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# PHYSICAL ACTIVITY AND SCREEN TIME: A CROSS-SECTIONAL STUDY IN ALIGARH, NORTH INDIA

Sameena Ahmad<sup>1</sup>, M. Athar Ansari<sup>2</sup>, Salman Khalil<sup>3</sup>, Ali Jafar Abedi<sup>4</sup>, Mohd. NajmulAqib Khan<sup>5</sup>

<sup>1</sup>Junior resident, <sup>2</sup> Professor, <sup>3</sup>Associate Professor, <sup>4</sup>Assistant Professor, Department of community medicine, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh, India

<sup>5</sup> Assistant Professor, Department Of Community Medicine, Government Medical College, Haldwani, Uttarakhand, India

Corresponding author: Ali JafarAbedi

Email: alijafarabedi@gmail.com

## ABSTRACT

Children have been exposed to electronic devices. They grow up thinking that these devices are a part of their daily lives. As they get older, their dependency on such devices grows, even during school days. As a result, their physical activity is hardly handled even until they reach adulthood. This study assessed the frequency of physical activity, duration of screen time, and association between these variables amongst school children. This cross-sectional study was conducted among 800 school-based adolescents aged 12 to 14 years at A.M.U. High Schools, Aligarh, in July 2018 to June 2019. Students were asked about their physical activity and screen habits by disseminating a self-reported questionnaire. The data were analyzed in SPSS version 20.0. The study found that most of the students had adequate physical activities (75.51%), while the reported screen time duration was also adequate for most (59.1%). The association between the two variables was not statistically significant ( $p > 0.05$ ). For the students with inadequate frequency of physical activity and enough duration of screen time, interventions should be done both at family and school levels to make them more physically active and better at performing studies and reaping the benefits of good health.

**Keywords:** physical activity, school children, adolescents, screen time

## INTRODUCTION

The benefits of physical activity at all age groups, right from childhood, have been well documented. Adolescence, particularly, is a critical period of development during lifetime in which behavior patterns and lifestyle choices i.e., being physically active are established. There has been ample research that can demonstrate the advantages of being physically active, as well as the health effects of less physical activities and more sedentary behaviour (Kumar, Robinson and Till, 2015). There has been growing evidence about positive impacts of physical activity on child's social and cognitive development carrying forward to adulthood (Organization, 2019). The first ever global trends for adolescents with inadequate physical activity indicate that increment in physical activity between 11 to 17 years

adolescents must be given urgent attention (Guthold, Stevens, Riley *et al.*, 2018).

The trend and frequency of physical activity in children and adolescents in developing countries have been analyzed in depth (McKenzie, Marshall, Sallis *et al.*, 2000; Sallis, Prochaska and Taylor, 2000); however, there is a dearth of documentation for the same in developing countries, particularly Asian. Nowadays, frequency of physical activity in children decreases due to various factors, e.g., changes in lifestyles such as watching television, playing games on computer or mobile phones for long hours, to name a few. It has also been known that excessive exposure of screen time can cause a tendency to overuse of such electronic devices later in the next development phase and interruption of healthy routine, whilst also affecting studies at the same time (Canadian Paediatric Society, 2017).

Besides, children do not compensate for physical activities after school, while chances for doing physical activities are restricted during the school day. Along with decreased frequency of physical activity, longer screen time puts the children at risk of various health issues such as overweight, blood sugar problems, decreased social interaction, and others (Kang, Lee, Shim *et al.*, 2010; Sisson, Broyles, Baker *et al.*, 2010). Additional school-based physical activities may be warranted to engage children even beyond physical education classes (Ronghe, Gotmare and Kawishwar, 2016). In view of this, it was thought that it was important to carry out an assessment of frequency of physical activity, the duration of the screen time, and the association between these variables in school children aged 12 to 14 years. By doing this study, it accounts for preventive measures that could be placed in time to avoid the incidence of overweight later in adulthood.

## METHODS

The current study was conducted across high schools of Aligarh Muslim University (AMU), Aligarh, a city in the North India, from July 2018 to June 2019. Selected schools had recess during the working days, along with physical education classes in their curriculum. The AMU currently maintains six high schools, including three male and three female schools.

A cross-sectional design was used as the research approach. The participants were selected using simple random sampling with a table of random numbers which students could choose. The selected students were aged between 12 to 14 years and had to be present on the day of examination and had willingness to participate in the examination. Whereas, the exclusion criteria were children aged less than 12 years and more than 15 years, not willing to participate, absent on the day of examination, uncooperative, and suffering

from chronic illness, endocrinal problems, physical and mental problems.

The study was carried out after getting the approval of the Research Ethical Committee, Faculty of Medicine, Aligarh Muslim University. Written consent was obtained prior to the research from the principals of the relevant schools through the School Education Directorate of AMU. The respondents informed their consent for participation orally. Those who did not give consent were excluded from the research. Students were assured about the confidentiality of the information and their identity during the examination and interview. If a medical problem was diagnosed, the respondent would receive appropriate medical advice. Health education and advice would be provided to all respondents.

Taking prevalence of physical inactivity at 21% (Nawab, Khan, Khan *et al.*, 2016), absolute permissible error at 3% with a confidence level of 95%, and a non-response rate at 10%, the sample size (n) amounted to 709, which were rounded off to 800. Simple random sampling with probability proportionate to size (PPS) was used to draw the sample size.

The study instrument included pre-tested questionnaires regarding details of socio-demographic variables and screen time and physical activity questionnaires for older children (PAQ-C) aged 8-14 years (grades 4-8). It could be used among those children present in the school system which had recess in their daily work schedule. The questionnaires had been tested for reliability and finally obtained a high internal consistency (0.96) for final PAQ-C score. The highest correlation was found in item 9 ( $\rho = 0.311$ ;  $p < 0.01$ ) (Benítez-Porres *et al.*, 2016). Significantly moderate correlation was found in moderate physical activity (MPA) ( $r = 0.462$ ;  $p < 0.001$ ) and moderate to vigorous physical activity (MVPA) ( $r = 0.483$ ;  $p < 0.001$ ); physical activity assessment was done through PAQ-S (Physical Activity Questionnaire for Smaller Children). The validity of PAQ-S

for the estimation of MPA and MVPA was found to be almost similar to the self-reported measures for schoolchildren (Manios *et al.*, 2013).

Screen time was defined as screen viewing, including the use of any electronic devices such as tablets, smartphones, video games, television, wearable technology, or computer. It has been reported that children 11-14 years old, on an average, spend about 9 hours a day in front of screen, while it should not be more than 2 hours per day (Encyclopedia, 2020).

Regarding anthropometric measurements, Body Mass Index (BMI) was measured with an electronic weighing machine, which was kept on a firm horizontal surface. The respondents were asked to stand upright, lean their back against the wall, move the heels closer one another without shoes, and looking at a horizontal plane. Children with BMI of  $>+1$  SD (equivalent to BMI 25 kg/m<sup>2</sup>) are categorized overweight. Similarly, underweight is labelled to children with BMI  $<-1$  SD according to the WHO growth charts (5-19 years) for adolescents (World Health Organization, 2020).

The interview schedule was pre-tested by performing a pilot study on 10% of the sample size to assess the feasibility and appropriateness of the research instruments and methods. Based on the pre-test, the interview schedule was modified as per response elicited, and the words used in the questionnaire were simplified to make them more understandable. Completed schedules were checked weekly for consistency and completeness by the supervisors. Data were analyzed using SPSS version 20.0 (Chicago, IL, United States) for Windows.

The Chi-square test was applied to study the association between physical activity and screen time among children. A statistical significance level ( $p$ ) was set at  $< 0.05$ . (to ethical clearance number D. No. 1006/FM dated 13.7.2018)

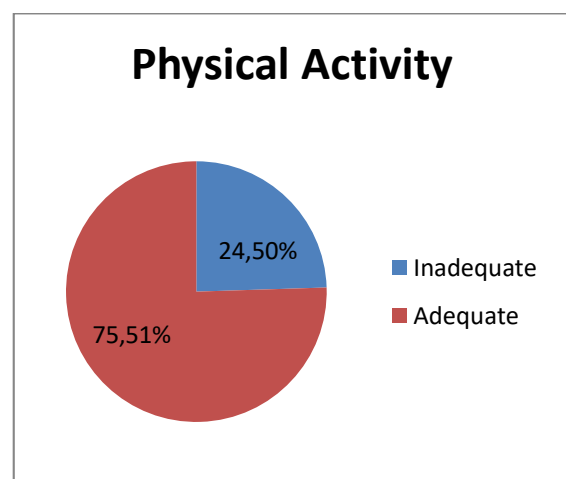
## RESULTS

This section explains sociodemographic characteristics of the respondents.

Table 1 shows that the majority (42.6%) of the respondents was in the 12-year age group as new academic session just started at the time of study. The mean age of the respondents was between  $12 \pm 0.81$  years. In the present study, 56.6% of the respondents were males, and 43.4% were females. As many as 92.4% lived in urban areas, while 7.6% students lived in rural areas.

**Table 1.** Sociodemographic characteristics of the respondents

Characteristics	Frequency (N)	Percentage (%)
<b>Age in years</b>		
12	341	42.6
13	244	30.5
14	215	26.9
<b>Sex</b>		
Male	453	56.6
Female	347	43.4
<b>Address</b>		
Urban	739	92.4
Rural	61	7.6

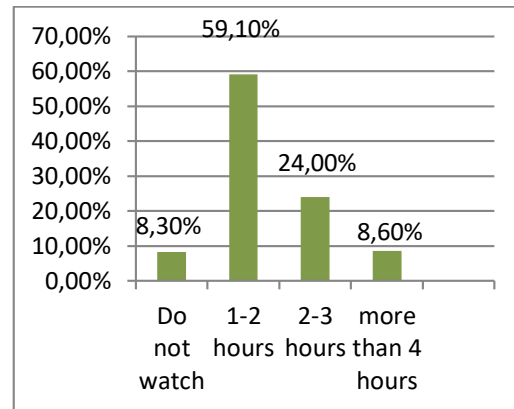


**Figure 2.** Distribution of students at A.M.U. High Schools by frequency of physical activity

Figure 2 presents the majority of the adolescent respondents had adequate frequency of physical activity (75%). Meanwhile, inadequate frequency of physical activity was reported among a quarter of the students. It can be concluded that students with adequate frequency of physical activity met the minimum required criteria for physical activity, while students with inadequate frequency of physical activity could be at risk of various diseases which arise due to less physical activity.

Very few students (8.30%) reported that they did not have enough time to watch television mainly due to their packed study schedule or coaching or tuition classes. A few students (24%) reported that they watched television for more than 2-3 hours, and very few (8.6%) informed having screen time of more than 4 hours, while the majority (59.10%) had screen time of 1-2

hours (see Figure 3). Hence, it can be concluded that screen time duration could mainly depend on the time left after school and coaching classes. The total mean screen time was  $2.6 \pm 0.94$  hours per day.



**Figure 3.** Distribution of students at A.M.U. High Schools by device screen time

**Table 2.** The average duration of screen time by variables among students at A.M.U. High Schools

Sex	N	Mean screen time duration
Males	453	2.40±1.23 hours
Females	347	2.31±1.16 hours
t= 0.9; p <0.05		
Age	N	Mean screen time duration
12 years	341	2.6±0.90 hours
13 years	244	2.8±1.03 hours
14 years	215	2.6±0.89 hours
ANOVA F = 3.38; p < 0.05		
BMI	N	Mean Screen time Duration
Underweight	415	2.6±0.96 hours
Normal	204	2.6±0.94 hours
Overweight	181	2.6±0.90 hours
ANOVA F = 0.167; p > 0.05		

Table 2 presents that the mean screen time had a statistically significant association with gender as the T-test showed the mean screen time was not much different among males from females ( $2.40 \pm 1.23$  and  $2.31 \pm 1.16$ , respectively). Regarding the age groups, the ANOVA test found age was significantly related to screen time duration. The mean screen time was not much different among the three age

groups ( $2.6 \pm 0.90$  hours among 12-year-old students,  $2.8 \pm 1.03$  hours among 13-year-old students, and  $2.6 \pm 0.89$  hours among 14-year-old students). While the BMI was not significantly different from the mean screen time ( $2.6 \pm 0.96$  hours among underweight students,  $2.6 \pm 0.94$  hours normal students, and  $2.6 \pm 0.90$  hours among overweight students).

**Table 3.** The association between frequency of physical activity, age, sex, BMI and screen time among students at A.M.U. High Schools

Age	Physical activity level				$\Sigma$
	Inadequate		Adequate		
	n	%	n	%	
12 years	53	15.5	288	84.5	341
13 years	69	28.3	175	71.7	244
14 years	74	34.4	141	65.6	215
$\chi^2=28.110$ , df= 2, p <0.05					
Sex	Physical activity level				$\Sigma$
	Inadequate		Adequate		
	n	%	n	%	
Male	76	16.8	377	83.2	453
Female	120	34.6	227	65.4	347
$\chi^2=33.675$ , df=1, p<0.05					
BMI	Physical activity level				$\Sigma$
	Inadequate		Adequate		
	n	%	n	%	
Underweight	105	25.3	310	74.7	415
Normal	54	26.5	150	73.5	204
Overweight	37	20.4	144	79.6	181
$\chi^2=2.184$ , df=2, p>0.05, r= 0.03					
Screen time duration	Physical activity level				$\Sigma$
	Inadequate		Adequate		
	n	%	n	%	
1-2 hours	109	23.0	364	77	473
2-3 hours	46	24.0	146	76	192
More than 4 hours	16	23.2	53	76.8	69
Do not watch T.V	25	37.9	41	62.1	66
<b>Total</b>	<b>196</b>	<b>24.5</b>	<b>604</b>	<b>75.5</b>	<b>800</b>
$\chi^2=7.023$ , df= 3, p >0.05, r= -.056					

From the table below, frequency of physical activity progressively decreased across all the age groups as the age increased. The low frequency of physical activity (15.5%) was found among 12-year age group, and more increased frequency (34.4%) was observed among 14-year age group, while adequate frequency of physical activity (84.5%) was found among 12-year age group. It had decreased to a mere 17.2% among 14-year age group. Frequency of physical activity was significantly associated with age groups.

A significant association was found between sex and frequency of physical

activity (p < 0.05). It can be seen that more male respondents had more adequate frequency of physical activity (83.2%) than female ones (65.4%). Also, females as compared to males had more inadequate frequency of physical activity (34.6%).

The study demonstrated a large number of underweight students had adequate frequency of physical activity (74.7%), while only a small number of overweight students had inadequate frequency of physical activity (20.4%). Weight was not significantly related to frequency of physical activity (p > 0.05).

However, a weak positive correlation existed between these variables.

Along with this, the majority of the students with adequate physical activity had recommended screen time duration, i.e., between 1-2 hours. Meanwhile, the students with good screen time duration (23.3%) had inadequate frequency of physical activity. Most of the students (76.8%) with good screen time duration could do physical activity adequately. The association between frequency of physical activity and screen time duration was not significant ( $p > 0.05$ ) and negative ( $r = -.056$ ).

## DISCUSSION

Research conducted in Canada among children between 8- 13 years old ( $n= 401$ ; 194 boys and 207 girls) reported that a significant decrease in frequency of physical activity was found along older ages (Sherar *et al.*, 2007). A review study on diet, physical activity, and inactivity in children and adolescents (5-18 years of age) found that frequency of physical activity decreased as ages got older (Leech, McNaughton and Timperio, 2014). In India, a similar study among children around 5-18 years old showed also support the current results (Swaminathan *et al.*, 2011). There was an increase in the academic burden that caused students not able to have sufficient time for being physically active. The increase in academic burden also leads to decrease in time for physical activities; in turn, it could be the reason that worsens the situation.

With regards to physical activity and sex, among students aged 12 to 14 years in China, a larger number of males had higher frequency of physical activity (Shi *et al.*, 2006). Another study in Saskatchewan reported a significant association between increasing age and decreasing physical activity among school children (Sherar *et al.*, 2007). Along with this, a study in Spain concluded that among students aged 12-18 years, 26.2% of the whole boys and 46% of the total girls could not meet adequate

frequency of physical activity (Serrano-Sanchez *et al.*, 2011). Studies done in Nigeria and India are consistent with the facts that the patterns and frequency of physical activity among schoolboy adolescents varied by sex. The frequency of physical activity in males was marginally higher compared to females (Oyeyemi, Ishaku, Oyekola *et al.*, 2016; Swaminathan *et al.*, 2011). The findings are also consistent with the current study, in which boys were more physically active compared to girls. Similarly, in another study regarding patterns of physical activity behavior, higher numbers of male students engaged in high frequency of physical activity compared to girls who did not show any such trend (Smith *et al.*, 2016). In another cross-sectional study on 456 college students aged 18-28 years in Saudi Arabia, almost half of the female students reported physical inactivity (Alzamil *et al.*, 2019).

In the same way as the current study, research among urban children aged 8-15 years in South Indian reported that moderate to vigorous frequency of physical activity was higher in boys than in girls (Swaminathan *et al.*, 2011). A study among school children aged 10-19 years ( $n= 1714$ ; 55% males and 45% females) in Ambala, Haryana, reported that the frequency of physical activity remained consistently less than 60 minutes per day in both sexes. Around 40% adolescents reported  $> 1680$  METs/week, and 11% adolescents spent  $> 2520$  METs/week, respectively (Pathak *et al.*, 2017).

As whether physical activity was related to BMI was concerned, some studies showed similar results while some had discordant results. A study in Seychells stated frequency of physical activity and weight had a significantly inverse relationship (Bovet, Auguste and Burdette, 2007). Another study in Iran reported that physical activity and weight had a significantly inverse association as well (Kelishadi *et al.*, 2007). However, this study is not in line with the present study. In



Ghana, children who had more weight were less physically active than children with normal weight (AOR = 1.44; 95% CI = 1.07, 1.94) (Aryeetey, Lartey, Marquis *et al.*, 2017). A study among school students in Bhubaneswar city, India mentioned low frequency of physical activity was significantly associated with overweight, while the current study showed different results (Hota *et al.*, 2015). In contrast, research reported that BMI was not significantly associated with frequency of physical activity, and so did the present study (Goyal *et al.*, 2011).

The major current findings conveyed that most of the students had adequate frequency of physical activity and good screen time duration as recommended by the guidelines (Encyclopedia, 2020).

With regard to physical activity, a study in Dakar reported that 57% of the students were involved in moderate physical activity, while 43% had low PAL (Diouf *et al.*, 2016). Another study in Greece reported similar results to the present study that school children conducted adequate frequency of physical activity (Diouf *et al.*, 2016; Tsioufis *et al.*, 2011). The PAQ-C questionnaire in the current study tends to overestimate moderate frequency of physical activity and screen time duration compared to the measured intensity of physical activity (Peters *et al.*, 2010). By contrast, the 2016 India Report on physical activity in children and youth stated that only about 38% of children between 13-15 years old met the recommended PAL (Katapally *et al.*, 2016). Similar results have been found in a few other studies conducted in West Bengal and Nagpur, India (Lahiri *et al.*, 2019; Ronghe *et al.*, 2016).

Various studies from Mexico and India have reported that school adolescents did not adhere to the recommended screen time limit. Most of them had average screen duration of 3 hours per day and used mobile phones for the entertainment purposes (Dubey *et al.*, 2018; Lahiri *et al.*, 2019; Morales-Ruán *et al.*, 2009). Another study

in Australia reported about 63% adolescents used electronic devices for more than 2 hours per day (Hysing *et al.*, 2015). These results are in line with the current study where 24% of the students had screen time duration of more than 2 hours per day, and 8.6% had screen time duration of more than 4 hours per day.

The mean screen time duration was more than 2 hours per day in both male and female students. However, it was higher in males than females probably due to easy availability and accessibility to devices and lack of recreational facilities in residential areas, leading children to be compelled with using electronic devices for recreational purposes (Shah, Fahey, Soni *et al.*, 2019). In rural areas of Western India, the average screen time duration was 2.7 hours (SD = 1.7). This finding accords with the present study.

