westernmost village in Mijen Subdistrict is bordered by the area Wedung Sub-district, Demak District. Desa Pasir Village had a population of 8854 people with 4515 men and 4339 women in January 2016, making Pasir village the most populous village in the Mijen District area. Of the many inhabitants, most of the people of Pasir Village have a livelihood as farmers with the largest shallot, red chilies, and other crops. As the largest producer of shallot in the Demak District, the crop yields were distributed to other cities such as Jakarta, Tuban, Surabaya, and even Kalimantan and its surroundings.

Income from shallot harvest in Pasir Village makes this village ranked No. 2 as the largest shallot producer after Brebes District. Farmers in Pasir Village initially hired or took expert farmers from Brebes District to teach about planting shallots, but currently, the people of Pasir Village have cultivated their fields. On average, farmers in Pasir village use more than two pesticides, and they often used pesticides such as Amate, Arjuna, and Regent. The spraying mechanism used by farmers is correct by following the wind's direction, but most farmers still use trenches in their planting system. The Trenching system can increase the likelihood of pesticide exposure. Harvesting was usually done two times a year. Farmers used to spray pesticides before and after the harvest season to get rid of pests.

Table 1. Relationship between Independent Variables and Dependent Variable

Independent Variables		Dependent Variable Level of Intelligence				Total		p-value
		Less		Good				
		f	%	f	%	f	%	
Types of Pesticides	>2 Types	13	32.5	27	67.5	40	100.0	0.001
	≤2 Types	5	7.5	62	92.5	67	100.0	
Pre-Harvest Spraying	Yes	15	25.9	43	74.1	58	100.0	0.007
	No	3	6.1	46	93.9	49	100.0	
Post-Harvest Spraying	Yes	9	33.3	18	66.7	27	100.0	0.008
	No	9	11.3	71	88.8	80	100.0	
Planting System	Trench	13	31.0	29	69.0	42	100.0	0.002
	Not a Trench	5	7.7	60	92.3	65	100.0	
Storage	Inside House	2	5.9	32	94.1	34	100.0	0.0039
	Outside House	16	21.9	57	78.1	73	100.0	
Playing Environment	Former Rice Field	4	18.2	18	81.8	22	100.0	0.848
	Not Former Rice Field	14	16.5	71	83.5	85	100.0	
Bedroom Area	Less	11	25.6	32	74.4	43	100.0	0.047
	Good	7	10.9	57	89.1	64	100.0	
Ventilation Area	Less	12	25.0	36	75.0	48	100.0	0.041
	Good	6	10.2	53	89.8	59	100.0	
Gestasional Age	≤3 Months	9	23.1	30	76.9	39	100.0	0.190
	>3 Months	9	13.2	59	86.8	68	100.0	
Pesticide Contact	Yes	4	33.3	8	66.7	12	100.0	0.105
	No	14	14.7	81	85.3	95	100.0	
Age	<11 Years	11	14.9	63	85.1	74	100.0	0.418
	≥11 Years	7	21.2	26	78.8	33	100.0	

α = 0.05

Table 1 describe that the Type of Pesticide variable shows that 13 (32.5%) respondents used >2 types of pesticide and 5 (7.5%) respondents used ≤2 types of pesticide. The analysis results obtained a p-value of 0.001 at a significance level of 5%, which meant there was a relationship between the type of pesticide and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir. The Pre-Harvest Spraying variable shows that among respondents who had less intelligence, 15 (25.9%) respondents performed pre-harvest spraying and 3 (6.1%) respondents did not perform pre-harvest spraying. The analysis results obtained a p-value of 0.007 at a significance level of 5%, which meant that there was a relationship between pre-harvest spraying and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir.

The Post-Harvest Spraying variable shows that among respondents who had less intelligence, 9 (33.3%) respondents performed post-harvest spraying and 9 (11.3%) respondents did not perform post- harvest spraying. The analysis results obtained a p-value of 0.008 at a significance level of 5%, which meant that there was a relationship between post-harvest spraying and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir. The Planting System variable explain that among respondents who had less intelligence, 13 (31.0%) respondents used trenches in the plating system and 5 (7.7%) respondents did not use trenches in the plating system. The analysis results obtained a p-value of 0.002 at a significance level of 5%, which meant that there was a relationship between the planting system and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir.