As for BMI status and time duration, in Ireland, a longitudinal study reported longer screen time in overweight children than normal children (O'Brien, Issartel and Belton, 2018). Consistent with the current study, a similar study conducted in Tamil Nadu, India conveyed no significant association between BMI and screen time (S. Santha Kumar, 2019). Regardless of BMI, students had an average screen time of 2.6 hours per day (Nawab *et al.*, 2016).

A study among school adolescents in the United States showed that less exposure to screen and more adequate frequency of physical activity were associated with lower obesity (Boone *et al.*, 2007). In contrast, this current study showed screen time was not associated with frequency of physical activity. Similarly, various other studies among school adolescents in Spain, the United Kingdom, and the United States confirmed children having less screen time were more physically active (Marshall *et al.*, 2004; Sandercock, Ogunleye and Voss, 2012; Serrano-Sanchez *et al.*, 2011). However, in Ireland, research found that screen time duration was far unrelated to frequency of physical activity (O'Brien *et al.*, 2018). In



India, some studies contrastingly showed screen time was correlated with frequency of physical activities (Boone *et al.*, 2007; Dubey *et al.*, 2018).

## CONCLUSION

Almost a quarter of the students had inadequate frequency of physical activity, while almost more than half of the respondents followed the recommended screen time limit. Screen time was not significantly correlated with frequency of physical activity.

For children having inadequate frequency of physical activity, interventions can be introduced at family, school, and community levels, along with strong political commitment from the government. Parents can be role models, teaching them the benefits of being physically active. Increasing the duration and frequency of physical education classes at schools, provision of proper infrastructure and safe environment in residential areas are some ways to ensure children's physical activity. Teachers should educate the students about the importance of taking proper diet as well as limiting screen time on electronic devices. Besides, they need to motivate them to perform more physical activity (CDC, 2011). Despite the results, the present study may have some limitations due to a short period of data collection using the PAQ-C questionnaire, thus leading to bias. Apart from this, since the study was conducted only on adolescents enrolled to schools, the previous results might not be generated to the entire adolescent population of the same age group.

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# THE RELATIONSHIP BETWEEN MATERNAL AND CHILD HEALTH SERVICES WITH THE PREVALENCE OF STUNTING BASED ON THE BASIC HEALTH RESEARCH IN INDONESIA

Demsa Simbolon,<sup>1</sup> Dhea Adevianti<sup>1</sup>, Luluk Setianingsih<sup>1</sup>, Lisma Ningsih<sup>2</sup>, Lusi Andriani<sup>3</sup>

<sup>1</sup>Department of Nutrition Health Polytechnic Ministry of Health Bengkulu, Indonesia

<sup>2</sup>Department of Health Promotion Ministry of Health polytechnic Bengkulu, Indonesia

<sup>3</sup>PolytechnicDepartment of Obstetrics MoH Bengkulu, Indonesia

Correspondence address: Demsa Simbolon

Email: demsa\_ui03@yahoo.com

## ABSTRACT

Stunting is a linear growth disorder considered as a serious health problem in Indonesia, where its prevalence is related to maternal and child health (MCH) services. This study aimed to compare the coverage of maternal and child health services between two surveys and analyze how they relate to the prevalence of stunting. The study used aggregate data from the 2013 and 2018 Basic Health Research Reports using a cross-sectional approach. The research sample spanned to 34 provinces in Indonesia. Stunting prevalence was taken as aggregate data from individuals based on height-for-age z-scores (HAZ). The independent variable was the achievement of MCH service indicators. Data analysis used variance measures, correlations, simple linear regression, and paired T-tests. The results found variations in the prevalence of stunting, with 25.4% in 2013 and 25.1% in 2018. There was a 7.4% decrease in severe stunting prevalence between 2013 and 2018, but the decrease was not significant ( $p = 0.506$ ). The analysis results of the 2013 Basic Health Research showed that MCH service indicators related to stunting prevalence were coverage of antenatal care, iron consumption, delivery by health personnel, delivery in health facilities, postpartum maternal health services, low birth weight (LBW) prevalence, neonatal examination, complete immunization, health card ownership, and growth monitoring. The analysis results of the 2018 Basic Health Research showed that MCH indicators were related to the prevalence of antenatal care coverage, delivery by health personnel, and delivery in health facilities, postpartum maternal health services, LBW prevalence, neonatal examination, and complete immunization. There was a significant increase in the coverage of MCH services from 2013 and 2018 ( $p < 0.0001$ ), except for the coverage of Fe tablet consumption, the prevalence of stunted birth babies, ownership of health cards, provision of vitamin A, and provision of colostrum. The better the coverage of MCH services, the lower the stunting prevalence. Efforts to improve the MCH service programs are required to reduce the prevalence of stunting for Indonesian children.

**Keywords:** stunting, children under five years old, coverage of maternal and child health services

## INTRODUCTION

Stunting is a condition of growth failure in children under five due to chronic malnutrition (National Team for the Acceleration of Poverty Reduction, 2017). If a toddler's height is lower than the standard by the World Health Organization Multicentre Growth Reference Study (WHO-MGRS), then the toddler is considered stunted. If the z-score value is less than -2 from the standard deviation (SD), then a child is considered stunted, while a z-score of less than -3 SD indicates a child is severely stunted (Indonesian Ministry of Health, 2018a). Causes of stunting include malnutrition experienced

by pregnant women and children under five and limited health services i.e., antenatal care or maternal health services during pregnancy (Sandjojo, 2017). Toddlers who experience stunting will have a suboptimal level of intelligence and will be more susceptible to disease and increased risk of decreased productivity.

Globally, the rate of stunting in the world was 22.2% in 2017 (150.8 million children under five years old), with 55% of children under five affected in Asia (WHO, 2017). Reports on the results of Basic Health Research in 2013 showed the prevalence of stunting nationally reached > 30%, although the WHO limit was < 20%. In 2010, the national prevalence of stunting

amounted to 35.6%, meaning there was an increase of 1.6%. Of 37.2% stunting prevalence rate, there were some severely stunted children (18.0%) and stunted children (19.2%) (Indonesian Ministry of Health, 2013). The 2018 Basic Health Research mentioned the prevalence decreased to 36.8%, but this figure was still above 30% and had not reached the target (Indonesian Ministry of Health, 2018b). The World Bank research results illustrated losses due to stunting reached 3-11% of gross domestic revenue (GDP). With a 2015 GDP of Rp 11,000 trillion, economic losses due to stunting in Indonesia were estimated to reach between Rp 300 trillion and Rp 1,210 trillion per year (Sandjojo, 2017).

Various attempts have been made to overcome the problem of stunting; for example, policies have been formulated on priority health development programs. Four priority programs were focused in the 2015-2019 periods, particularly on reducing maternal and infant mortality, reducing the prevalence of stunting, controlling infectious diseases, and controlling non-communicable diseases. Efforts to improve the nutritional status of the community and to reduce the prevalence of stunted children are among the national development priorities listed in the main targets of the 2015-2019 Medium-Term Development Plan. The target for stunting prevalence in children under two years (stunted and severely stunted) has been placed at 28% (Indonesian Ministry of Health, 2018a). In addition to policies on priority health development programs, the Indonesian Ministry of Health has put in a place a specific nutrition intervention program through public health centers and integrated health centers for the first 1,000 days of a child's life. They have also implemented the Supplementary Feeding Program for under-nourished children and pregnant women with chronic energy deficiency (CED). Additionally, through the National Team for the Acceleration of Poverty Reduction, a program for 160 priority districts/cities

has been launched for the intervention of dwarfism or stunting in children (National Team for the Acceleration of Poverty Reduction, 2017).

Research by Kusumawati et al. (2015) has shown that the percentage of stunting cases was higher in babies born with a history of low birth weight (LBW) and a long family history of birth length/height below 48 cm, babies who struggle with breastfeeding, and babies lacking access to health services and immunization. Further analysis found that toddlers with a history of poor health and immunization services had 3.17 times risk of stunting compared to toddlers with a history of good health and immunization services. Research by Rahayu et al. (2015) showed that children with LBW were 5.9 times more likely to experience stunting than children without LBW. Likewise, a study by Candra and Puruhita (2011) suggested that a history of LBW was one of the risk factors that influenced the incidence of stunting in children 1-2 years old in Semarang City.

While there have been numerous stunting studies across certain regions in Indonesia, there are no studies on the national stunting prevalence that have used individual aggregate data comparing the results between the 2013 and 2018 Basic Health Research. Based on the above problems and the high prevalence of stunting in Indonesia, the research aimed to describe the achievement of coverage of maternal and child health services in Indonesia by comparing the 2013 and 2018 Basic Health Research. The next objective was to explain a correlation between coverage of maternal and child health services with the prevalence of stunting in Indonesia in order to develop a more appropriate strategy to reduce the incidence of stunting.

## **METHODS**

The study used secondary data from the 2013 and 2018 Basic Health Research

using a cross-sectional design. The samples were chosen from 33 provinces for the 2013 Basic Health Research and 34 provinces for the 2018 Basic Health Research. Stunting prevalence was aggregate data from individuals using a z-score of the toddler HAZ index based on the anthropometric standards of WHO toddlers in 2005. Variables in maternal health services included the percentage coverage of antenatal care, iron consumption, possession of MCH books, delivery assistance by health workers, delivery places, and postpartum maternal health services. Child health service variables were measured from the prevalence of LBW, stunted birth length, neonatal examination, immunization, health cards and MCH book ownership, growth monitoring, consumption of vitamin A capsules, early breastfeeding initiation, colostrum, and prelacteal feeding. Data were analyzed using variance measurements and bivariate analysis through correlations, simple linear regression, and paired T-tests. The data of

Basic Health Research have received ethical clearance approval from the Health Research Ethics Commission of the Indonesian Ministry of Health Research and Development. The 2013 Basic Health Research obtained an ethical clearance certificate number of LB.01.01/51/KE.006/2013, and the 2018 Basic Health Research had an ethical clearance certificate number of LB.02.01/2/KE.024/2018.

## RESULTS

Table 1 shows that variations in the prevalence of stunting in Indonesia were still very wide and subject to 25.4% in 2013 and 25.1% in 2018. The prevalence of stunting in Indonesia still included severe public health problems (the prevalence above 30%). There was a significant decrease in the prevalence of severe stunting by 7.4% between 2013 and 2018, but the prevalence of stunting was not significant ( $p = 0.506$ ).

**Table 1.** Prevalence of Stunting in Indonesia

Prevalence of Stunting	2013 (%)		2018 (%)		Decrease (%)	P-value <sup>a</sup>
	Min-Max	X ± SD	Min-Max	X ± SD		
Severely stunted	8.2-27.6	18.4 ± 4.5	5.6-16.2	11.1 ± 2.8	7.4	0.0001 <sup>a</sup>
Stunted	15.0-25.7	19.8 ± 3.3	11.5-26.7	19.1 ± 3.1	0.6	0.506 <sup>a</sup>
Percentage of stunting	26.3-51.7	38.2 ± 6.1	17.6-42.7	30.3 ± 5.3	7.8	0.0001 <sup>a</sup>

<sup>a</sup>Paired T-test. Source: Basic Health Research 2013 and 2018

Table 2 shows the description of maternal health care coverage in Indonesia with wide variations in maternal health care coverage between provinces. The coverage of maternal health services that was still very low was the percentage of MCH book

ownership (37.8% in 2013 and 47.6% in 2018) and coverage of health services provided to mothers during the period of 6 hours to 42 days after giving birth (26.5% in 2013 and 34.4% in 2018)



**Table 2.** Relationship of Coverage of Maternal Health Services with Prevalence of Stunting Toddlers in Indonesia

Indicator Coverage of Maternal Health Services	Min-Max (%)	X ± SD	r	p-value <sup>a</sup>	p-value <sup>b</sup>
Percentage of pregnancy check antenatal care (K4)					
Basic Health Research 2013	41.4-85.5	63.9 ± 12.2	-0.607	0.0001	0.0001
Basic Health Research 2018	43.8-90.2	67.3 ± 11.7	-0.44	0.009	
Percentage of iron consumption ≥ 90 items					
Basic Health Research 2013	43.2-87.1	63.1 ± 9.8	-0.526	0.002	0.0001
Basic Health Research 2018	13.9-68.5	32.5 ± 14.8	-0.333	0.051	
Percentage of ownership of MCH books					
Basic Health Research 2013	14.8-63,5	37.8 ± 13.6	-0.201	0.262	0.0001
Basic Health Research 2018	22.3-76.4	47.6 ± 13.6	-0.264	0.131	
Percentage of birth health workers					
Basic Health Research 2013	58.9-99.9	82.7 ± 12.0	-0.572	0.001	0.0001
Basic Health Research 2018	57.9-99.7	90.6 ± 9.6	-0.3368	0.032	
Percentage of delivery at health facilities					
Basic Health Research 2013	25.2-99.0	60.9 ± 21.3	-0.625	0.0001	0.0001
Basic Health Research 2018	30.1-98.5	71.8 ± 17.1	-0.452	0.007	
Percentage of maternal health services					
Basic Health Research 2013	8.8-55.5	26.5 ± 11.9	-0.477	0.005	0.0001
Basic Health Research 2018	16.8-62.4	34.4 ± 11.4	-0.427	0.012 <sub>o</sub>	
<sup>a</sup> Pearson Correlation	<sup>b</sup> Paired t-test	<sup>r</sup> Correlation Coefficient			

The analysis results of the 2013 Basic Health Research showed that maternal health service indicators related to the prevalence of stunting were the complete coverage of pregnancy checks during antenatal care (K4), iron consumption, health worker birth attendants, delivery in health facilities, puerperal maternal health services; the indicators were also observed in the 2018 Basic Health Research, except iron consumption coverage (Table 2). The higher the coverage of maternal health services, the lower the stunting prevalence. The bivariate analysis results with the paired t-test showed a significant increase in the coverage of maternal health services

( $p < 0.0001$ ), except coverage of Fe tablet consumption from 63.1% in 2013 to 32.5% in 2018.

Table 3 shows the coverage of neonatal visits increased, but the achievement of complete neonatal examination coverage was still very low (43.5%). The coverage of complete immunization for children under five in Indonesia decreased slightly from 59.2% in 2013 to 57.9% in 2018. The most common reasons that mothers of children under five had not weighed children aged 6-59 months for the past six months was because the child was already older ( $\geq 1$  year) and the mothers were busy.

**Table 3.** Characteristics of Children Health Services in Indonesia

Characteristics of Children Health Services	Basic Health Research 2013	Basic Health Research 2018
Neonatal visits		
KN1 (6-48 hours)	71.3	84.1
KN2 (days)	61.3	71.1
KN3 (8-28 days)	47.5	50.5
KN complete (K4)	39.3	43.5
Types of immunization		
HB-0	79.1	83.1
BCG	87.6	86.9
DPT-HB3	75.6	61.3
Polio 4	77.0	67.6
Measles	82.1	77.3
Completeness of immunization		
Complete immunization	59.2	57.9
Incomplete immunization	32.1	32.9
No immunization	8.7	9.2
Reasons for mother not to weigh children 6-59 months old		
Child is old ( $\geq 1$ year)	27.2	14.1
Children have finished immunization	10.0	10.8
Children do not want to measure their weight	7.9	8.1
Bored if only weighed	1.6	-
Forgot/do not know the schedule	7.6	12.8
No place for measuring baby weight	3.1	2.8
Remote place	9.9	6.8
Busy/hassle	24.2	28.3
Lazy	8.6	15.1
Unavailable	-	1.3

Source: Basic Health Research 2013 and 2018

**Table 4.** Relationship of Coverage of Child Health Services with Prevalence of Stunting in Indonesia

Coverage Indicators	Min-Max (%)	X $\pm$ SD (%)	Correlation Coefficient	p values <sup>a</sup>	p values <sup>b</sup>
Prevalence of low birth weight (LBW)					
Basic Health Research 2013	7.2-16.8	10.7 $\pm$ 2.4	0.370	0.034	0.000
Basic Health Research 2018	2.6-8.9	6.2 $\pm$ 1.3	0.119	0.502	1
Prevalence of stunted birth length					
Basic Health Research 2013	9.6-28.7	20.1 $\pm$ 4.8	0.019	0.915	0.029
Basic Health Research 2018	11.7-81.4	25.1 $\pm$ 11.5	-0.332	0.062	
Percentage of neonatal examinations (K4)					
Basic Health Research 2013	9.2-58.3	32.3 $\pm$ 12.6	-0.499	0.003	0,000
Basic Health Research 2018	14.7-71.3	37.0 $\pm$ 14.3	-0.469	0.005	1
Percentage of complete immunization					
Basic Health Research 2013	29.2-83.1	55.5 $\pm$ 15.1	-0.449	0.004	0.911
Basic Health Research 2018	19.5-92.1	56.2 $\pm$ 16.8	-0.484	0.004	

Coverage Indicators	Min-Max (%)	X ± SD (%)	Correlation Coefficient	p values <sup>a</sup>	p values <sup>b</sup>
Percentage of not having a health card					
Basic Health Research 2013	39.7-48.1	58.9 ± 10.1	-0.405	0.019	0.000
Basic Health Research 2018	10.8-48.1	26.7 ± 9.28	-0.002	0.991	1
Percentage of absence of under-five growth monitoring					
Basic Health Research 2013	7.2-65.4	40.3 ± 13.8	0.406	0.019	0.000
Basic Health Research 2018	4.4-47.6	23.8 ± 10.1	0.277	0.113	1
Percentage of vitamin A					
Basic Health Research 2013	52.3-89.2	71.8 ± 8.8	-0.301	0.089	0.000
Basic Health Research 2018	32.4-65.1	50.5 ± 7.6	-0.274	0.116	1
Percentage of early breastfeeding initiation < 1 hour					
Basic Health Research 2013	21.7-52.9	33.7 ± 7.8	-0.053	0.770	0.000
Basic Health Research 2018	34.3-74.1	54.6 ± 9.8	-0.194	0.272	1
Percentage of giving colostrums					
Basic Health Research 2013	84.8-98.3	93.6 ± 3.4	-0.149	0.409	0.000
Basic Health Research 2018	49.4-97.7	8.9 ± 82.6	-0.17	0.336	1
percentage of prelacteal feeding					
Basic Health Research 2013	22.2-62.7	9.8 ± 43.1	-0.204	0.255	0.000
Basic Health Research 2018	13.2-59.3	32.7 ± 9.44	-0.109	0.541	1

<sup>a</sup>Pearson Correlation<sup>b</sup>Paired T-test

Table 4 shows a description of children's health services in Indonesia; there were quite wide variations between provinces. There were some problematic cases in terms of the coverage of neonatal examination between 9.2%-58.3%; complete immunization coverage between 29.2%-55.5%; coverage of health card ownership with a range of 13%-45%; coverage of children under five never weighed nor monitored ranging from 7.2%-65.4%; coverage of early breastfeeding initiation between 21.7%-52.9%; and the percentage of pre-actual feeding between 22.2%-62.7%.

Table 4 also shows that there were significant differences in the coverage of child health service indicators, except that immunization coverage with no significant change between 2013 and 2018 ( $p = 0.911$ ). Child health services could be improved by reducing the prevalence of LBW infants, covering full neonatal examinations, monitoring growth and development, administering IMD, and prelacteal feeding. The prevalence of babies born with LBW dropped significantly from 10.7% in 2013

to 6.2% in 2018. The coverage of complete neonatal examinations increased significantly from 32.3% in 2013 to 37% in 2018. There was a decrease in the percentage of children under five who had never been weighed from 40.3% in 2013 to 23.8% in 2018. There was a significant increase in the coverage of early breastfeeding initiation within less than an hour from 33.7% in 2013 to 54.6% in 2018. There was a decrease in the percentage of pre-actual feeding from 43.1% in 2013 to 32.7% in 2018.

The decreased coverage of child health services was found in some variables i.e., babies born with stunted birth lengths, health card ownership, provision of vitamin A, and provision of colostrum. The prevalence of babies born with a stunted birth length (< 48 cm) increased from 20.1% in 2013 to 25.1% in 2018, and that of children under five without a health card increased from 23.2% in 2013 to 26.7% in 2018. The coverage of vitamin A administration decreased from 71.8% in 2013 to 50.5% in 2018, so was the coverage

of colostrum administration from 93.6% in 2013 to 82.6% in 2018.

The correlation analysis and linear regression results of 2013 Basic Health Research showed no significant relationship between LBW and stunting. There was a significant and negative relationship between neonatal examination coverage, complete immunization coverage, ownership of health cards and MCH books, and children under five who were never weighed or monitored with the prevalence of stunting. These results indicated that the lower the percentage of child health service coverage, the higher the prevalence of stunting in children under five in Indonesia. There was no correlation between the prevalence of stunted birth length with vitamin A administration, early breastfeeding initiation, colostrum administration, or prelacteal feeding.

## DISCUSSION

The results showed that the prevalence of stunting in toddlers in the 2018 Basic Health Research decreased by 7.8% compared to the 2013 Basic Health Research. A significant decrease occurred in the prevalence of very short toddlers, while the prevalence of short toddlers was not significantly different. Despite the decline, the prevalence of stunting was still a serious problem because it went from 26.3% to 51.7% (WHO, 2010). When compared between provinces, the variations were also quite wide. The lowest prevalence was in Riau Islands, Special Region of Yogyakarta, Special Capital Region of Jakarta, and East Kalimantan (<30%), while the highest was in East Nusa Tenggara (>50%). The prevalence of stunted toddlers in Indonesia was even higher than in India among children aged 2 years (25.7%), 3 years (26.4%), 4 years (24.5%), 5 years (27.6%), and 6 years (30.5%) (Bose and Mandal, 2010), and it was also higher than the average prevalence of stunting in the world at 26.7% (WHO, 2017). The decrease in stunting prevalence is related to various efforts of maternal and child health services that have been carried out by the

government. This can be seen in the increase in coverage of maternal and child health services reported in the 2013 and 2018 Basic Health Research.

The maternal health service coverage based on the 2018 Basic Health Research showed an increase in the percentage of antenatal care (ANC), complete pregnancy check, ownership of MCH handbook, delivery in health facilities, and postnatal maternal health services. The 2018 Basic Health Research showed the percentage of health workers helping deliveries decreased compared to the 2013 Basic Health Research. Efforts should be improved in achieving more maternal health services, especially the coverage of iron consumption ( $\geq 90$  tablets) and the number of health workers helping deliveries.

The coverage of pregnancy check and antenatal care was negatively associated with stunting prevalence. The higher the coverage of complete ANC, the lower the stunting prevalence. This is in line with the research in Mataram where mothers who did not comply with antenatal care standards had 2.3 times risk of having a stunted toddler than mothers who received standard antenatal care. The standard antenatal care visits amount to four visits during pregnancy (Najahah *et al.*, 2013).

The coverage of iron consumption was significantly, negatively related to stunting prevalence. The higher the percentage of iron consumption coverage, the lower the prevalence of stunting. The results found that mothers who consumed less than 90 Fe tablets during pregnancy had the risk of having a toddler who experienced linear growth disorders. Failure to grow in toddlers was closely related to the lack of nutrient intake. Research in Nepal showed that pregnant women who consumed iron and folic acid could prevent stunting in children younger than 2 years (RR = 0.86; 95% CI = 0.77-0.97). Pregnant women who consumed more than 90 iron and folic acid tablets before 6 months prior to giving birth could reduce the risk of stunting by 23% (RR = 0.77; 95% CI = 0.64-0.92). Fe and folate tablets

consumption significantly reduced the risk of stunting in Nepali children aged < 2 years (Nisar, Dibley, and Aguayo, 2016). Anemia during pregnancy is a problem that often occurs in developing countries, including Indonesia. The results found that both mothers consuming less than 90 Fe tablets and more had 42% and 35.5% of children under five born with linear growth disorders, respectively.

Fe tablet consumption was associated with impaired linear growth of infants in the womb due to anemia in pregnant women. Simbolon's (2013) research found there were differences in the average birth weight of infants, in which infants with 440.7 grams were more in non-anemic pregnancies. Anemic pregnant women had 6.4 times the risk of giving birth to a LBW baby. Anemia in pregnant women can increase the risk of morbidity and mortality of mothers and babies, and the possibility of giving birth to LBW and premature babies is also greater.

Anemic pregnant women were at risk of giving birth to shorter babies (51.76 cm) compared to mothers who were not anemic (55.54 cm). They were also more prone to giving birth to babies with lower body weight (3,048 grams) compared to mothers without anemia (3,615.6 grams) (Lelic *et al.*, 2014). Anemia can be a direct cause of growth disorders due to increased oxygen in placental tissue and an indirect effect of malnourishment. pregnant women taking dangerous substances are twice more likely to give birth to LBW and premature babies (Yildiz *et al.*, 2014).

The results proved that delivery helped by health workers and the coverage of deliveries in health facilities were significantly related to the prevalence of stunting. The lower the delivery helped by health workers and the coverage of delivery in health facilities, the higher the prevalence of stunting. The prevalence of LBW was significantly, positively related to the prevalence of stunting. The higher the prevalence of LBW, the higher the prevalence of stunting. Some research also

proved that the lower the birth weight, the higher the risk of toddlers experiencing growth disorders. Research by Espo *et al.* (2007) found that the strongest predictor of stunting in 12 months of age was low birth weight. Most babies with LBW experience growth disorders in childhood. In Asian countries such as Bangladesh, China, India, Pakistan, the Philippines, and Sri Lanka, LBW could be a predictor factor of nutritional status among pre-school children. A conclusion from 12 studies stated that babies with intra-uterine growth retardation (IUGR) experienced growth failure in the first two years. At the age of 17 to 19 years, men and women born with IUGR-LBW were 5 cm shorter and 5 kg skinner compared to children born normally (Allen, 2014). The results of this study are also in line with research by Oktarina and Sudiarti (2014) who found a relationship between birth weight and the incidence of stunting in infants. Toddlers with LBW had 1.31 times risk of stunting compared to normal ones. Birth weight is a strong predictor of future body size. Babies with LBW experience growth retardation in the uterus, both acute and chronic (Akram and Arif, 2005).

The results found that the coverages of postnatal maternal health service and neonatal examination were significantly, negatively correlated with stunting; the higher the coverage of postnatal maternal health service and the lower the coverage of neonatal examination, the lower the prevalence of stunting. Good postpartum care is very important because most maternal and newborn deaths occur in the first two days; further, postnatal care is necessary to handle complications after delivery. The Riau Islands, East Nusa Tenggara, and Papua showed the worst performance in this regard. The coverage of timely post-delivery services only at 18% in the Riau Islands. Around 26% of all postpartum mothers received postpartum care (UNICEF Indonesia, 2012).

The 2013 and 2018 Basic Health Research indicated that the coverage of neonatal service increased, while the coverage of BCG, DPT-HB3, and measles

immunization and complete immunization decreased. The reasons for mothers not taking their children's weight measured in integrated health centers varied. In 2013, the most common reason was that the children were older than 1 year old. The 2018 Basic Health Research showed the most common was they were busy. These results indicated the need for frequent visits to integrated health centers for infant growth and development monitoring and complete immunization.

As many as 41.1% of the children who were not fully immunized had experienced a linear growth disorder, so did 32.5% of the children with complete immunization. The research results of Picauly and Toys (2013) in Kupang and East Sumba, East Nusa Tenggara also found that incomplete basic immunization was a risk factor for stunting. Children who had no history of immunization had a greater chance of stunting than children who had a history of immunization. If the child were not immunized, they will have an increased risk of stunting. Children who did not get complete immunization had seven times risk of experiencing linear growth disorders (95% OR = 1,256-42,014). These results are in line with the study of Kusumawardani et al. (2019), which stated that the completeness of immunization had a significant effect on stunting. Immunization is done by injecting vaccines into the body to become resistant to diseases that are endemic or dangerous.

Picauly and Toy (2013) also found that children who had a history of infectious disease had a greater chance of stunting than children who did not. If children had a history of disease and/or infection, they were 2.332 times more likely to be stunted. The results of this study are in line with research by Yustisia (2019), which stated that infectious diseases had a significant effect on the prevalence of stunting in children aged 24-59 months. Severe infections can worsen nutritional conditions due to poor food input and loss of the essential nutrients through vomiting and diarrhea. Infectious diseases such as

respiratory infections can also reduce appetite.

Ownership of health cards and MCH books and the coverage of growth monitoring were significantly related to the incidence of stunting. The lower the coverage of having health cards and MCH books, the higher the prevalence of stunting. The results are in line with the research in Sidoarum village, Sleman, Yogyakarta where the frequency of growth monitoring was the most dominant factor of stunting in children aged 3-5 years (OR = 3.1; 95% CI = 1,268-7,623). Children who were less actively going to an integrated health center were 3.1 times more at risk of being stunted than children who regularly visited it (Destiadi *et al.*, 2013). Research by Kenney et al. (2013) showed that frequent visits of mothers and children under five to health service facilities had a significant relationship with the child's nutritional status. Integrated health centers are places to monitor the nutritional status and growth of children regularly, including their weight and height. Visiting integrated health centers is an indicator of community access to basic health services such as growth and development monitoring. Mothers who actively visit integrated health centers will get more information about maternal and child health; therefore, they are accounted to care for children well. Besides, integrated health centers is to improve nutritional status, reduce malnutrition, and reduce infant mortality (Indonesian Ministry of Health, 2012).

## CONCLUSION

The prevalence of stunting in Indonesia is a serious public health problem. As shown in the 2013 and 2018 Basic Health Research, the prevalence of stunting decreased significantly, especially the prevalence of severe stunting. The decline was associated with an increase in the coverage of maternal and child health services from 2013 to 2018. Optimal interventions may increase the coverage of

maternal and child health services in reducing the prevalence of stunting in Indonesia.

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# THE RELATIONSHIP OF RESPONDENT CHARACTERISTICS, KNOWLEDGE, ATTITUDES, AND OWNERSHIP OF LATRINES TOWARDS ITS LOW USE OF LATRINES IN GUNUNG ANYAR VILLAGE, SURABAYA CITY

Anca Laika<sup>1</sup>, Retno Adriyani<sup>1</sup>

<sup>1</sup>Department of Environmental Health,  
Faculty of Public Health, Airlangga University, Surabaya, Indonesia  
Correspondence address: Anca Laika  
E-mail: laikaanca@gmail.com

## ABSTRACT

Gunung Anyar Tambak village had the lowest access to latrines. Some residents defecate in rivers or other places. The study was conducted to determine a relationship of factors and low use of latrines in Gunung Anyar Tambak village. It was observational research with a cross sectional design. Samples were selected from the population through simple random sampling. Guided interviews were conducted to 75 respondents in RW 01 Gunung Anyar Tambak village. The research variables were respondent characteristics (education level and income level), knowledge, attitudes, and latrine ownership. Data analysis was done using the Chi-square test with a degree of confidence at 95%. The results showed a significant relationship between respondent characteristics including education level ( $p = 0.000$ ), income level ( $p = 0.000$ ), knowledge ( $p = 0.006$ ), attitude ( $p = 0.003$ ), and latrine ownership ( $p = 0.000$ ) on low use of latrines. The variable with the strongest relationship was latrine ownership.

**Keywords:** education, income, knowledge, attitude, latrine ownership

## INTRODUCTION

More attention has to be brought to Indonesia's diverse sanitation problems, especially towards open defecation. In 2015, the World Health Organization (WHO) stated that 13% of the world's population still practiced open defecation, and the Southeast Asia's population who practiced it amounted to 34%. This number was 21% higher than that of the world's population. The Southeast Asian region is still characterized by many developing countries. In Indonesia, the number of people whom practice open defecation decreased from 40% in 1990 to 22% in 2016; however, it has not yet reached the targets of National Medium-Term Development Plan.

In 2015-2019 National Medium-Term Development Plan, the Indonesian Ministry of Health has set a target on stopping 100% of open defecation cases. In 2015, as many as 64 million Indonesians could not access proper sanitation, and 34 million still defecated in open areas. Therefore, an acceleration of Community-

based Total Sanitation (STBM) by 400% is needed to achieve this target (Indonesian Ministry of Health, 2018).

Observing the national cumulative access to sanitation, only Yogyakarta province has made a progress by 100%. Other provinces such as East Java have access to sanitation by 89.71%, South Sulawesi by 94.30%, Bali by 92.30%, Bangka Belitung by 91.47%, and Central Java by 90.38% (Indonesian Ministry of Health, 2018). In 2017, East Java, out of its 38 districts/cities, only achieved 5 open-defecation-free (ODF) districts/cities, which were Madiun city, Magetan, Pacitan, Ngawi, and Lamongan districts. Thirty-three districts/cities in East Java are not yet ODF; one of them is Surabaya city (Indonesian Ministry of Health, 2018).

Based on the progress of sanitation access in 2017, residents of Surabaya city had 794,055 permanent healthy latrines, 377,796 semi-permanent healthy latrines, 19,166 shared latrines (used by more than 1 family), and 16,082 defecation cases. Fifty-five out of 154 villages in Surabaya city were ODF; in other words, ninety-nine

villages, e.g., Gunung Anyar Tambak village had not received the ODF status (Indonesian Ministry of Health, 2018).

In the East Surabaya areas, Gunung Anyar district had 97.48% access to latrines, the lowest among other districts i.e., Rungkut (99.30%), Mulyorejo (99.19%), Sukolilo (99.03%), Tenggilis Mejoyo (98.90%), Tambaksari (98.63%), and Gubeng (98.33%). Specifically, Gunung Anyar Tambak village had the lowest access to latrine (93.54%). Higher access to latrines was found in other villages such as Gunung Anyar village (97.94%), Gunung Menanggal village (97.93%), and Rungkut Tengah village (94.45%) (Indonesian Ministry of Health, 2018).

Broadly speaking, in Gunung Anyar district, there were 17,684 permanent healthy latrines, 18,062 families, 0 shared permanent healthy latrines, and 378 open defecation cases (Indonesian Ministry of Health, 2018). Data on latrine access showed that RW 01 had the lowest use of latrines (60.06%) when compared to RW 03 (100%), RW 04 (100%), RW 05 (100%), RW 06 (100%), RW 07 (100%), RW 08 (100%), and RW 09 (100%) (Gunung Anyar Primary Healthcare Center, 2017). In Gunung Anyar Tambak village, RW 02 has been merged with RW 03 which is residential areas along with RW 09, while RW 01 is a village area. It means the Gunung Anyar subdistricts, especially in Gunung Anyar Tambak village, must pay more attention and efforts to increase latrine use and ownership. This study was conducted to analyze a relationship between respondent characteristics, knowledge, attitudes, and latrine ownership with the low use of latrines in RW 01 Gunung Anyar Tambak village, Gunung Anyar district, Surabaya city.

## METHODS

This study was observational research using analytical methods and a cross-sectional research design. It was

conducted by observing and distributing questionnaires to the subjects. Dependent and independent variables studied were observed at one time. The research was conducted in RW 01, Gunung Anyar Tambak village, Gunung Anyar district, Surabaya city. The research population was all families in RW 01 area which had access to latrines below 55% in 2017, specifically RT 01 and RT 05 having 36% access to latrines. The total population was 119 families, consisting of 50 families in RT 01 and 69 families in RT 05.

The research samples were people who owned a house in RW 01. Calculated by the Lameshow formula, the research sample size was 75 families as respondents. The respondents were family members aged at least 18 years and living in one house. They were chosen through probability sampling with the simple random sampling technique. A lottery was conducted to select families as respondents.

The dependent variable was the use of latrines, and the independent variables were respondent characteristics (education level and income level), knowledge, attitudes, and latrine ownership). Data were collected and obtained using guided interviews for gathering variables of knowledge, attitudes, latrine ownership, and respondent characteristics (education level and income level). Measurements for knowledge were stated in ten multiple-choice questions related to latrines use and ownership. It would be considered good if each respondent's score was greater than or equal to 75%; adequate if 56% to 74%; and poor if less or equal to 55%. Attitude was measured from 10 statements, consisting of 5 positive statements and 5 negative statements, scored in the Likert scale. A score greater than or equal to 36.67 was considered good attitude; 23.34 to 36.66 adequate; and less than or equal to 23.33 poor. The data were then analyzed using a univariate analysis and then bivariate analysis with the Chi-square statistical test. If there were cells with an expected value of less than 5 (20%), the Fisher's exact test

would be carried out with a 95% confidence level ( $\alpha = 0.05$ ). This study passed the ethical clearance and received ethical approval from the Research Ethics Commission, Faculty of Dental Medicine, Universitas Airlangga with Certificate Number: 254/HRECC.FODM/V/2019.

## RESULTS

This section explains the analyses of the dependent variable (latrine use) and independent variables (education level, income level, knowledge and attitude and latrine ownership).

**Table 1.** Distribution of Respondent Characteristics in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variables	n	%
<b>Education Level</b>		
Graduated from elementary school/equivalent	9	12.00
Completed junior high school/equivalent	21	28.00
Completed high school/equivalent	29	38.66
Diploma	11	14.66
Bachelors	5	6.68
<b>Income Level</b>		
High	29	38.66
Low	46	61.34

Regarding the respondent characteristics, most of the respondents were high school graduates/equivalent, and the least were bachelors graduates. Most of the respondents also had income lower than the minimum wage of Surabaya (Table 1).

Knowledge and attitude variables among most of the respondents were categorized good in regards to the use of latrines (Table 2). The results on latrine ownership found that most of the respondents already had a (private) latrine

(Table 3). They mostly had good latrine use as well (Table 4).

**Table 2.** Distribution of Respondents' Knowledge and Attitudes in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variables	n	%
<b>Knowledge</b>		
Good	41	54.67
Adequate	22	29.33
Poor	12	16.00
<b>Attitude</b>		
Good	46	61.33
Adequate	24	32.00
Poor	5	6.67

**Table 3.** Distribution of Latrine Ownership in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variable	n	%
<b>Latrine Ownership</b>		
Own a Latrine (private)	41	54.67
Do not own a latrine	34	45.33

**Table 4.** Distribution of latrine use in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variable	n	%
<b>Latrine use</b>		
Good	44	58.66
Poor	31	41.34

According to Table 5, the results of the bivariate test found that most of the respondents who had good use of latrines were graduates of senior high school/equivalent education level, while elementary school/equivalent education level had the smallest number of respondents with good use of latrines. Most of the respondents who had poor use of latrines were junior high school graduates/equivalent few diploma/bachelors graduates had poor use of latrine.

The results of the bivariate test with the Chi-square test showed that there was a significant relationship ( $p = 0.000$ ) between education level and latrine use. Moreover, it produced a contingency coefficient of 0.508 showing that the relationship between the variables was strong (Table 5).

The results of the bivariate test found that most of the respondents who had good use of latrines also had a high level of income. Most of the respondents who had inadequate use of latrines had a low level of income (Table 5).

The results of the chi-square test between described that there was a significant relationship ( $p = 0.000$ ) between

the level of income and latrine use. Moreover, it produced a contingency coefficient of 0.444 proving that the relationship between the variables was strong enough. An OR-value of 8.882 showed that the respondents with a high level of income were 8.882 times more likely to have good latrine use compared to those with low income.

According to Table 6, the results of the bivariate test found that most of the respondents who had good use of latrines also had good knowledge. Meanwhile, most of the respondents who had poor use of latrines did not have sufficient knowledge.

**Table 5.** Relationship between Respondent Characteristics and Latrine Use in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variables	Latrine use				Total		P-value	
	Good		Poor		n	%		
	n	%	n	%				
<b>Level of education</b>								
Graduated from elementary school/equivalent		2	22.2	7	78.8	9	100	0.000
Completed junior high school/equivalent	high	5	23.8	16	76.2	21	100	
Completed high school/equivalent	high	23	79.3	6	20.7	29	100	
Diploma Bachelors		14	87.5	2	12.5	16	100	
<b>Income Level</b>								
High		25	86.2	4	13.8	29	100	0.000
Low		19	41.3	27	58.7	46	100	

**Table 6.** Relationship between Knowledge and Attitudes towards Latrine Use in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variables	Latrine use				Total		P-values
	Good		Poor		n	%	
	n	%	n	%			
<b>Knowledge</b>							
Good	30	73.2	11	26.8	41	100	0.006
Adequate	7	31.8	15	68.2	22	100	
Poor	7	58.3	5	41.7	12	100	
<b>Attitude</b>							
Good	34	73.9	12	26.1	46	100	0.003
Adequate	8	33.3	16	66.7	24	100	
Poor	2	40.0	3	60.0	5	100	

**Table 7.** Relationship between Latrine Ownership and Latrine Use in RW 01, Gunung Anyar Tambak Village, Gunung Anyar District, Surabaya City in 2019

Variables	Latrine use				Total	P-value	
	Good		Poor				
	n	%	n	%			n
<b>Latrine Ownership</b>							
Own a Latrine (private)	40	97.6	1	2.4	41	100	0.000
Do not own a latrine	4	11.8	30	88.2	34	100	

Based on the chi-square test results, there was a significant relationship ( $p = 0.006$ ) between knowledge and latrine use. It obtained a contingency coefficient of 0.344, meaning the relationship between knowledge and latrine use was fairly strong.