The Storage variable shows that among respondents who had less intelligence, 2 (5.9%) respondents stored the crop yields inside the house and 16 (21.9%) respondents stored the crop yields outside the house. The analysis results obtained a p-value of 0.039 at a significance level of 5%, which meant that there was a relationship between the storage of crops and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir. The Playing Environment variable indicates that respondents who had less intelligence, 4 (18.2%) respondents had playing environment in the former rice field and 14 (16.5%) respondents had playing environment not in the former rice field. The analysis results obtained a p-value of 0.848 at a significance level of 5% which meant that there was no relationship between the playing environment and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir.

The Bedroom Area variable indicates that among respondents who had less intelligence, 11 (25.6%) respondents had less bedroom area and 7 (10.9%) respondents had good bedroom area. The analysis results obtained a p-value of 0.047 at a significance level of 5%, which meant that there was a relationship between the bedroom area and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir. The Ventilation Area variable shows that among respondents who had less intelligence, 12 (25.0%) respondents had less ventilation area and 6 (10.2%) respondents had good ventilation area. The analysis results obtained a p-value of 0.041 at a significance level of 5%, which meant that there was a relationship between ventilation area and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir.

The Gestasional Age variable shows that among respondents who had less intelligence, 9 (23.1%) respondents were exposed to pesticiddes in the gestational age of ≤3 months and 9 (13.2%) respondents were exposed to pesticiddes in the gestational age of >3 Months. The analysis results obtained a p-value of 0.190 at a significance level of 5% which meant that there was no relationship between maternal gestational age and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir. The Pesticide Contact variable can be seen that among respondents who had less intelligence, 4 (33.3%) respondents had a contact to pesticide and 14 (14.7%) respondents had no contact to pesticide. The analysis results obtained a p-value of 0.105 at a significance level of 5%, which meant that there was no relationship between contact pesticides and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir. The Age

variable explain that among respondents who had less intelligence, 11 (14.9%) responds aged >11 years and 7 (21.2%) respondents aged ≤11 years. The analysis results obtained a p-value of 0.418 at a significance level of 5%, which meant that there was no relationship between age and the level of intelligence of students in grades 4, 5, 6 of State Elementary School 1 Pasir

Farmers who plant crops that are vulnerable to pests always depend on pesticides in plants' care, starting from planting, growing, and harvesting. Based on their predecessors' experience, they will emulate farming behavior, which is considered quite successful, and they are afraid to change to cropping patterns and crop maintenance, which they think will have a destructive impact on crop yields. Shallots farmers in Pasir Village have received counseling both from the Agriculture Department's agricultural educator and from the health counselor from the community health center about the health hazards of pesticides both for the spraying operator and for families who participate in managing the shallot planting period.

In handling the protection of shallots from the planting, growing, and harvesting, farmers use several types of pesticides such as organophosphate, carbamate pesticides, and even suspected that some farmers use organochlorine pesticides are very toxic and difficult to degrade in nature. (Jayaraj et al., 2016). In addition to these pesticides, it is still possible to use fungicides (plant fungus killers), which are toxic to the human body (Rouabhi, 2010). OPs (organophosphate) act as an inhibitor of the acetylcholinesterase (AChE) enzyme, which targetting several molecules, such as hormones; neurotransmitters; neurotrophic factors; enzymes related to the metabolism of beta-amyloid protein as well as inflammatory (Ghimire, 2016). OPs also affected the thyroid hormone. Thyroid hormone is known as a growth hormone, especially on brain development, which affects neuron and brain development. The similarity in the chemical structure of pesticides with thyroid hormones (TH-r) in target cells, it interferes with the process of thyroid hormone synthesis. TH synthesis in the thyroid colloid requires Iodine, which circulates as Iodine ion. In the thyroid gland, iodine is combine with the amino acid tyrosine to produce thyroxine (T4) or triiodothyronine (T3). Synthesis of THs (T4 & T3) is tighly controlled by the HPT-axis, disruption at any of the multiple levels along the Hypothalamus-Pytuitary-Thyroid axis is causing the disruption of THs secretion. The Hypothalamus produces thyrotropin releasing hormone (TRH) which triggers production of thyroid stimulating hormone (TSH) by anterior Pituitary, TSH stimulate iodine up-take. Pesticides like thyroid hormone (TH-r), it will affect THs production (Lacasaña et al., 2010). The OPs as a free radical will damage the cell wall through lipid peroxidation so that all of the organelle cells would affect and could not act properly that will end by cell death. Because of that process, mitosis of brain cells will stop and will affect the development of the brain (Mishra et al., 2012).