Table 6 presents the results of the bivariate test that most of the respondents who had good use of latrines also had good attitudes towards it. Most of the respondents who had insufficient use of latrines had adequate attitudes. The chi-square test results showed that there was a significant relationship ( $p = 0.003$ ) between attitudes and latrine use. It resulted in a contingency coefficient of 0.364, meaning that the relationship between knowledge and latrine use was classified strong enough.

Based on Table 7, the results of the bivariate test showed that most of the respondents who had good use also had (private) latrines; on the other hand, those who had poor use did not own latrines. The Chi-square test found a significant relationship ( $p = 0.000$ ) between latrine ownership and latrine use. A contingency coefficient value of 0.867 suggested that the relationship between latrine ownership and use was very strong, while an OR-value of 300.000 showed that the respondents who owned (private) latrines had 300.000 chances of having good latrine use when compared to those without latrines.

## DISCUSSION

Gunung Anyar Tambak village has an area of 823.40 Ha, located in the Gunung

Anyar district. It is in the Eastern borders the Madura Strait, making it lush with large mangrove (47.90 Ha) and protected forests (479 Ha) as well as rivers and ponds (19.50 Ha). It is near the North borders which is Medokan Ayu village, to the South which is Tambak Oso village, to the East which is the Madura Strait, and to the West the Gunung Anyar village. There were still many rivers and ponds in the area, facilitating locals to practice open defecation. Most of the villages (93.54%) had access to latrines; however, 151 families within RW 01 ranked the lowest amongst others did not have latrines (Indonesian Ministry of Health, 2018)

Improving the health status can be done by providing physical environment facilities, for example, latrines. The availability of latrines would promote a healthy and clean environment. A latrine that meets the predetermined requirements can prevent the spread of disease and environmental pollution (Taringan, 2008). The indiscriminate disposal of feces has great potential in spreading diseases. An object contaminated by human feces may cause diseases for other humans (Notoatmodjo, 2003).

The chi-square result showed education level was significantly related to latrine use. It is in line with research conducted by Kurniawati and Windraswara (2017) who found there was a relationship between education level and usage behavior. They observed the respondents with higher education were 3.6 times more likely to use latrines than respondents with low education. In the KATAJAGA

program in Gunungpati district, Semarang, research conducted by Oktanasari et al.c (2017) supports the result by saying education level had a significant relationship with latrine use. Individuals with a higher education level tend to have broader insights, thereby making them embarrassed for practicing open defecation. While among people with a low education level would, open defecation is commonly considered as a culture. However, this study is not in line with research conducted by Horhoruw et al. (2014) who found education level was not related to latrine use.

The research results indicated that the majority of respondents with a high level of education (senior high school/equivalent, diploma, and bachelors) had good use of latrines. Meanwhile, the respondents with low education (elementary high school/equivalent and junior high school/equivalent) had poor use of latrines.

Further, the chi-square results found that there was a significant relationship between income level and latrine use. This study is in line with research of Sari (2016) that highlighted a significant relationship between income levels and family defecation in Kerjokidul village, Ngadirejo district, Wonogiri regency. People who generally have a high economic level can provide defecation facilities, affecting the use of latrines, while people with a low income level choose to defecate on a river or other open areas due to economic constraints.

This study is also in line with research of Nur (2015) which noted that there was a significant relationship between income levels and defecation behavior. She explained that people with low income did not feel the need to participate in latrine ownership. In turn, they less use latrines. It was also considered more comfortable to defecate on catfish ponds or other ponds because it was difficult to build a latrine. The respondents who had low income had

9.500 times greater chances of using latrines less frequently.

This study is not in line with research conducted by Apriyanti et al.c (2019) who demonstrated that family income did not have a relationship with latrine use ( $p = 1.000$ ). The respondents with high income sometimes did not have a proper waste disposal site. Those with high income even indicated that free latrines were only for low-income people. The results indicated that most of the respondents with high income also had good use of latrines. While, the majority of respondents with low income had less use of latrines.

Knowledge had a significant relationship with latrine use. The result is in line with research of Sayati (2018) knowledge was significantly related to the use of healthy latrines as observed in the work area of 23 Ilir Primary Healthcare Center Palembang in 2018 ( $p = 0.012$ ). People with insufficient knowledge about latrine use would lack capacity of using the latrines. Limited knowledge results in a lack of health care efforts in the community. This study is also in line with research of Talinusa et al. (2017) between knowledge and defecation behavior in Jayakarsa village where there was a relationship ( $p = 0.000$ ). Research by Paramita (2016) supports this study by saying there was a significant relationship between knowledge and use of latrines ( $p = 0.018$ ). Good use of latrines is supposed to be followed by good knowledge. The research also showed that the majority of respondents with good knowledge would have good use of latrines. The majority of respondents with sufficient or insufficient knowledge had poor use of latrines.

The Chi-square test obtained a significant relationship between attitudes and latrine use. This result is in line with that of Nasfryal et al (2019) in residential areas of Purus village, West Padang district. Attitudes and latrine use were equal; in another sense, the better the attitudes of eating, the better the use of latrines.



Motivation may influence attitudes and be letting individuals involved in certain activities. Their involvement can stimulate participants to improve their awareness and eventually change their attitudes.

The results are in line with other findings by Fatma and Putra (2018) who found the attitude and use of sanitary latrines had a significant relationship ( $p = 0.034$ ). Attitudes influenced one's behavior; in another sense, the relationship between attitudes and behavior was directly proportional. Attitude is related to one's actions to use latrines. It affects the choice of actions taken by individuals towards certain objects, personalities, and events (Otaya, 2012). The result also showed that most of the respondents with good attitudes also had good use of latrines. However, some respondents with adequate attitudes had poor use of latrines.

The Chi-square test also yielded that there was a significant relationship between latrine ownership and latrine use. This study is in line with research conducted by Caesar and Riza (2019) who found a relationship ( $p = 0.026$ ) between latrine ownership and latrine use in Setro Kalangan village, Kaliwungu district, Kudus regency. Research conducted by Pane (2008) supported the result as well ( $p = 0.000$ ). Latrine ownership was closely related to its use ( $OR = 27.04$ ).

Similar research conducted by Husna and Mailanie (2018) also showed a relationship between latrine ownership and defecation habit ( $p = 0.029$ ) in Semantok village, Sampoinet district, Aceh Jaya regency in 2017. The use of latrines depended on the community as the main spearhead in healthy latrine use according to health requirements. Defecation habit and latrine use are influenced by latrine ownership, but some people who own latrines still practice open defecation due to cultural influences. The results of this study also indicated that the majority of respondents who owned latrines also had good use of latrine. Meanwhile, those who

did not own latrines had poor use of latrines.

## CONCLUSION

The research results concluded that there was a significant relationship between respondent characteristics (education level and income level), knowledge, attitudes, and latrine ownership with latrine use in RW 01, Gunung Anyar Tambak village, Gunung Anyar district, Surabaya City. Latrine ownership was the strongest factor related to latrine use.

In order to increase the frequency of latrine use, it is necessary to improve attitudes, knowledge, and latrine ownership, specifically for people who still practice open defecation. There is a need to increase community support through community leaders, health care officers, and cadres to remind or urge to stop open defecation in the community.

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# EFFECT OF PRECONDITIONS AND UNSAFE ACTS ON EVACUATION DURATION IN FIRE DISASTER CONDITIONS (STUDY AT THE INPATIENT BUILDING OF GENERAL HOSPITAL R. KOESMA TUBAN)

Erwin Era Prasetya<sup>1</sup>, Denny Ardyanto W.<sup>1</sup>, Hari Basuki Notobroto<sup>2</sup>, Tjipto Suwandi<sup>1</sup>

<sup>1</sup>Departement of Occupational Safety and Health,  
Faculty of Public Health, Airlangga University, Surabaya, Indonesia

<sup>2</sup>Departement of Biostatistics and Demography,  
Faculty of Public Health, Airlangga University, Surabaya, Indonesia

Correspondence Address: Erwin Era Prasetya

Email: erwineraprasetya@gmail.com

## ABSTRACT

Hospital fires have the potential to cause fatalities and huge material losses, there were 22 hospital fires covered by newspapers in India in 2011-2012 with 102 dead. Buildings are considered safe if all occupants building threatened by fire must be able to exit and assembly point before available safe egress time. This study aimed to analyze the effect of preconditions and unsafe acts (violations of evacuation procedures) on evacuation duration in fire disaster conditions in the inpatient building of general hospital R. Koesma Tuban. This study was an observational study, a quantitative method and cross sectional design, which were carried out in April-July 2019. Analysis of Covariance test results stated preconditions (age, sex, exercise habits, location of inpatient ward, distance traveled) affect the duration of evacuation ( $p < 0.05$ ) while preconditions (interaction between workers and readiness of workers) don't affect the duration evacuation ( $p > 0.05$ ). Violation of evacuation procedures has the potential to influence the duration of evacuation ( $p = 0.054$ ). The conclusions this study are age, gender, exercise habits, location of the inpatient ward, and distance traveled affect the duration of the evacuation.

**Keywords:** Duration of evacuation, preconditions, violations of evacuation procedures, hospital.

## INTRODUCTION

The hospital is a place that has a high risk to the safety and health of hospital human resources, patients, patient companions, visitors, and the hospital environment. So that in the framework of managing and controlling risks related to occupational safety and health in hospitals, it is necessary to organize hospital occupational safety and health in order to create a healthy, safe, secure, and comfortable hospital condition. Indonesian Ministry of Health, 2016)

Fire is an oxidation event that has three elements involved in it, namely combustible fuel, oxygen in the air and a source of heat energy that can cause danger and injury even to death. (NFPA, 2003). Fire at the hospital has the potential to cause fatalities and huge material losses, there were 22 hospital fires covered by

newspapers in India with 102 dead (Chowdhury, 2014). The latest hospital fires reported by the British Broadcasting Company (BBC) was on January 26, 2018 at Sejong Hospital, about 380 kilometers southeast of Seoul, South Korea. 41 people died as a result of fire. The most recent case of hospital fires in Indonesia occurred on December 14, 2017 at Kurnia Hospital, Cilegon City, Banten, Indonesia. Sparks from the electrical short circuit in the child's room. The fire was extinguished using a mild fire extinguisher by hospital staff, but the fire grew larger and caused panic throughout the hospital. This happened because in the hospital there were patients who did not allow to save themselves (BBC, 2018).

General Hospital R. Koesma Tuban has four storey inpatient buildings (eight inpatient rooms). In each inpatient room there are 20-33 bed patients with BOR

(Bed Occupancy Rate) which reaches more than 70%. But the inpatient building has a disadvantage that is the absence of emergency exits, only exits that are not fire resistant. As for fire detectors and alarms in each room, there is only one. And also the absence of emergency lighting on corridors, stairs and ramps. For this reason, the evacuation process in the inpatient building of General Hospital R. Koesma Tuban is more difficult to do and requires quite a long time (Koesma RSUD, 2019).

Preconditions that affect unsafe actions are environmental factors, workers' conditions and personal factors. Workers' conditions include age, sex, and exercise habits. Personal factors are the readiness of workers and interactions between workers. Environmental factors are corridors, emergency exits, ramps, lighting, room location, and the distance of the room to the assembly point (Wiegmann & Shappell, 2005).

Unsafe acts or unsafe actions are factors that cause accidents. Unsafe actions are defined as active actions or mistakes committed by someone that result in an unsafe situation or event. Unsafe acts are divided into two levels, namely errors and violations (Butler et al., 2017). In this study, the violation are violations of evacuation procedures.

Therefore, the purpose of this study is to analyze the effect of preconditions and unsafe acts (violations of evacuation procedures) on the duration of evacuation under fire disaster conditions in the inpatient building of General Hospital R. Koesma Tuban.

## METHODS

This study was a research that used quantitative methods and types of observational research because researchers only observed subjects to conduct evacuation simulations without intervening or giving treatment. The evacuation simulations were done in the inpatient

building of general hospital R. Koesma Tuban, namely Teratai, Asoka, Mawar, Anggrek, Bougenvil, Dahlia, Anyelir and Melati rooms. This study was conducted in April-July 2019. The population was a team of employees (nurses and non-nurses) in 8 inpatient rooms totaling 129 people. To evacuate a patient, 2 inpatient employees were needed to get 64 teams to become the study population. Sampling of research from existing populations was then performed sample calculations using the Lemeshow formula, so that a sample of 50 teams was obtained. The sampling technique was obtained randomly (Levy, P. S., & Lemeshow, S. 2009). The sampling technique was obtained randomly with the exclusion criteria of employees who had a history of heart disease.

Data collection techniques used were primary data that includes evacuation time obtained from evacuation simulations, physiological conditions of workers (age, sex, sports habits) and personal factors (worker readiness, interaction between workers) obtained through a questionnaire containing the characteristics of respondents including age, sex, exercise habits, interaction between workers and readiness of workers in the inpatient room. Interaction questionnaire between workers and worker readiness were adopted from Hamid's research (2017). Then the results of the questionnaire were analyzed using statistical tests. As for environmental data such as (corridors, emergency exits, ramps, lighting, room location, and the distance of the room to the assembly point) as well as infrastructure especially those that support evacuation in the event of a fire disaster were obtained with observation sheets related to standards in accordance with the Hospital Building Technical Guidelines that safe in emergencies and disasters, Minister of Health Number 1691 Year 2011 concerning Hospital Patient Safety and Minister of Health Decree Number 1087 concerning Occupational Health and

Safety Standards in Hospitals. Observation data in this study were taken by UPT K2 Surabaya and the researchers.

Unsafe actions or violations of the evacuation procedure were obtained with an observation sheet related to the evacuation procedure when an evacuation simulation was carried out. Evacuation simulations were carried out by 2 inpatient staff, starting from moving the patient (played by hospital staff) from the inpatient bed to the brancard then the patient was evacuated to the assembly point. Secondary data used were hospital profiles, inpatient staff data, and

evacuation procedure. The certificate of ethics was issued by the Health Research Ethics Commission of the Faculty of Public Health, Airlangga University with the certificate number of ethics 136 / EA / KEPK / 2019.

## RESULTS

### Characteristics of respondents

The characteristics of respondents measured here were based on age, sex, and exercise habits, shown in Table 1.

**Table 1.** Distribution of Respondent Characteristics

Characteristics of respondents	Nurse		Non-Nurse		Total	
	Amount	%	Amount	%	Amount	%
<b>Usia</b>						
≤ 25 y.o	14	15.7	1	9.1	15	15
26-35 y.o	47	52.8	2	18.2	49	49
≥ 36 y.o	28	31.5	8	72.7	36	36
Average Age (y.o)	32.12		38.36		32.81	
<b>Sex</b>						
Male	20	22.5	5	45.5	25	25
Female	69	77.5	6	54.5	75	75
<b>Exercise Habits</b>						
≤ once a week (rarely)	60	67.4	7	63.6	67	67
Twice a week (sometimes)	21	23.6	2	18.2	23	23
3-5 times a week (often)	8	9	2	18.2	10	10

Source: Primary Data, 2019

Based on the research results presented in Table 1, the average age was 32.81 y.o, with an average age of nurses 32.12 y.o, and the average age of non-nurses was 38.36 y.o. The highest number at the age range of 26-35 years was as much as 49%. Nurses gender were 22.5% male and 77.5% female. Non-nurses gender were 45.5% male and 54.5% female. While the exercise habits of nurses 67.4% were less than or equal to once a week and the exercise habits of non-nurses 63.6% were less than or equal to once a

week. This showed that the majority of nurses and non-nurses only exercise less than or equal to once a week.

### Precondition

The results of the study of the average duration of the evacuation based on the Precondition variables (age, sex, exercise habits, inpatient room location, distance to assembly point, interaction between workers, and readiness of workers) would be presented in Table 2.

**Table 2.** Average Evacuation Time Based On Precondition Variables

Precondition Variable	Evacuation Time (second)		Value <i>p</i>	
	Mean	SD		
<b>Age</b>				
≤ 25 y.o	92.50	19.10	0.022	
26-35 y.o	92,06	35.87		
≥ 36 y.o	100,04	37.63		
<b>Sex</b>				
2 female employees	102.60	38.61	0.001	
1 male and 1 female employees	84.44	26.55		
2 male employees	74.25	28.86		
<b>Exercise habits</b>				
2 employees who rarely exercise	94.76	35.79	0.047	
1 employee who rarely exercise and 1 employee who sometimes exercise	10.75	39.88		
2 employees who sometimes exercise or 1 employee who rarely exercise and 1 employee who often exercise	81.90	32.04		
1 employee who sometimes exercise and 1 employee who often exercise	91.75	12.37		
2 employees who often exercise	127.5	-		
<b>Inpatient Room Location</b>				
1 <sup>st</sup> Floor	69.75	20.05		0.033
2 <sup>nd</sup> Floor	120.60	28.33		
<b>Distance to Assembly Point</b>				
Teratai Room (178,7 m)	89.21	19.37	0.000	
Asoka Room (213,4 m)	134.21	39.27		
Mawar Room (91,3 m)	48.78	5.54		
Angrek Room (196,5 m)	112.50	22.99		
Bougenvil Room (121,3 m)	64.33	13.05		
Dahlia Room (202 m)	97.60	14.15		
Anyelir Room (108,2 m)	76.92	10.47		
Melati Room (190 m)	132.00	11.38		
<b>Interaction between Workers</b>				
Good	106.92	24.10	0.577	
Sufficient	87.98	36.38		
Less	81.60	54.20		
<b>The Readiness of Workers</b>				
Good	97.48	33.94	0.959	
Sufficient	87.65	33.48		
Less	97.75	56.29		

Source: Primary Data, 2019

Based on Table 2, the average duration of evacuation on the team of employees with an average age of less than or equal to 25 y.o and 26-35 y.o did not

differ greatly, namely 92.50 seconds and 92.06 seconds. Evacuation time increased to 100.04 seconds on the employee team with an average age of more than or equal

to 36 years. The average evacuation time was faster in the gender mix of the team of 2 male employees (74.25 seconds) compared to the team of male and female employees (84.44 seconds) and 2 women (102.60 seconds). While the average evacuation time was the fastest (81.90 seconds) on teams with 2 employees sometimes sports or 1 employee rarely and 1 employee often sports. The average evacuation time was the slowest (127.5 seconds) on teams with 2 employees often exercising. This happened because there was only 1 team with 2 employees who often exercise and the employee worked in the Asoka room on the 2nd floor and the farthest distance.

Based on the location of the room, the average evacuation time in the first floor inpatient was faster (69.75 seconds) than in the second floor inpatient (120.60 seconds). The distance of the room with the farthest assembly point was the Asoka room which was located on the second floor with a distance of 213.4 m and required the longest evacuation time (134.21 seconds), while Mawar room which was located on the first floor with a distance of 91.3 m and took time the fastest evacuation (48.78 seconds).

The average evacuation time for less interactions between workers was the shortest (81.60 seconds), and the average evacuation time for good interactions between workers was the slowest (106.92 seconds). The average evacuation time was faster for workers with sufficient readiness (87.65 seconds) compared to workers with good preparedness (97.48 seconds) and workers with less preparedness (97.75 seconds) in the face of a fire disaster in the room inpatient.

Based on the Analysis of Covariance, it was found that the average characteristics of the team of employees during evacuation affected the duration of fire evacuation with a value of  $p = 0.022$ . The sex characteristics of the employee team influenced the duration of fire evacuation with a value of  $p = 0.001$ .

Exercise habits also affected the duration of the evacuation with a significance value of  $p = 0.047$ . The location of the inpatient room affected the duration of the evacuation with a value of  $p = 0.033$  and the distance to the assembly point also affected the duration of the evacuation with a value of  $p = 0,000$ . Interaction factors between workers and worker readiness did not affect the duration of the evacuation. This was indicated by the value of  $p > 0.05$  on interaction between workers  $p = 0.577$  and readiness of workers  $p = 0.959$ .

### **Environmental Factors**

The results of observations of environmental conditions in the inpatient room includes; Corridors are safe lanes established to reach the assembly point in the event of a disaster. The size of the corridor as horizontal access is considered based on the corridor function, spatial function, and number of users. Hospital corridor requirements include the width of the corridor with a minimum access of patient beds of 2.4 m, non-slippery and barrier-free floors. The following observations on the corridor were presented in Table 4.

Based on Table 4, there were 3 elements of examination of the corridor, 5 inpatient rooms (Mawar, Bougenvil, Dahlia, Anyelir and Melati) in accordance with the standard while 3 inpatient rooms (Teratai, Asoka and Anggrek) there were 1 element that was not in accordance with the standard namely the corridor was not barrier-free. This matter caused by the large number of patients in the three rooms, so there were patients treated in the corridor

The emergency exit that was the focus of this research was the exit of the inpatient room which was the main access to the ramp and or hallway, as a means of escape to the evacuation route so that it quickly exited to the assembly point. There were various requirements at the exit, including the fire-resistant door, the



direction of the door opening inside, width, automatically closes and the door is not the door is not locked, the door blocked, as presented in Table 5

**Table 4.** Observation Result of Inpatient Room Corridor General Hospital R. Koesma

Element	R o o m							
	Teratai	Asoka	Mawar	Anggrek	Bougenvil	Dahlia	Anyelir	Melati
Corridor width $\geq 2,4\text{m}$	2,75	2,75	2,75 m	2,75 m	2,75	2,75	2,75 m	2,75 m
non-slippery floors	and 3m	and 3m			and 3m	and 3m		
barrier-free floors	√	√	√	√	√	√	√	√
	X	X	√	X	√	√	√	√

Source: Primary Data, 2019

**Table 5.** Observation Result of the Exit in the Inpatient Room of General Hospital R. Koesma

Element	R o o m							
	Teratai	Asoka	Mawar	Anggrek	Bougenvil	Dahlia	Anyelir	Melati
Fire-resistant door	X	X	X	X	X	X	X	X
The direction of the door opening	X	X	X	X	X	X	X	X
Door width $>122\text{ cm}$	180cm	180cm	160cm	160cm	180cm	180cm	160cm	160cm
The door is not locked	√	√	√	√	√	√	√	√
The door automatically closes	X	X	X	X	X	X	X	X
The door is not blocked, always in good condition and ready to use	√	√	√	√	√	√	√	√

Source: Primary Data, 2019

Based on Table 5, there were 6 elements of inspection of the exit. Three elements were not in accordance with the standards, namely the door was not fire resistant, the direction of the door opening inside and the door could not close automatically.

Ramps were located in multi-story inpatient buildings to evacuate weak patients and must be evacuated using a wheelchair and brancard. The results of ramp observations at General Hospital R. Koesma based on the ramp requirements that must be completed were presented in Table 6.

**Table 6.** Ramp Observation Results of General Hospital R. Koesma

Elemen	R a m p	
	Ramp between Asoka and Anggrek Room	Ramp between Dahlia and Melati Room
The slope of the ramp outside the building $\leq 6^\circ$	4,9°	5,4°
Horizontal length of one ramp (slope $7^\circ$ ) $\leq 900$ cm. The length of the ramp with a lower slope can be longer	√	√
The minimum width of the ramp is 95 cm and 120 cm with the safety edge	150m	150m
The ramp bordes must be free and flat	√	√
The floor surface of the ramp is not slippery	√	√
The ramp is illuminated with sufficient lighting	√	√
The ramp is equipped with handrail	√	√

Source: Primary Data, 2019

**Table 7.** Lighting Intensity Measurement Results of General Hospital R. Koesma

Measurement Location	Hours (WIB)	Lighting Intensity (Lux)	
		Local (Average)	General (Average)
<b>Daytime Measurement</b>			
Teratai	13.30	85	82
Asoka	13.40	214	182
Anggrek	13.50	270	166
Ramp Anggrek-Asoka	14.05	1971	2643
The Hallway Teratai – Mawar – Assembly Point	14.20	934	652
Mawar	14.30	179	143
Bougenvil	14.40	107	104
Dahlia	14.50	183	208
Melati	15.00	632	978
Ramp Dahlia-Melati	15.10	608	1659
Anyelir	15.15	101	104
The Hallway Anyelir – IGD – Assembly Point	15.35	1015	882
<b>Nighttime Measurement</b>			
Ramp Anggrek-Asoka	18.35	43	67
The Hallway Teratai – Mawar – Assembly Point	18.45	16	70
Ramp Dahlia – Melati	19.15	59	75
The Hallway Anyelir – IGD – Assembly Point	19.55	34	47

Source: Primary Data, 2019

Based on Table 6, there were 7 inspection elements to the ramp and all elements were in accordance with the

standard. Emergency lighting on the evacuation route must continue on occupants need a means of escape. In each

inpatient room only had 1 emergency light placed on the nurse station that lights up when the electricity went out. The results of measurements of lighting intensities carried out under normal conditions were presented in Table 7.

Based on Table 7, the results obtained that the light intensity in 8 inpatient rooms, evacuation routes and assembly points were still in accordance with the minimum light intensity level of 5 lux for emergency lighting. Assembly Point or evacuation zone general hospital R. Koesma for the purposes of evacuating patients and officers during a disaster / mass disaster in the hospital there are 4 zones. Zone 1 (the assembly point in front of the emergency room, includes: Anyelir and Melati rooms). Zone 2 (Assembly point in front of the south outpatient building). Zone 3 (assembly point in front of the west outpatient building). Zone 4 (the assembly point in front of the mortuary which includes: rooms Teratai, Asoka, Mawar, Angrek, Bougenvil dan Dahlia).

**Unsafe acts**

Unsafe acts or in this study were violations of the evacuation procedure committed by a team of employees. The results of observations of the team of employees who committed violation of evacuation procedures were presented in Table 8.

Based on Table 8, 40% of the employee team violated of evacuation procedures (moderate and low). This could be seen from the use of high-heeled shoes, how to move the patient to the brancard, forgetting to remove the lock on the brancard wheel, how to push the brancard, how to turn the brancard, how to stop the brancard and teamwork. *Analysis of Covariance* results was significance value of  $p = 0.054$  which means violation of evacuation procedures during evacuation

had a potential influence on the duration of evacuation during a fire.

**Table 8.** Observation Results of Employee Team Compliance to Evacuation Procedures during Evacuation

Compliance to Evacuation Procedures	Total	%
Good	30	60
Moderate	16	32
Low	4	8

Source: Primary Data, 2019

**DISCUSSION**

According to Wiegmann and Shappell Preconditions or preconditions of unsafe actions are certain conditions that cause unsafe acts (Wiegmann & Shappell, 2003). Preconditions for unsafe actions include environmental factors, worker conditions and personal factors. According to Kasereka, factors that can affect the speed of evacuation are emotions, physical limitations, stress, wind speed, age and gender (Kasereka et al., 2018).

The results of this study indicate that there is an influence of age on the duration of evacuation in fire conditions in the inpatient room of General Hospital R. Koesma Tuban. Where the relatively young age is less or equal to 25 years and 26-35 years, the evacuation time tends to be the same, which is faster than the age of more or equal to 36 years. This is consistent with previous research that the average speed of movement of visitors when descending stairs and aisles under normal conditions at an average density of 2.9 people / m<sup>2</sup> is 0.15 m/s for graduates and graduates and 0.13 m/s for male parents and women (Chu et al., 2019).

Characteristics based on the sex of the team of inpatient staff during the evacuation simulation also affected the duration of the evacuation in the fire conditions in the inpatient room of General

Hospital R. Koesma Tuban. This is consistent with previous research which states that there are differences in the speed of walking of the population during the evacuation process based on gender and age. The average walking speed of young men is 1.32 m/s while young women are 1.27 m/s. There is a difference of 0.05 m/s between men and women of the same age (Chu et al., 2019).

Cardiorespiratory capacity (CRC) is the main indicator of human physical limits.

Repeated muscle activity during evacuation can cause local muscle fatigue (LMF) or local muscle fatigue that affects the speed and duration of evacuation. CRC and LMF are influenced by one's sporting habits. The more a person exercises, the greater the CRC and it takes a long time for LMF to occur (Halder et al., 2018).

In this study shows that employee exercise habits affect the duration of the evacuation. Where someone with a habit of exercising has the potential to be able to get quickly to the meeting point when a fire disaster occurs. This is consistent with previous research that there is an influence between the form of contrast training with 100 meters running speed and optimal stride length. The contrast exercise in question is a resistance exercise that causes the muscles to contract which aims to increase the strength of the body's endurance. So as to be able to do work at a higher level. When someone has a habit of exercising, it will indirectly affect the strength and speed of someone to run to the point of assembly when there is a fire (Rumini et al., 2012).

The location of the inpatient rooms which consists of 1st floor and 2nd floor are connected by a special ladder for employees and ramps. The distance to the second floor inpatient room is 50 m longer because it passes through the ramp during evacuation so the evacuation duration value becomes large. In this study shows the location of floor space 1 and 2 affect the duration of the evacuation during a fire

disaster. This is not much different from previous studies that the time needed for evacuation to the assembly point of the 2nd floor of the building is longer than the 1st floor during an emergency situation (Andhika et al., 2013).

Distance to assembly point in this study is from the patient's bed in the inpatient room to the assembly point. In this study shows that distance to assembly point influences the evacuation duration during the evacuation simulation

Interaction between workers is needed as a communication medium when we work, but apparently in the evacuation process it is not directly related. In the event of a fire disaster, all inpatient staff only prioritize the evacuation process as quickly as possible to the meeting point, without seeing the pair in the team. The results showed that there was no influence between the interaction of workers with the duration of the evacuation. This is different from previous research that in disaster emergency conditions communication is needed as a function of management and coordination (Rudianto, 2015).

Worker readiness includes staff readiness and knowledge of patient evacuation procedures. In the process of evacuation from a fire disaster, the safety of the occupants of the building is primary. In this study, employee readiness did not affect the duration of the evacuation. This is almost the same as previous research that community preparedness is at a high level. In an emergency situation the community tends to take actions that can minimize the impact of the disaster. Community preparedness during emergencies is influenced by community knowledge about what is done when a disaster occurs and knowledge about disaster risk is still lacking (Dodon, 2013).

Based on environmental factors in the inpatient corridor, the corridor floor is not slippery and the width of the corridor is different. Inpatient corridors are barrier-free except Asoka, Teratai and Anggrek. In these three rooms, there is often a buildup

of patients to be treated in the corridor. This patient buildup can hinder the evacuation process and endanger patient safety. This is not in accordance with Minister of Health Regulation number 1691 Year 2011 concerning Hospital Patient Safety.

Inpatient room of General Hospital R. Koema does not have an emergency exit specifically. Emergency door here is the main exit from the inpatient room which is the main access to the ramp and or hallway that can be passed by the brancard. The main door is unlocked, unobstructed, always in good condition and ready to use. The width of the door is 180 cm in the Asoka, Teratai, Bougenvil and Dahlia rooms while the Mawar, Anggrek, Anyelir and Melati rooms have 160 door widths.

Next to the main door, there are different exit doors in each inpatient room. The Asoka, Teratai, Mawar and Anggrek rooms have 10 exits. The Bougenvil and Dahlia rooms have 8 exits. The Anyelir and Melati rooms have 7 exits. The width of the door is at least 122 cm and the large number of doors is intended so that patients, staff, patient companions, and visitors can be evacuated quickly in the event of a fire disaster.

Three elements that are not in accordance with the standard are the door made of aluminum and glass that is not fire resistant, the direction of the door opening inside and the door cannot close automatically. This is not in accordance with the Technical Guidelines for Building Hospitals that are Safe in Emergencies and Disasters (Indonesian Ministry of Health, 2012) and Minister of Public Works and Human Settlements Regulation Number 26 Year 2008 concerning Technical Requirements of Fire Protection Systems in Buildings and the Environment (Indonesian Ministry of Public Works and Human Settlements, 2008). Standards for emergency doors include fire-resistant doors, internal door opening, wide, door

unlocked, automatic door closing and unobstructed door.

The inpatient rooms have 2 ramps which are located in a multi-storey inpatient building. The first ramp connects the Asoka and Anggrek rooms while the second ramp connects the Dahlia and Melati rooms. The results of observations on both ramps obtained a slope angle of  $4.9^\circ$  and  $5.4^\circ$ . The slope angle of the ramp must be considered during the construction of the ramp so as not to endanger the patient especially during the evacuation process. The width of the second ramp is 150m, the landing bord is free and flat, the floor surface is not slippery, sufficient lighting (day and night) and equipped with handrails. The results of the observation of the ramp are in accordance with Minister of Health Decree Number 1087 Year 2010 concerning Health and Safety Standards at the Hospital, namely: the slope of the ramp outside the building  $\leq 6^\circ$ , horizontal length of one ramp (slope  $7^\circ$ )  $\leq 900$  cm, the length of the ramp with a lower slope can be longer, the minimum width of the ramp is 95 cm and 120 cm with the safety edge, The ramp bordes must be free and flat, the floor surface of the ramp is not slippery, the ramp is illuminated with adequate lighting and the ramp is equipped with handrail.

Lighting in normal conditions is obtained by the intensity of lighting in 8 inpatient rooms, evacuation routes and assembly points during the day above 100 lux except the Teratai room which has a local lighting intensity (average) of 85 lux and general 82 lux. At night, the intensity of the ramp lighting, the lobby and the meeting point 16-75 lux. Ramp and hallway are outside the building so that it gets light from around. This is in accordance with Permenaker Number 5 Year 2018 concerning Occupational Safety and Health at Work Environment which has a minimum light intensity standard of 5 lux for emergency lighting.

The closest assembly point in the inpatient room is the assembly point in zone 1 and zone 4. The assembly point in that zone already has the words "Assembly Point" and there is a fairly wide area available (area > 0.3 m<sup>2</sup> / person), safe from falls or other hazards, the location is easy to reach and does not preclude danger handling vehicles. In zone 1, the car park is sometimes closed and becomes narrow.

Unsafe acts (violations of evacuation procedure) or unsafe actions are factors that cause accidents. Unsafe actions are defined as active actions or mistakes committed by workers which result in unsafe situations or events (Wiegmann & Shappell, 2003). In this study shows that there are still employees who violate evacuation procedure. This violation of the evacuation procedure occurs because employees in the inpatient room forget and rarely reopen the evacuation procedure in each room. While the socialization about fire handling and evacuation simulation is only done once a year and is not evenly distributed throughout the entire room / unit / installation, so that makes the staff in the inpatient room less understand and not accustomed when facing an emergency during a fire. Dissemination standards regarding fire handling and evacuation simulations are carried out once a year at all levels at the internal hospital level (Hospital Accreditation Commission, 2018).

## CONCLUSION

The conclusion of this study is preconditions such as age, sex and exercise habits affect the duration of the evacuation during a fire disaster. Building location and distance can also affect the duration of the evacuation during a fire disaster. While the interaction between workers and the readiness of workers does not affect the duration of the evacuation during a fire disaster. There are some environmental factors including infrastructure that do not meet the standards, so that they need

immediate improvement to support the safety of patients and staff during the evacuation process. Unsafe acts (violations of evacuation procedure) at the time of evacuation have the potential to influence the duration of the evacuation during a fire disaster. Expected to General Hospital R. Koesma Tuban can provide socialization or fire evacuation simulation at least once a year and be comprehensive to all employees. In subsequent studies, it can be carried out an assessment of other factors that can affect the duration of the evacuation during a fire.

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# THE RELATIONSHIP BETWEEN WORKING BEHAVIOR AND THE INCIDENCE OF TYPE II DIABETES MELLITUS OF WORKERS WITH THE SNEHANDU THEORY

Ninin Nuryantini Farid<sup>1</sup>, Bagus Pratama Suwardono<sup>1</sup>

<sup>1</sup>Department of Health Promotion and Behavioral Science  
Faculty of Public Health, Airlangga University, Surabaya, Indonesia  
Correspondence address: Ninin Nur Yantini Farid  
E-mail: yantidwi95@gmail.com

## ABSTRACT

There are two types of Diabetes Mellitus (DM), namely Type I DM and Type II DM. Type II DM is caused by the inability of the body to respond to insulin that is produced by the pancreas, thus resulting in an increase in blood glucose levels. Eleven out of twenty workers at the Faculty of Public Health, Universitas Airlangga suffered from Type II DM. Observational research with a quantitative approach was conducted through a cross-sectional approach. The population selected was 89 workers at the faculty. The samples were randomly selected with the characteristics of having more than 45 years of age. There were significant variables between working behavior and the incidence of Type II DM including work, last education, and social support. Furthermore, there were insignificant variables between working behavior and the incidence of Type II DM including gender, age, family members, frequency of exercise, behavior intention, personal autonomy, accessibility to information, and action situation. In conclusion, individual's latest education, employment, and social support had a significant relationship with exercise behavior and the incidence of Type II DM.

**Keywords:** physical exercise, diabetes mellitus, workers at FKM Universitas Airlangga

## INTRODUCTION

Diabetes Mellitus (DM) is categorized as the complex and chronic disease because it requires medical attention to control blood sugar (Soegondo, 2015). Diabetes mellitus is divided into two types, namely Type I DM and Type II DM. Type I DM causes abnormal insulin production due to damage of the pancreatic beta cells. One of the characteristics of Type I DM is that insulin is not produced according to the needs of the individual's body due to genetic factors from birth (Soegondo, 2015).

Meanwhile, Type II DM is a condition where the body cannot absorb insulin effectively (N.G. and N.J. 2019). This is due to an unhealthy lifestyle, i.e., a lack of physical activity, smoking and poor psychological conditions (Soegondo, 2015). According to all categories of DM sufferers whose age is between 45-60 years, 90-95% of them suffer from Type II DM. However, the trend began to shift to productive ages as there was a significant

increase in the prevalence rate of DM from 6.9% in 2013 to 8.5% in 2018, or it reached more than 16 million people (Indonesian Ministry of Health, 2018). Humans in general will experience a drastic physiological decline after the age of 40 (Muslim, 2018).

Moreover, families who have a history of Type II DM also have a greater risk of 5-10 times of becoming diabetic (Smeltzer, 2007). Additionally, an unstable psychological condition has an influence on the dietary consumption of individuals and causes them to consume high-glucose foods. It increases the body's metabolism and energy demand, which causes the pancreas to work harder and decreases the production of insulin (Smeltzer, 2007).

Based on the International Federation of Diabetes (IDF) (2017), in 2014, the prevalence rate of DM was 8.3% of all populations in the world and increased to 387 million sufferers. In Southeast Asia, there were 81 million people who suffer from DM. The number of people with DM was estimated to continue to increase from



7% among those aged 20-79 years in 2010; it will increase to 8.4% in 2030 (World Health Organization, 2015). Indonesia is in the 5th position for the highest population of DM sufferers after China, India, America, and Brazil, with a total of 5.81% of the population suffering from DM (International Federation of Diabetes (IDF), 2017).

Based on data from the Indonesian Basic Health Research (2013), 30.4% of people with DM were diagnosed, and 69.6% of people were free from DM. Of the total population amounting to 176,689,336 individuals, a proportion of DM sufferers over 15 years old was at 6.9%. Moreover, 93.1% of the population were undiagnosed for DM. The data of Indonesian Basic Health Research (2013) also stated that 1.1% DM sufferers were between 15-24 years old; 2.7% between 25-34 years old; 6.1% between 35-44 years old; 9.7% between 45-54 years old; 11.5% between 55-64 years old; 13.2% between 65-74 years old; and 13.20% between 75 years and over (Basic Health Research, 2013). The data indicated that the number of DM sufferers increased with age. This is directly proportional to the statement from the Indonesian Society of Endocrinology (2011) who stated that people over 45 years of age will experience increasing glucose intolerant to age. This is due to changes in the body's composition, decreased physical activity, decreased tissue sensitivity to insulin, or combination of the above to body aging (Iglay *et al.*, 2007).