During the shallot plant maintenance, the farmer's family members, such as his wife and children, often assist in crop maintenance. Immensely during harvest, his wife and children also help clean the shallot from attached soil or clean the shallot from pests that do not die during pesticide spraying. The process of pesticide spraying carried out by shallots farmers in Pasir Village in Mijen sub-district, Demak, is the same as that carried out by shallots farmers in Brebes. This process is because, at the beginning of their planting efforts, they contracted farmers in Brebes to protect crops from pests. The pesticide spraying farmers from Brebes applied the spraying pattern they used to do in Brebes, which they said as relatively safe, and the results were quite effective in protecting plants from pests.

The process of pesticide spraying that has been practiced until now is a spray pattern of 2-3 times a week, even more spraying during the rainy season, and by using more than two types of pesticides. Farmers did not only carry out spraying during the growing process of shallots but also before harvest and after harvest to protect the harvest during storage. They prepared pesticides in the house. During the pesticide mixing process and when spraying, they rarely used complete personal protective equipment to ensure they were exposed to pesticides. This practice may cause

serious health problems to depend on the dose of exposure and duration of exposure. Health effects of acute and chronic on pesticide spraying farmers have been widely studied, but the impact of pesticides on people who help the processes from planting to harvest and those who live in the house wherein the shallot yields are stored have not been widely studied (Damalas & Eleftherohorinos, 2011). The spraying pattern that was carried out during the maintenance of shallots, before harvest and after harvest, will cause the crop yields to contain a large number of pesticide residues, and in summer, the pesticide residues will evaporate and spread throughout the room in the house so that people who live in it will be exposed to these pesticides.

Risk factors related to the level of intelligence of children (OD Ratio) ranked from the factor with the most significant effect were: the type of pesticides (5.970), Planting system (5.379), Pre-harvest spraying (5.349), Post-harvest spraying (3.944), Area of house ventilation (2.944), Bedroom area (2.799) and storage place for crop yields (0.223). Variables that did not affect children's level of intelligence were playing environment p=0.848; gestational age p=0.190; contact to pesticides p=0.0105 and age p=0.418.

The type of pesticide was the most significant risk factor associated with the level of intelligence. This result was very relevant because farmers who applied pesticides to protect shallot plants from pests did not only use one type of pesticide, but they mixed several types from organophosphate groups or the type of carbamate. It is even possible to add organochlorine pesticides, which are very toxic and persistent in the environment (Van Dyk & Pletschke, 2011). It was coupled with a planting system trenches, pre-harvest, and post-harvest spraying behavior operand and the storage of crop yields inside around the house. The house condition that did not meet the requirements of a healthy house regarding the ventilation area and bedroom area, it could be assumed that when there was the evaporation of pesticides on shallots, it would pollute the entire room occupants of the house (Aktar et al., 2009; Van Dyk & Pletschke, 2011).

Pesticide pollution in pregnant women in the first trimester will affect the fetus in the uterus by developing fetal growth at that time (Takser et al., 2004). Theoretically, fetal development in the three months gestation is in the period of the nerve cell and brain development, so that pesticide contamination during this period can affect the neurological and brain health of the fetus, which was examined in this study as the level of intelligence or IQ of children. The effect of pesticide poisoning during pregnancy will fail to form neurons (nerve cells) that may lead to neurogenesis, angiogenesis, and synaptogenesis. The failure of neurons' formation will cause symptoms by the time exposure and the part of the brain, in the formation or development stage at that time.

Learning and remembering process disorder primarily occurs when the brain's formation and development in the Temporalis and Frontalis lobes experience interference that is very likely to occur when the fetus is still in the uterus. Pesticides are known to penetrate the brain barrier of the fetus which come from mothers exposed to pesticides, and these pesticides have the nature of free radicals that severely damage the nerve cell membrane walls so that many nerve cells fail to grow, and this condition results in the decreased normal function of cerebrum area. Damage in other parts of the brain is possible considering that the process of growth and development of the brain co-occur by the gestational age and brain development process itself

Conclusion

Onion farmers in the Pasir village of Demak Regency who apply cropping patterns and crop patterns with excessive use of pesticides and mixing several types of pesticides, will definitely cause poisoning effects both on the farmers themselves and on their families. This is reinforced by the storage of crops in the house and the environmental conditions of the house which are not suitable for health conditions. When it is summer, the pesticides attached to shallots will evaporate and affect all residents of the house. If at that time the occupants of the house were pregnant women in the 1st trimester (less than 3 months

of pregnancy), at this time there was a process of formation and development of the brain in the Temporal lobe and Frontal lobe.

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