The Basic Health Research (2013) mentioned DM is more likely to be suffered by women as their risk of obtaining DM is 7.7%, while for men is 5.6%. This is supported by Irawan's research (2010) which states that women had a high risk for DM as a woman's body is prone to a larger increase in body mass index compared to men. Women who have gone through menopause or post menopause undergo premenstrual syndrome, which causes them to experience the spread of fat in the body. The spread of fat in the body can easily be

accumulated because of hormonal processes and puts women at a high risk of suffering from DM. In Indonesia, 17.9 million people were at risk of suffering from DM. Meanwhile, there were 10 million people with DM in Indonesia (Basic Health Research, 2013). The East Java province was in the 10th place for the prevalence of DM sufferers in Indonesia. Surabaya was among the 9 cities for having a prevalence of 6.8% DM sufferers of the population in 2012 or as many as 21,262 people (Basic Health Research, 2013).

Workers in Surabaya have dense working hours that are on average around 8.5 hours/day, which causes workers to skip breakfast and physical activities (Fauzia, Sari and Artini, 2013). Guidelines regarding working hours are regulated in the Mayor of Surabaya's Regulation Number 21 of 2006 concerning Working Days and Hours for Agencies in Surabaya. The guidelines state that the effective hours of the week are from 07.30 am-04.00 pm with a break from 12.00 am-12.30 pm on Monday to Thursday and from 07.30 am-03.00 pm with a break from 11.00 am-01.00 pm on Friday. Saturday and Sunday are holidays, and thus most workers cannot exercise 3-4 times a week. Based on the age group, according to Prasetyo's study (2005), less than 70% of individuals for the 5-19 age group exercised, while less than 20% of those aged 20-60 years did exercise. This showed that there was a decrease in exercise activity at the age of 20 years. Further, the percentage of DM sufferers by occupation was at 5.8% per 12,191 individuals (Basic Health Research, 2013).

The health data on employees of the Faculty of Public Health, Universitas Airlangga shows that 11 out of 20 workers suffered from DM in 2017 as recorded in the Integrated Development Post (FKM UA POSBINDU) Book. Besides, there were 8 female workers and 3 male ones who suffered from DM according to their fasting blood pressure. According to the World Health Organization (2015), blood sugar levels should be less than 110 for normal

fasting, for pre-diabetes mellitus 110-125, and for DM more than 126. This is confirmed by Jelantik and Haryati (2014) by stating that DM often affected more women because they tended to have more low-density lipoprotein (LDL) (which is often called “bad cholesterol”), higher triglycerides, and lower physical activities than men.

According to Willett et al (2002), exercise and proper diet can affect the increase in DM cases in obese individuals. Therefore, it is advised for people with DM to exercise for 150 minutes/week. Sports activities that can be done include moderate aerobics (maximizing the heart to 50-70%) and heavy aerobics for approximately 90 minutes/week maximizing the heart by more than 70% and being conducted in 3-4 sessions per week (The Indonesian Society of Endocrinology, 2011).

Physical activity or exercise is the most influential activity towards the successful management of DM (Utomo, A.Y.S and Julianti, H.P, 2011, 2011). The Faculty of Public Health, Universitas Airlangga has carried out physical activities such as gymnastics every Friday, but both employees and educators rarely participate in the agenda. Besides, the duration of physical activity is not appropriate as it should be 3-4 times a week. Exercise is an important factor in DM handling as it also maintains body weight, helps improve insulin function in the body, keeps blood pressure normal, and improves psychological well-being (American Diabetes Association, 2014). This is also supported by the research of Fauzia, Sari and Artini (2013) which found that out of a total of 147 samples with DM, less than 50% exercised because of managing DM. Human health behavior such as exercise has many influencing factors, both internal and external (Notoatmodjo, 2012).

Apart from exercise, dietary patterns are also important for managing Type II DM, for example, by not consuming excess fat, sugar, having breakfast before 9 o'clock, and eating fruits and vegetables

(Indonesian Ministry of Health, 2014). Dewi (2013) declared that inadequate consumption of fruits and vegetables causes less intake of fiber and magnesium, leading to Type II DM. Moreover, fat consumption can increase more than 25% of fat content in the blood (Indonesian Ministry of Health, 2014).

Based on the theoretical analysis, Snehandu B. Kar stated that healthy behavior is influenced by a person's intention to act (behavior intention), social support, information, and facilities for health (accessibility to information), personal autonomy in decision making and action, and the possibility of individual to act in a certain context (action situation). Therefore, this study aimed to analyze a relationship between exercise behavior and the incidence of Type 2 DM among workers at the Faculty of Public Health, Universitas Airlangga.

## **METHODS**

This study was conducted at the Faculty of Public Health, Universitas Airlangga, Surabaya, in May to June 2018. It was an observational study with a quantitative method and used a cross-sectional approach. Primary data were obtained through interview and questionnaires sent directly to respondents. The population was 89 workers over 45 years old at the Faculty of Public Health, Universitas Airlangga, Surabaya. The number consisted of staff and lecturers. Then, 48 samples were obtained by using the Slovin simple random sampling technique when the population was homogenous and had the same chance. The criteria of the samples were divided into 2, namely inclusion and exclusion. The inclusion criteria for the respondents were workers over 45 years old, actively working, not sick, and willing to be interviewed. Meanwhile, the exclusion criteria for them were those less than 45 years old, not actively working, sick, and unwilling to be interviewed.

The independent variables used were worker characteristics, worker exercise intentions and worker social support. The workers also answered the questionnaire with the categories of strongly agree, agree, neutral, disagree, and strongly disagree. The variables of access to worker information and knowing workers' decisions were discovered in the questionnaire with yes and no categories. While the dependent variable included exercise behavior among the workers.

This study used a descriptive analysis and statistical analysis. The statistical analysis was conducted to determine whether there was a relationship between the research variables. Further, the research test used Chi-square to determine the existence of a relationship between research variables. A significance result of less than 0.05 suggested a relationship, while no significant relationship would result in a score of more than 0.05. Data management was performed in editing, scoring and tabulating processes. Editing was done to complete each questionnaire and ensure that all of the questions were answered, otherwise it was necessary to re-collect data from the respondents. Scoring was done to assess each value to measure the ability of the respondents. Tables were also created according to the required analysis. Before being conducted, this study passed the ethics review with the ethical number: 211-KEPK.

## RESULTS

The distribution of the respondents was based on several categories such as age, family members, gender, latest education, and employment status. The calculations from 48 samples at the Faculty of Public Health, Universitas Airlangga, are explained in this section.

Table 1 shows that the age range of respondents at the Faculty of Public Health, Universitas Airlangga, had an average age of 41-60 years. Ages of above 40 years fall in the middle-age category, while those

aged 60-70 years are categorized as elderly (World Health Organization, 2007). This shows that the workers were classified middle aged and elderly.

**Table 1.** Frequency Distribution of Respondents by Age in 2018

Age Range	Total	Percentage
11-20	0	0%
21-30	0	0%
31-40	0	0%
41-50	20	41.67%
51-60	20	41.67%
≥ 60	8	16.66%
<b>Total</b>	<b>48</b>	<b>100%</b>

**Table 2.** Frequency Distribution of Respondents by Family Member in 2018

Family members	Total	Percentage
≤ 3	13	27.08%
≥ 4	35	72.92%
<b>Total</b>	<b>48</b>	<b>100%</b>

Regarding family members, Table 2 indicates that the majority of the respondents had > 4 family members (72.92%). However, in regards to this study, it is not only the quantity but the quality of family members that can affect the reminders between family members.

**Table 3.** Frequency Distribution of Respondent by Gender in 2018

Gender	Total	Percentage
Male	26	54.17%
Female	22	45.83%
<b>Total</b>	<b>48</b>	<b>100%</b>

Viewed from gender, the distribution of respondents was not significantly different; there were 54.17% males and 45.83% females. Based on several studies, men may have a higher risk for developing DM (L'Heveder and Nolan, 2013). Meanwhile, women may have a higher risk of suffering from DM (Alghadir

et al., 2014). These opposing views may result from differences in the number or condition of the respondents in each study.

**Table 4.** Frequency Distribution of Respondents by Lastest Education in 2018

Lastest education	Total	Percentage
No school	0	0%
Elementary school	0	0%
Junior high school	0	0%
High school	11	22.92%
Associate Degree 3	0	0%
Bachelors	10	20.83%
Masters	9	18.75%
Doctorates	18	37.50%
<b>Total</b>	<b>48</b>	<b>100%</b>

For the latest education, the majority of respondents obtained their Doctorate Degree (37.50%), followed by high school (22.92%). Therefore, when dealing with DM, there is no similarity in perceptions due to different levels of education.

**Table 5.** Frequency Distribution of Respondents by Occupation in 2018

Employe ment	Suffering from Diabetes	Not Suffering from Diabetes	%
Teacher	9	16	52.8%
Employe es	17	6	47.2%
<b>Total</b>	<b>48</b>	<b>100%</b>	

**Table 6.** Frequency Distribution of Respondents by Frequency of Exercise in 2018

Exercise Frequency	Total	Percentage
Often	13	27.08%
Rarely	21	43.75%
Never	14	29.17%
<b>Total</b>	<b>48</b>	<b>100%</b>

There were 26 workers who suffered from DM. Employees suffered from DM more than educators. This is related to knowledge and a work environment that can affect their healthy lifestyle.

Based on frequency of exercise, Table 6 shows that the majority of them or around 43.75% did sports 1-2 times per week. According to the respondents who rarely did sports, they usually fulfilled their exercise needs by participating in gymnastics every Friday at the Faculty of Public Health, Universitas Airlangga.

**Table 7.** Frequency Distribution of Respondents by Intention to Exercise in 2018

Intention to Exercise	Total	Percentage
Good	23	47.92%
Bad	25	52.08%
<b>Total</b>	<b>48</b>	<b>100%</b>

Regarding behavior intention (intention to exercise), 47.92% of the respondents had the intention to exercise (see Table 7).

**Table 8.** Frequency Distribution of Respondents by Social Support in 2018

Social Support	Total	Percentage
Good	30	62.50%
Bad	18	37.50%
<b>Total</b>	<b>48</b>	<b>100%</b>

In terms of social support from family, co-workers, close friends, and people around them, the majority of workers received good social support (62.50%). This showed that information and emotional support can influence individuals to behave positively because of legitimacy or recognition from those around them.

**Table 9.** Frequency Distribution of Respondents by Accessibility to Facilities and Information in 2018

Accessibility to Facilities and Information	Total	Percentage
Good	15	31.25%
Bad	33	68.75%
<b>Total</b>	<b>48</b>	<b>100%</b>

Table 9 illustrates that the accessibility to facilities and information among the respondents was still low. As many as 68.75% of the respondents did not have access to facilities and information. Access to information related to sports and ease of exercising outside and within the office can affect an individuals' exercise behavior.

**Table 10.** Frequency Distribution of Respondents by Personal Freedom in 2018

Personal Decision	Total	Percentage
Good	7	14.59%
Bad	41	85.41%
<b>Total</b>	<b>48</b>	<b>100%</b>

Table 10 shows that personal autonomy of the respondents was still low (14.59%). This showed that the level of education did not guarantee the making of good personal decisions. Personal decisions can affect the level of individual compliance with choosing an action.

**Table 11.** Frequency Distribution of Respondents by Possible Conditions in 2018

Possible Conditions	Total	Percentage
Good	24	50.00%
Bad	24	50.00%
<b>Total</b>	<b>48</b>	<b>100%</b>

For situation factors, situations that allowed the respondents to prevent the incidence of DM reached 50.00%.

## DISCUSSION

### Respondents' Age

The results of the Chi-Square test for age was 0.695, suggesting no significant association with the incidence of DM. The average human physical ability decreases after the age of 40 years (Maryani, 2010). Being overweight at the age of 45 years will further increase the chance of suffering from DM as it is related to the body's insensitivity to insulin. The result of this study is not in line with research conducted by Widiyanti and Tafal (2014) which found that there was a relationship between age and the incidence of DM. However, Wulan and All, (2017) stated that there was no significant relationship between age and the incidence of DM. This is reinforced by Retnowati and Satyabakti (2015) who found that the quality of life or age of DM sufferers had more impact due to chronic conditions such as complications as the main trigger.

### Number of Family Members

The chi-square test found that the number of family members had no relationship with the incidence of DM ( $p = 0.222$ ). The number of family members did not affect the incidence of DM, while family support did. Family support consists of the action, attitude and acceptance given by family members to their family member who suffers from the disease (Pieter and Lubis, 2010). Support is obtained from the closest people, such as parents, children, husbands, wives, and others. It can be in the form of information, attitudes, or material (financial) support that makes the individuals feel cared for and supported (Wulan and All, 2017). Hence, the quality aspect of family members through action and support will have more impact compared to the quantity of family members.

### **Gender Characteristics**

Sex had no relationship with the incidence of DM ( $p = 1.000$ ), indicating that both men and women were at risk for DM. However, according to one respondent's opinion, she had less time and energy because apart from being a career woman, she also managed households without the help of an assistant. Therefore, she had less opportunities to exercise to reduce the risk of DM. A study by Herdianti (2017) also explained that there was a relationship between gender and the incidence of DM. Nevertheless, according to research by Jelantik and Haryati (2014) and Retnowati and Satyabakti (2015), there was no significant relationship between gender characteristics and the incidence of DM. Complementary diseases or complications due to DM are more negatively impactful on gender as male DM sufferers can become impotent, and women may suffer from vaginal infections (Handayani and Tandra, 2010).

### **Education Level**

According to the chi-square results, there was a relationship between the latest education level and the incidence of DM ( $p = 0.037$ ). Education is an experience undertaken to develop one's abilities and quality of life. If the individual's education improves, they would also be more able to utilize the knowledge they have and improve their skills (Syamsiah, 2011). Individuals with higher education are more capable of eating more nutritious and healthier food and prefer health services that prioritize prevention and medical care (Papalia, Olds and Feldman, 2009). This is in accordance with research of Cabral, Tahu and Tague (2016), which found that there was a significant relationship between education level and the incidence of DM. One's actions will be reflected on insights she/he has as well as the cognitive domain obtained from the educational process and experience (Cabral, Tahu and Tague, 2016).

### **Employement**

The current results found that more teaching staff experienced DM as compared to educators. There was a relationship between work and the incidence of DM ( $p = 0.019$ ). This result is supported by research of Mongisidi (2015) which stated that work and diabetes mellitus were allied. Grant et al. (2009) further found unemployed individuals were more at risk of developing DM due to the lack of physical activity. This has an impact on the body's metabolic processes as it does not maximize calorie burn in the body.

### **Frequency of Exercise**

Frequency of exercise, in turn, did not have any relationship with the incidence of DM ( $p = 0.962$ ). The result of this study is supported by Damayanti's study (2015) which stated that physical activity was not significantly related to the incidence of DM and components of the blood glucose metabolic syndrome. Conversely, Kriska, Hawkins and Richardson (2008) concluded that if a person did more activities such as exercising, blood glucose levels could be lower. The differences in previous studies may be the result of physical activities that meets the standards of frequency, duration, intensity, and types of activity.

### **Behavior Intention**

The chi-square test also displayed no relationship between self-intention and diabetes incidence ( $p = 1.000$ ). Intention is a tendency to choose or not to do something, in which individuals have full authority over their decisions (Ajzen, 2005). Previous research from Haskas (2018) also stated that there was no relationship between intention and DM control.

### **Social Support**

The results indicated that there was a relationship between social support and the incidence of DM ( $p = 0.004$ ). Social support may involve financial support,

information support, emotional support, and others. Besides, previous research from Akoit (2015) also stated that social support could help individuals who suffered from DM to control more their condition. Likewise, if the social support is low, it will also have an impact on the individual's physical activity (Akoit, 2015). It can also be concluded that a lack of social support in the surrounding environment results in a lack of attention to perform sports or physical activity, leading to a greater risk for DM.

### **Accessibility to Information**

The chi-square test results showed no relationship between the accessibility to facilities and information with the incidence of DM ( $p = 0.310$ ). The result of this study is not in accordance with the statement from Rosa (2015), which found that information support i.e., giving advice and disseminating information was considered as assistance by families. Information becomes a factor that influences knowledge and cognition to form individual actions/behaviors. Different results on this variable may be caused by differences in the level of education which influences information acceptance and different economic affordability in each individual.

### **Personal Autonomy**

There was no relationship between personal decision and the incidence of DM ( $p = 0.223$ ). Self-control will influence decision making to carry out a behavior that is purely of its will without the influence of others (Evans et al. 2013). Hagger et al. (2013) vity and diet. The different results may be caused by differences in education levels. The lower the level of education, the more likely low the self-control. Therefore, it may be easier for people to be influenced by other parties.

### **Actionable Situations**

The study indicated that there was no relationship between possible actionable

situations and the incidence of DM ( $p = 0.772$ ). Research of Essy Phitri et al. (2013) stated that an attitude by itself could not be manifested in the form of action. Even though the individual had sufficient knowledge, it could not ensure a positive change in attitude. Attitudes, in turn, can be a closed behavior, where changes cannot necessarily be observed. Changes in attitude can be manifested by personal freedom and conditions that allow one of the facilities. A study by Ajzen (c2005) concluded an individual could feel being more able to control their behavior if receiving supporting factors rather than inhibiting factors.

### **CONCLUSION**

The DM status of the workers at the Faculty of Public Health, Universitas Airlangga was associated with education levels and employment statuses. Meanwhile, age, family members, gender and frequency of exercise were not associated with the incidence of DM.

The chi-square tests showed several independent variables i.e., behavior intention, accessibility to information, personal autonomy, and actionable situation did not have a significant relationship with the incidence of DM,. Meanwhile, social support had an association with the incidence of diabetes mellitus.

The academic community at the Faculty of Public Health, Universitas Airlangga, can take prevention measures from DM by scheduling physical activities indoors or outdoors every day for 10 minutes. Moreover, outbound activities and family participation could be done to prevent DM and support their family members at risk of DM. Outbound activities can also address family roles in DM self-management.

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# OVERVIEW OF SANITATION HYGIENE AND BACTERIOLOGICAL QUALITY OF FOOD AND EQUIPMENT ON FOOD MANAGEMENT SITES AT JUANDA AIRPORT, SURABAYA IN 2019

Devi Shintiya Chilmi<sup>1</sup>, Ririh Yudhastuti<sup>1</sup>, Bangun Cahyo Utomo<sup>2</sup>

<sup>1</sup> Department of Environmental Health, Faculty of Public Health, Airlangga University, Surabaya, Indonesia

<sup>2</sup> Environmental Risk Control Sector, Surabaya Class I Port Health Office, Indonesia

Correspondence address: Devi Shintiya Chilmi

Email: devischilmi@gmail.com

## ABSTRACT

Sites for managing and providing food for the community contribute to the emergence of major foodborne diseases. The airport gives notes on how important it is to prevent food-borne diseases. This study aimed to review the sanitary hygiene and bacteriological quality of the food and equipment on food management sites in Terminal 1 of Juanda Airport, Surabaya. This was a descriptive study using a cross-sectional study design. The research population was all 53 food management sites in Terminal 1 of Juanda Airport. A large sample of four food management sites were taken based on the number of food management sites offered to be surveyed every month. The research variables were sanitation hygiene and bacteriological quality of the food and equipment on the food management sites. Data collection on sanitation hygiene was done through observation and interview. Data collection on bacteriological quality of food and equipment was performed by taking and checking food samples and equipment from each food management site. The assessment of sanitation hygiene on the four food management sites in Terminal 1 of Juanda Airport received a score of > 700. The results of bacteriological food quality showed that *Escherichia coli* was found in food samples produced by one food management site. The results of bacteriological equipment quality showed that there was no *Escherichia coli* on the equipment used by four food management sites, but the total plate count value on the equipment was > 0. All food management sites in Terminal 1 of Juanda Airport met sanitation hygiene requirements but did not meet the bacteriological quality requirements for equipment because the total plate count value exceeded the threshold value. In terms of bacteriological food quality, most of the food management sites met the health requirements.

**Keywords:** sanitation and hygiene, *Escherichia coli*, total plate count, airports

## INTRODUCTION

Humans occupy the top rank in the food chain; it means that food is a basic human need to maintain survival and a source of energy to carry out daily activities. Not only does it need to have optimal nutritional values, but also the food consumed by humans must also be managed in a hygienic manner. Proper food management i.e., the storage method and transportation method that meet the requirements can guarantee safety of the food for consumption. Safe and healthy food for consumption does not contain microorganisms or other substances that are potentially harmful to human health. In addition, the hygiene and sanitation of food management areas also have an effect on bacterial contamination such as *Escherichia*

*coli* and *Salmonella sp.* on food (cYunus et al, 2015).

Until now, cases of food poisoning in Indonesia are still high. The 2017 POM Agency Annual Report Data showed the number of cases of drug and food poisoning nationally throughout Indonesia was 4,643 cases in 2017. The main cause of these poisoning cases was the food group, with as many as 1,226 cases (336 cases of food, 890 cases of drinks) (BPOM RI, 2018). Besides, the 2017 Indonesian Health Profile mentioned diarrhea outbreaks affected residents in 12 provinces in Indonesia. The number of diarrhea sufferers was 1,725, and there were 34 deaths caused by diarrhea (Indonesian Ministry of Health, 2018). Food poisoning can occur as a result of several factors, including poor personal hygiene, unclean food processing equipment, and improper and unhealthy

food handling methods (Amikawati et al, 2017).

Food safety is something that needs attention. Unsafe food can create a cycle of disease. Given the possibility of diseases that can be transmitted through food and drink, monitoring the hygiene and sanitation of food management places is an important effort in all public health activities. Food hygiene and sanitation are needed to protect food from contamination and disease-transmitting microorganisms in order to prevent food borne diseases from occurring. Food contaminated by microorganisms or toxins entering the human digestive tract can cause diseases such as diarrhea, typhoid, gastrointestinal syndrome, and worm infections (Herman et al, 2015). Food hygiene and sanitation in food processing facilities at airports are expected to reduce, minimize, and eliminate negative impacts that may arise from the ongoing food processing.

The Port Health Office is one of the technical implementation units within the Indonesian Ministry of Health which consists of several divisions, one of which is Environmental Risk Control. This division has the task of carrying out supervision of sanitation hygiene in food management sites and securing food and beverages in the airport and port environment. Supervision for food and beverage security starting from the selection of raw materials to the serving of food are required to protect food and beverages. This must be done to reduce the possibility of contamination and ensure that the food is safe for consumption and does not cause harm, poisoning, or disease in humans (Indonesian Ministry of Health, 2007).

Airports have a very important role in preventing the spread of various diseases that may occur. Airports provide basic and supporting facilities, one of which is restaurant. Restaurants which provide food for the public have the potential to cause health problems or spread diseases caused by the food they produce; therefore, the

hygiene and sanitation of food management sites at airports require further supervision to prevent food borne diseases. Juanda Airport in Surabaya is one of the working areas of the Class I Surabaya Port Health Office which has the authority to supervise the sanitation hygiene of the food management sites there. Speaking about the issue, this study aimed to describe the sanitation hygiene and bacteriological quality of food and equipment on the food management sites at Juanda Airport, Surabaya.

## **METHODS**

This was a descriptive observational study that used a cross sectional study design. All 53 food management sites in Terminal 1 of Juanda Airport became the research population. The sample size in this study was 4 food management sites determined based on the number of sites accepting survey schedule on a monthly basis. The food management sites which were surveyed in February 2019 were food management sites A, B, C, and D.

The research variables were sanitation hygiene and bacteriological quality of processed food, as well as the bacteriological quality of equipment used by the food management sites. The data collection on hygiene was done by observing the selected food management sites. An interview was also carried out with a food labor at each food management site to investigate the personal hygiene of the food labor. The observation and interview guide was the assessment sheet of sanitation hygiene which is based on the Indonesian Ministry of Health Regulation Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation. A food management site is declared having good sanitation hygiene if the total score obtained in the assessment reaches a minimum of 700 (Indonesian Ministry of Health, 2003).

The bacteriological quality of food and equipment was assessed by examining food samples and equipment from each

food management site. The food samples underwent a bacteriological examination with the *Escherichia coli* parameters. The sampled food was food served warm with around 50-70°C. The swab method was used for sampling the equipment, which was then checked with the parameters of the total plate number (ALT) and *Escherichia coli*. Examination of food samples was carried out at the Surabaya Health Laboratory Center.

The variables of hygiene, sanitation, food quality, and equipment quality were analyzed by comparing the scores obtained and the results of the bacteriological food and equipment quality as regulated in the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation. A food management site was declared having sanitary hygiene if it obtained a minimum score of 700. Food quality was declared to meet health requirements if no *Escherichia coli* was found in the food (level = 0 per gram of food sample). Meanwhile, the quality of the equipment was declared to meet the health requirements if the germ count or ALT was 0.

This study has passed the ethical clearance by the Health Research Ethical Clearance Committee, Faculty of Dental Medicine, Universitas Airlangga with the

Certificate No. 344 / HRECC.FODM/VI/2019.

**RESULTS**

**Food Hygiene and Sanitation Assessments on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya**

Table 1 shows the results of food hygiene and sanitation assessments on the four food management sites, all of which received a score of more than 700. The highest score was obtained by food management site B, while the lowest score was obtained by food management site D. Food management site A had a score of 796.5; food management sites B had a score of 813.5; food management sites C had a score of 798.5, and food management sites D had a score of 752.5.

**Bacteriological Inspection of Food on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya**

Table 2 shows that the examination of food samples obtained negative results, meaning there was no *Escherichia coli* in the food samples taken from food management sites A, B, and C. Meanwhile, the food samples taken from food management site D had *Escherichia coli*.

**Table 1.** Results of Food Hygiene and Sanitation Assessments on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya

Variables	Maximum Score	Food Management Sites			
		A	B	C	D
Location and building	100	84.5	83.5	84.5	81.5
Sanitary facilities	150	115	117	123	97
Kitchen, dining room and grocery store	150	117	127	111	104
Food ingredients and finished food	110	77	77	77	77
Food processing	50	50	50	50	50
Storage of food stuff	90	78	86	78	78
Food serving	50	40	40	40	40
Equipment	150	120	120	120	120
Labor	150	115	113	115	105
<b>Total Score</b>	<b>1,000</b>	<b>796.5</b>	<b>813.5</b>	<b>798.5</b>	<b>752.5</b>

**Table 2.** Bacteriological Quality Inspection Results of Food on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya

Food Management Sites	Type of Food	Bacteriological Examination Status ( <i>Escherichia coli</i> )
A	Coconut-milk vegetable soup	Negative
B	Corn soup	Negative
C	Tamarind vegetable soup	Negative
D	<i>Rawon</i>	Positive

**Table 3.** Bacteriological Quality Inspection Results of Equipment on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya

Food Management Sites	Types of Equipment	Bacteriological Examination Status	
		<i>Escherichia coli</i>	ALT
A	Plate	Negative	10
B	Soup bowl	Negative	180
C	Tablespoon	Negative	160
D	Bowl	Negative	530

### Bacteriological Quality Inspection of Equipment on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya

Table 3 presents that the food management sites A, B, C, and D were not contaminated by *Escherichia coli* bacteria. However, the ALT of the equipment used by each food management site was more than 0 which exceeded the threshold value. The number of ALT in food management site A was 10 colonies, food management site B 180 colonies, food management site C 160 colonies, and food management site D 530 colonies.

## DISCUSSION

### Overview of Hygiene and Sanitation on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya

The results indicated that 4 food management sites at Terminal 1 of Juanda Airport in February 2019 obtained a total score of more than 700. All the food management sites had met the sanitation

requirements and were declared to have proper sanitary hygiene. This followed the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation.

Table 1 explains food processing on each food management site that had met the maximum score. However, some others still received a score far from the maximum score. The result of this study is in line with research conducted by Dakwani (2019) showing the food processing conditions on food management sites in Gudang 100 met the requirements because food labor used food tongs, spoons, forks, and plastic gloves to protect food from cross-contamination.

Location and building variables on each four food management sites did not meet the requirements in the Regulation of the Indonesian Ministry of Health Regulation Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation. The food management buildings had broken doors. Some areas did not even have doors, and thus there was a high possibility of insects and rats entering the

buildings. The presence of insects and mice on a food management sites can be a source of disease transmission (Pulungan et al. 2013). This is similar to research by Dakwani (2019) who found that location and food management buildings in 100 warehouses at several depots did not yet meet the requirements according to the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation. Food management rooms were directly exposed to outside conditions, meaning that there was a great potential for pollution e.g., incoming smoke, dust, rats, and insects to enter the areas. The food management sites were located at Terminal 1 of Juanda Airport. However, the food management sites were not properly closed off, thereby leading to the risk of being contaminated by rats, insects, and other Disease-carrying animals.

Several variables that met the requirements included location, floor, walls, ventilation, lighting, roof, and ceiling. The four food management sites were located farther than 100 meters away from sources of pollution; therefore, no unpleasant or foul odor could enter from these sources. The buildings hosting the four food management had clean, flat, waterproof, and non-slippery floor even though the edges of the floors were not conical. The walls and ceiling looked clean and dry. The ventilation used was artificial ventilation with the help of a functioning air conditioner (AC). In other words, the room temperature was not hot and the air circulation was good. There was enough natural and artificial light to illuminate the room. Insufficient lighting can cause discomfort and eye fatigue, and reduce a person's productivity (Amikawati c 2017).

One of the sanitation facilities on the food management sites was clean water. The availability of clean water was sufficient as needed. The quality of clean water available on each site met the standard according to the Regulation of the Indonesian Ministry of Health Number 492

of 2010 concerning the Requirements for the Quality of Drinking Water which should be colorless, odorless, and tasteless.

Wastewater produced by each food management sites flew to closed, watertight, and smooth channels. The wastewater disposal channel on the sites met the requirements because the sewerage drainage flew smoothly, was closed and watertight, and was equipped with a grease trap to avoid freezing or clotting of oil which can cause blockages in the drain pipe and minimize adverse impacts on the environment. Wastewater needs to be processed before it is disposed of into water bodies. It ensures it does not pollute the environment and pose a danger to human health (Yogisutanti et al.2018).

Grease traps are also used at Kualanamu Airport to separate trash and dirt from water. Garbage and dirt originating from restaurants, offices, and toilets are channeled into the grease traps to prevent them from clogging the sewerage (Sudjanto et al. 2016).

However, the results of this study are different from research conducted by Pulungan et al. (2013), who noted that the disposal of wastewater on the food management sites at Terminal of Roro Port did not meet health requirements because the sewerage was clogged and discharge of wastewater was not smooth or the wastewater was stagnant around the sites. Things like this can lead to the proliferation of disease vectors.

Garbage officers got rid off the trash cans on the food management sites every 24 hours to avoid piles of garbage. However, there were two food management sites that still had open trash cans. The piles of garbage could become a nest for vectors and mice. Improper waste management will have a negative effect on human health because waste may become a breeding ground for vectors and rats. Besides, the use of open trash cans allows cockroaches, flies, mice, and other animals to infest the trash. This presents potential food contamination due to cockroaches, flies, rats, or other

animals perching or touching the food and carrying bacteria that can cause health problems (Nuraini and Hajimi, 2014).

The most important place in food processing is kitchen. The kitchen should be taken under high consideration because it has a fairly high probability of contamination or spread of disease through vectors and food (Mutiarani, 2017). The results of this study indicated that the condition of the kitchen, dining room, and food warehouse on all food management sites did not meet the requirements. Overall, there were no written hygiene precautions for food labors or employees in the kitchen and no sinks for handwashing facilities in the dining room. Meanwhile, the grocery store didn't take proper precautions to keep insects and rats at bay.

The results of this study are similar to research conducted in restaurants in Losari Beach, Makassar City, which revealed that the kitchen, dining room, and grocery store did not meet health requirements. Some restaurants did not post hygiene precautions for food labors in the kitchen and had no automatic opening-and-closing doors in the dining room as well as insufficient food storage capacity (Fadly et al. 2017).

Food ingredients and processed food almost met the requirements since they were physically in good condition and registered in the lists of approved foods by the Indonesian Ministry of Health. Besides, there were no expired food ingredients or processed foods. The results of this study are in line with research conducted by Dakwani (2019) who said food ingredients on food management sites of Gudang 100 were not stored for a long time. The food handler stated they bought and prepared food ingredients from the market in the morning, and then the food ingredients were processed on the same day.

The food processing variable was the only variable fulfilled with the maximum score. Employees as food processors or food handlers wore complete clean uniform as required, such masks,

headgear, and aprons. Clean work clothes ensure sanitation and hygiene in food management because such clothes are free from dust or dirt, which can indirectly cause food pollution. Moreover, food handlers also used special tools to handle food. Food labors understand that long, dirty nails can contaminate the food.

A study stated that during food processing at the nutrition installation, Dr. Harjono paid less attention to sanitary work. The cooks seemed to taste the food by hand, and not all cooks wore aprons when processing food. There were food handlers who used aprons as hand rags after washing their hands. However, aprons should not be used to wipe hands and must be clean because dirty aprons can facilitate bacteria to breed (Jiastuti, 2018).

Workers on the four food management sites had not met the requirements because not all food handlers had attended courses and never done disease check-up. This is strongly inconsistent with the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation, which requires employees/food handlers to do check-up every six months and attend courses on food sanitation hygiene (Indonesian Ministry of Health, 2003). Employees and food handlers on all food management sites did not have open wounds and did not suffer from infectious diseases or skin diseases such as scabies, sores, or boils. Food handlers maintained cleanliness by always washing their hands with soap and running water before and after processing food. In addition to these requirements, employees and food handlers did not smoke while working, had short and clean hair and nails, and wore clean and tidy clothes. Food handlers in particular always wore an apron and a cap. They have a big role in maintaining the quality of the food served because they may be agents that can cause food contamination. Contamination of food caused by employees or food handlers may happen through various means such as



coughing, sneezing, and wounds on the hands (Amikawati et al. 2017).

### **Descriptions of Bacteriological Food Quality on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya**

The results showed that the bacteriological food quality at most food management sites met the health requirements as specified in the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation. It ensures that there are no *Escherichia coli* bacteria in the food. However, as seen from Table 2, some food still contained *Escherichia coli* bacteria.

Based on the regulation, prepared food served in restaurants must be in a good condition, i.e., not rotten or damaged. The food served should not contain *Escherichia coli* bacteria or have 0 bacteria per gram of food samples (Indonesian Ministry of Health, 2003).

The most common bacteria found in food is *Escherichia coli*. It is a major cause of food borne diseases in many countries. Some *Escherichia coli* bacteria can cause a disease or are pathogenic because they secrete Shiga-like toxins. Shiga toxin-producing *Escherichia coli* (STEC), enterohemo hemorrhagic *Escherichia coli* (EHEC), and verocytotoxic *Escherichia coli* (VTEC) are bacteria's names and can produce Shiga-like toxins. *Escherichia coli* O157: H7 is a type of STEC that is most often found in food or beverages. When a person is infected by STEC, he/she will feel abdominal pain accompanied by diarrhea for 24 hours or longer. If this disease is not treated quickly, complications will occur and endanger a person's life. The complications included necrosis of intestinal tissue, bloody diarrhea, and other acute and chronic diseases such as hemorrhagic colitis (HC) and hemolytic uremic syndrome (HUS). However, other researchers asserted that *Escherichia coli* is an early indication of pathogenic *Escherichia coli* strains such as *Yersinia sp.*,

*Salmonella sp.*, or *Shigella sp.* that may cause food borne diseases or diarrhea; therefore, *Escherichia coli* cannot be considered as the main cause of diarrhea (Elfidasari et al., 2011; Rananda et al., 2016; Saridewi et al., 2016).

The main requirement in determining good food quality is reviewing sanitation because, directly or indirectly, environmental conditions are related to food processing and serving. Poor environmental sanitation, especially in the kitchen, can cause the area to become a source of food contamination. *Escherichia coli* is a bacterium that often contaminates food. Its presence in water or food has a significant relationship with the discovery of pathogenic germs in food. *Escherichia coli* is used as an indicator of water or food contamination for microbiological requirements because it may indicate human fecal contamination. Contaminated food or drinks can indicate that sanitation practices are not being implemented properly (Kurniadi et al. 2013).

In addition to food processing, open serving of food can also result in contamination by bacteria, dust, and flies. Personal hygiene in food handlers e.g., handwashing before and after touching food, therefore, has an influence on food quality and the occurrence of contamination in food. Despite food processing and environmental conditions, personal hygiene in food handlers also needs to be considered to prevent food contamination. Maulana's (2018) research noted similar findings that food handler hygiene had a major effect on the incidence of pathogenic *Escherichia coli* contamination. Contaminated food, thus, can pose dangers to humans.

The results of this study are commensurate with research conducted by Romanda et al. (2016), who discovered *Escherichia coli* in food samples on the food management sites around the buffer area of Adi Soemarmo Airport, Surakarta. The presence of *Escherichia coli* in food was correlated with poor personal hygiene in food handlers, for example, not using

head coverings which may bring to cross-contamination during the food processing. The hands of food handlers are vectors of transmission for food borne disease (Lambrechts et al. 2014). If employees or food handlers are aware of and understand the importance of personal hygiene and health care, food safety will also improve. It is one of the basic requirements for food management in Indonesia since it can prevent food poisoning and food borne diseases.

Water sources contaminated by pathogenic bacteria can also pose risks to human health. Contaminated groundwater poses a high risk to public health because groundwater is a main source of drinking water. A study conducted by Rifta et al. (2016) stated that ice cubes using well water as raw material were proven to be positive for the *Escherichia coli* bacteria. Well water is more likely to be contaminated by bacteria than PDAM water.

The presence of pathogenic bacteria in food or beverages can be attributed to improper food storage. This study found that one of the food management sites processed food on an open shelf. Uncovered food storages can be contaminated by dust, insects, and microorganisms, which can reduce the quality of food and make the food unsafe for consumption. This is in line with Yunus's research which states that a food storage had a significant relationship with the occurrence of *Escherichia coli* contamination in food at restaurants in Padang, Manado, and Bitung cities. Processed food requires more attention in terms of food storage. Storage for processed food should not be attached to walls or floors and be protected and free from dust, insects, harmful chemicals, and other animals (Yunus et al. 2015).

The increase in the number of types of microbes in food can be due to improper use of tools, for example, the use of one knife for cutting both raw food and cooked or processed food. Equipment that is not well-washed before use can also increase

the number of microbes in food (Suryani, 2014).

### **Bacteriological Equipment Quality on Food Management Sites at Terminal 1 of Juanda Airport, Surabaya**

The results of this study indicated that all cutlery samples from the food management sites at Terminal 1 of Juanda Airport did not meet the health requirements as specified in the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation.

Table 3 shows the results of the bacteriological examination of cutlery samples using cotton swabs. All equipment samples were not found to have *Escherichia coli*, but all cutlery samples had an ALT value of more than 0 (zero) or exceeding the threshold value, meaning they did not meet the health requirements.

Based on the regulation, the number of germs on tableware should be 0 (zero) (Indonesian Ministry of Health, 2003). It was obtained from the ALT test which is the calculation of the number of microorganisms in general based on a large group such as bacteria, microalgae, or other bacterial groups but not specifically based on types of microorganism. ALT shows the number of bacteria that grow and develop in samples and can be a reference to determine the quality and safety of simplicia.

The presence of germs on utensils can be due to non-optimal washing of cutlery. As the four food management sites were surveyed, only one food management site used hot water to disinfect eating and cooking utensils. Hot water as disinfection can kill pathogenic bacteria that stick to tableware and cooking utensils. However, the laboratory results showed that the presence of column was still found in the cutlery although it was washed with hot water. This can happen because of higher demands in food causing food management inoptimal. To supply more cutlery, employees dry it with a cloth to make it available more quickly. Unclean dryer

wipes can be a source of germ or bacterial contamination on cutlery. Apart from poor washing of cutlery, bacterial contamination on cutlery can also be caused by poor personal hygiene practices among employees, such as avoiding to handwashing and storing cutlery in open places.

The results of this study are similar to Budon's in that all the tableware used at the canteen had an exceeding number of germs. In washing utensils, some steps include removing food scraps, using soap or detergent, using a washing tub, not soaking, and not draining the utensils or not drying it with a rag. All canteens did not store cutlery in closed cupboards or shelves (Budon, 2013).

Research conducted by Suryani (2014) found that unstandardized sanitation facilities could increase potential growth of germs on tableware. Likewise, washing of cutlery has a relationship with the number of germs on eating utensils at restaurants in the Depok Beach tourism area. Meanwhile, another opinion mentions that the number of germs that exceeds the threshold value on glass cutlery is probably caused by washing methods without disinfectants or with stagnant water (Yulia, 2016). Factors that affect the number of germs in food equipment include the source and quality of water for washing, washing method, use of disinfectants, pollution from wind, room conditions, and storage racks for cutlery (Khalidun and Baharuddin, 2018).

Cutlery should be washed in three tubs, which are a washing tub, a rinsing tub, and a rinsing tub with disinfectant. Used utensils should be washed thoroughly using hot water and soap. Equipment that has been washed and disinfected should be completely drained on a stainless steel rack until it dries on its own (Haderiah et al. 2015). It is not recommended to use a cloth or napkin for drying the tableware. If the cloth or napkin used is not clean (i.e., stained, damp, and unpleasant), it will cause bacterial contamination on the tableware. A damp cloth can be a breeding ground for

bacteria. A stained and unpleasant cloth can contribute to the number of bacteria on the tableware (Fadhila et al. 2015).

## CONCLUSION

Based on the results, all food management sites at Terminal 1 of Juanda Airport, Suabaya surveyed in February 2019 met the sanitation requirements and followed proper sanitation hygiene guidelines. However, they did not meet the required bacteriological quality of the equipment due to exceeding ALT value as specified in the Regulation of the Indonesian Ministry of Health Number 1098 of 2003 concerning Restaurant Hygiene and Sanitation. In terms of the bacteriological food quality, most of the food management sites at Terminal 1 of Juanda Airport met the health requirements as recommended.

Food management site owners need to repair some washing tubs that must have three wash basins and equipment according to the standard. Besides, the Class 1 Surabaya Port Health Office needs to carry out routine education and training on food sanitation hygiene for improving food quality. This effort may increase the knowledge and awareness of food handlers and food management site owners.

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# ANALYSIS OF MANAGERIAL COMPONENTS IN MOSQUITO VECTORS (Aedes Aegypti) CONTROL IN THE BUFFER AREA OF THE CLASS 1 SURABAYA PORT HEALTH OFFICE

**Fauzia Yulianti Ramadhani**

Departement of Enviromental Health,  
Faculty of Pubile Health, Airlangga University, Surabaya, Indonesia  
Correspondence address: Fauzia Yulianti  
Email: fauzia.yulianti.ramadhani-2015@fkm.unair.ac.id

## ABSTRACT

The *Aedes aegypti* index in the buffer area of the Class 1 Surabaya Port Health Office was in accordance with the Standard Operating Procedures (SOP) as stated in the Regulation of the Indonesian Ministry of Health Number 431 of 2007 (431/MENKES/SK/IV/2007) on Technical Guidelines for Control of Environmental Health Risks in Ports/Airports/Cross-Border in the Context of Health Quarantine. The Port Health Office has responsibilities to control environmental risks, one of which was the *Aedes aegypti* mosquitos in the borders. This study was descriptive observational and aimed to analyze the managerial components in *Aedes aegypti* mosquito control in the buffer area of the Class 1 Surabaya Port Health Office in Surabaya. The research variables (factors that determine control activities) were manpower, money, methods, materials, markets, machines, and information. The research subjects were two officers at Class 1 Surabaya Port Health Office and five cadres who monitored larva. Data were analyzed descriptively. The results explained that manpower, money, materials, market, technology, and information were all in accordance with the SOP of the Surabaya Port Health Office. However, the larva survey method did not comply with the SOP as officers still used the visual method. It was concluded that managerial components in *Aedes aegypti* control by Class 1 Surabaya Port Health Office followed the SOP except in their larva survey method. The researchers recommended carrying out a larva survey method by taking 1 larva from each container (single larva) at a time.

**Keywords:** *Aedes aegypti*, control vector, managerial components.

## INTRODUCTION

The revised International Health Regulations (IHR) of 2005 only mandates handling infected people and advising to call the nearest health service unit if symptoms of illness appear, but not mentioning the requirement of quarantine. Failure to take the actions may not overcome the global threat of disease caused by environmental change, resulting in a public health emergency of international concern (Indonesian Ministry of Health, 2007).

Preventive actions from the exit and entry of diseases, especially quarantine diseases, are the main strategic function of the Port Health Office (Surabaya Port Health Office). According to the Regulation of the Indonesian Ministry of Health Number 2348 of 2011

(2348/MENKES/PER/XI/2011) on Organization and Work Procedures of the Port Health Office, the Surabaya Port Health Office is a unit that technically works under the Ministry of Health and reports their work to the Directorate General of Disease Control and Health Environment.

The Surabaya Port Health Office has authority over land borders and monitors the entry and exit routes of carriers from one country to another in ports, airports, and land borders. These areas have the potential to become hubs for disease carriers moving from one country or region to another. Therefore, ports and airports are places worth investment since they are prone to vector-transmitted disease disturbances.

The work areas of the Class 1 Surabaya Port Health Office are Tanjung

Perak Surabaya, Gresik, Tuban, Kalianget, and Juanda Airport. Health problems that occur in the Juanda Airport environment are sorted out by the Class 1 Surabaya Port Health Office. This was an effort to control environmental risks by preventing the spread of infectious diseases and others, especially in the perimeter and buffer area according to standards in a professional manner. The numerous activities in the Juanda Airport area, where people and planes from various regions pass, have caused the airport to become a potential breeding ground area for disease vectors. One of them is the *Aedes aegypti* mosquito vector which can cause Dengue Hemorrhagic Fever (DHF). According to Atikasari and Sulistyorini (2018), the distribution of the *Aedes aegypti* vector could be extensively widespread in both densely populated cities and rural areas.

In subtropical and tropical areas such as the Northern islands of Australia and the Indonesian archipelago, mosquitoes, especially the *Aedes aegypti*, are found easily. Mosquitoes can carry 4 different dengue viruses, one of which is the cause of DHF (Indonesian Ministry of Health, 2016). DHF is an endemic disease that occurs year-round in many tropical and subtropical areas. This is even more prominent during the rainy season when conditions are favourable for mosquitoes to breed. In general, this is the time where large numbers of people will be infected for a short time which may cause outbreak.

Humans have been susceptible to the four dengue viruses, in Africa and Southeast Asia, since 100-800 years ago. The dengue virus rapidly spread during World War 2 where mosquitoes were transferred through the goods shipping, potentially contributing to the global spread of DHF (Centers for Disease Control and Prevention, 2010).

Nine countries were infected with dengue fever before 1970. However, DHF is still a disease endemic in over 100 countries today. The highest number of dengue cases, currently, was found in the

West Pacific, East Mediterranean, America, Africa, Southeast Asia, America. The number of cases in Southeast Asia, the Western Pacific, and the United States exceeded 1.2 million cases in 2008 and 2.3 million cases in 2010. In 2013 there were reports of 2.35 million cases in America with 37,687 cases of severe dengue. Not only was the current number of dengue cases increasing, but also it spread outside the tropic and subtropic areas such as Europe. In 2010, local transmission was first reported in Croatia and France. In 2010, there were over 2,000 cases of DHF in more than 10 countries in Europe. In 2012, around 500,000 people infected with DHF required hospitalization each year with most children died or 2.5% of the total deaths (World Health Organization, 2014).

Based on the annual report of Class 1 Surabaya Port Health Office, the House Index (HI), Container Index (CI), and Breteau Index (BI) in the buffer survey area were still above the Standard Operating Procedures (SOP) as stated in the Decree of the Indonesian Minister of Health Number 431 of 2007 (431/MENKES/SK/IV/2007) concerning Technical Guidelines for Environmental Health Risk Control at Ports/Airports/Cross-Border in the Context of Health Quarantine.

DHF becomes a significant public health issue in Indonesia. According to Istiqomah and Syahrul (2016), activity, mobility, and the habit of hanging clothes are risk factors of DHF in children aged less than 15 years. In line with the increase in community density and mobility, the distribution area of DHF and the numbers of the infected people may increase as well. In 1968, 58 people in Surabaya were infected with dengue fever, resulting in 24 deaths and a 41.3% mortality rate. Since then, DHF has spread widely throughout Indonesia (Indonesian Ministry of Health, 2010).

The *Aedes aegypti* mosquitoes vector control measures include

monitoring, identification, and the eradication of adult mosquitoes and larva (Nani, 2017). The *Aedes aegypti* mosquitoes control in the Class 1 Surabaya Port Health Office is carried out by the Environmental Risk Control Division in the Vector Control and Contagious-Disease Animals section. This section has the task of developing partnership networks, work and technology, as well as training and education in regards to controlling infection-transmitting animals and vectors in an airport environment; studying and disseminating information; controlling pesticides; eradicating disease-transmitting insects, fleas, and rats; coordinating the implementation of the eradication of infectious insects; preparing reports, evaluating, monitoring, and preparing materials.

From the cases described, the prevention and eradication program for DHF at the Class 1 Surabaya Port Health Office require managerial activities such as planning a program. According to Manullang (2008), the management components include 6M + 1I (man, money, methods, materials, market, machine, and information) and need to be implemented in the program.

The standard control measures for the *Aedes aegypti* mosquito vector that has been done by the Class 1 Surabaya Port Health Office included (1) personnel (man), (2) budget (money), (3) methods, tools, and materials, (4) marketing activities (market), (5) technology (machine), and (6) information. These factors were interrelated and affected the results of control measures. Based on Mufidz's research (2016), the implementation of *Aedes aegypti* mosquito control activities at the Tegal District Health Office depended on personnel, infrastructure, and funding. To further study this, the current research aimed to analyse the managerial components carried out by the Class 1 Port Health Office of Surabaya in mosquito vector control (*Aedes aegypti*) in the buffer area.

## METHODS

This study was observational research, where observations were conducted without intervening on the research subjects. The research population was the personnel responsible for the *Aedes aegypti* mosquito vector control at the Class 1 Surabaya Port Health Office of the Juanda Airport (2 people) and vector-monitoring personnel (5 people) in Semampir village, Sedati sub-district, Sidoarjo city. The sample used in this study was the total population. The study was conducted at the Class 1 Surabaya Port Health Office, specifically the Juanda Airport work area.

This study used both primary and secondary data. Secondary data were obtained from reports of budget (money) and information (information), while primary data were obtained from the interview and observation. Interviews were conducted to dive into the managerial components i.e., personnel (man), methods (method), tools and materials (materials), marketing or socialization (market), and technology (machines) which were compared to the SOP as stated in the Decree of the Indonesian Minister of Health Number 431 of 2007 (431/MENKES/SK/IV/2007) on Technical Guidelines for Environmental Health Risk Control at Ports/Airports/Cross-Border in the Context of Health Quarantine.

The standard vector control of *Aedes aegypti* mosquitoes included technical and implementing requirements. The technical requirement was that the mosquito vector control was conducted in the perimeter and airport buffer areas. Implementation of vector control should involve locations mapping, equipment needed for activities, control procedures, indexes calculations, and identification of adult mosquitoes and larva. Observations were made directly to the implementation of the vector control measures.

In this study, a data analysis was carried out descriptively by giving an



overview of the results. This study obtained an ethical review passing statement from the Ethics Commission,

Faculty of Dental Medicine, Universitas Airlangga, No: 300/HRECC.FODM/V/2019.

**RESULTS**

**Budget (Money)**

**Table 1.** Budget for *Aedes aegypti* Mosquito Control Program at Class 1 Surabaya Port Health Office

Activities	Activity Components	Frequency per Year	Volume
Larva survey	Incentives for Larva-monitoring personnel	12	5 people
larvae eradication	Larvicide powder	12	10 grams/house in 1 urban village
Fogging	Refreshment of cadres and supervisory personnel	4	2 cadres and 1 supervisor in 1 village
	Diesel purchase for insecticide solutions	4	19 liters per hectare
	Fuel purchase for a fog machine	4	3 liters per hectare
	Transportation fare for supervisors	4	1 person in 1 village
Socialization	Leaflets or brochures	12	50 people in 1 village

The budget allocated for *Aedes aegypti* mosquito control measures was in accordance with the SOP. The cost also included the larva-monitoring personnel, the procurement of larvicide powder, refreshment of cadres and health personnel, procurement of diesel fuel mixed with insecticides, procurement of fuel for fog machines, and transportation for supervisors. Meanwhile, the cost for outreach activities was issued for making leaflets or brochures.

The incentives were provided for 5 people per activity which was conducted 12 times a year. The 10 grams of larva pesticide was given per house in 1 urban village. Expenses spent for fogging activities were allocated for personnel's refreshments (2 cadres and 1 supervisor in 1 urban village), procurement of diesel (19 liters per hectare), procurement of fog engine fuel (3 liters per hectare), and transportation fare for supervisors (1 person in 1 village). While brochures or

leaflets for socialization activities were disseminated to 50 people in 1 urban village.

**Method**

**Table 2.** *Aedes aegypti* Mosquito Control Method at Class 1 Surabaya Port Health Office

Control Measures	Methods Used
Larva survey	Visual
Identification of mosquito larva	Microscope identification
Larva eradication	Small holes or pores in the larvicide packaging
Fogging	Fumigation based on case size and density figure

## Tools

The equipment used during the program was mosquito larvae survey sheet, identification forms, and fogging machines.

**Table 3.** *Aedes aegypti* Mosquito Control Measures at Class 1 Surabaya Port Health Office

Control Measures	Tools
Larva survey	1. Larva Examination Form 2. Stationery 3. Larva survey kit 4. Small bottles
Mosquito Larva Identification	1. Petri dish 2. Needle 3. Preparatory slide 4. Slide cover 5. Microscope
Larva eradication	1. Larvaeradication Form 2. Stationery
Fogging	1. Fogging machine 2. Jerry can 3. Fogging Report Form

## Materials

Some materials were used for Larva eradication and fogging.

**Table 4.** Materials for *Aedes aegypti* Mosquito Control Measures at Class 1 Surabaya Port Health Office

Activities	Materials Used
Larvaeradication	1. Larvicide powder (Temephos)
Fogging	1. <i>Lamda Cyhalothrin</i> 2. Solar Dex 3. Gasoline

## Socialization

The socialization carried out by the Class 1 Surabaya Port Health Office was explained in Table 5.

**Table 5.** Socialization of *Aedes aegypti* Mosquito Control Measures at Class 1 Surabaya Port Health Office

Indicators	Descriptions
Method	Extension
Target	Female in the work area of Class 1 Surabaya Port Health Office
Theory	1. The life cycle of a mosquito 2. Bionomics of mosquitoes 3. The 4M plus effort

The socialization was carried out routinely through counseling on the vector life cycle (*Aedes aegypti* mosquito), the bionomic of *Aedes aegypti* mosquito, and the 4M plus effort (draining, closing water reservoirs, recycling, getting rid of used goods, eradicating larva, and avoiding mosquito bites). Besides, leaflets or brochures detailing the importance of the control measures and the dangers of dengue fever were also distributed.

## Technology

**Table 6.** Use of Technology in *Aedes aegypti* Mosquito Control Measures at Class 1 Surabaya Port Health Office

Types of Technology	Descriptions
Hardware	1. Laptop or computer 2. Printer 3. Microscope 4. Fogging machine
Software	1. Microsoft office 2. Health Quarantine Information System Website (SINKARKES) 3. Email

In carrying out *Aedes aegypti* mosquito vector control, the Class 1

Surabaya Port Health Office used technologies to report the results.

**Information**

The control measures for *Aedes aegypti* mosquitoes were reported monthly, annually, and lastly via the Health Quarantine Information System (SINKARKES). The information was reported to the Directorate General of Disease Prevention and Control of the Indonesian Ministry of Health. The profile of the Surabaya Port Health Office regarding the yearly accomplished activities was also submitted to the Indonesian Ministry of Health, the Directorate General of Disease Prevention and Control, the East Java Provincial Health Office, the Surabaya City Health Office, and other cross-institutions.

**Table 7.** Information about *Aedes aegypti* Mosquito Control Measures at Class 1 Surabaya Port Health Office

Variables	Descriptions
Types of Report	1. Monthly Report
	2. Annual Report
	3. SINKARKES Report
	4. Port Health Office Profile
Report Dissemination	1. Indonesian Ministry of Health
	2. Directorate General of Disease Prevention and Control
	3. East Java Provincial Health Office
	4. Surabaya City Health Office
	5. Other cross-institutions

**DISCUSSION**

**Personnel (Man)**

Human Resources (HR) is a framework for formal systems within an organization to strengthen the efficiency and effectiveness of human potential and

talents in achieving organizational expectations (Mathis and Jackson, 2010). Human resources have a strategic role in a company because they are the main driver in an activity process and determine the smooth running of activities (Qustolani, 2017). There was 2 female personnel in charge of the *Aedes aegypti* mosquito control program in the working area of Juanda Airport. They were aged 46 years and 28 years in the Environmental Risk Control Division. One of them had attended a Training of Trainer (TOT), supporting her expertise and skills in carrying out *Aedes aegypti* mosquito control measures. They were highly educated as one had a bachelor's degree and the other had associate degree of environmental health.

The personnel at the health office was responsible for supervising and preparing reports of larva survey, larva identification, larva eradication, and fogging. Besides, they also provided counselling and guidance to larva-monitoring cadres and residents of Semampir village, thereby making the program run smoothly . The number of personnel was also adequate and in accordance with the standard which requires personnel to have appropriate educational competencies, for example, being a sanitarian or entomologist (Indonesian Ministry of Health, 2007).

The control measures for *Aedes aegypti* mosquitoes ranged from larva survey, larva identification, larvasidation, and fogging. The personnel was assisted by the larva-monitoring cadres who had received training from Class 1 Surabaya Port Health Office. The cadres consisted of 5 women aged 30-40 years and graduating from junior high school (1 person) and senior high school (4 people). One's education level is closely related to the broadness of knowledge, understanding, and problem solving (Muliawati, 2016).

Besides, there was a relationship between the cadre's education levels and their performance in eradicating dengue

(Indarwati and Prayitno, 2016). All cadres in Semampir had attended training (100%). Two people took training from the primary healthcare center and the Class 1 Surabaya Port Health Office, and three people received training from the Class 1 Surabaya Port Health Office. The cadres actively carried out larva surveys in 4 days at the fastest and one week at the longest.

In addition to examining *Aedes aegypti* mosquito larva, the cadres also provided counselling on how to prevent mosquito larva to the residents. Their roles will be under supervision and guidance from the Class 1 Surabaya Port Health Office. The cadres received facilities such as flashlights, stationery, larvicide powder, larva survey forms and uniforms from the Class 1 Surabaya Port Health Office. The incentives given was Rp. 150,000.00 per month per person. The personnel aspect in the *Aedes aegypti* mosquito control measures accorded with the SOP.

### **Budget (Money)**

Budget is a written plan on organization's activities stated in units of money or in units of services or goods (Nafarin, 2013). It is an influential instrument on implementing programs (Fitriyah and Fauzy, 2017). The budget for the *Aedes aegypti* control program was allocated from the 2019 Budget Implementation List (DIPA). There were four activities that required budgets, such as larva survey, larva eradication, fogging, and socialization.

### **Method**

A method is a rule implemented to execute real plans and achieve goals optimally (Sanjaya, 2010). There were four methods used in the *Aedes aegypti* control program.

### **Larva Survey**

Monthly larva surveys were conducted visually by looking for larva in each water reservoir, both outside and

inside the house. The Class 1 Surabaya Port Health Office also took larva samples from some water reservoirs. According to the SOP, the larva survey indicators include the House Index (HI), Container Index (CI), and Breteau Index (BI). The HI was measured by dividing the number of positive-larva houses by the number of inspected houses. The CI was calculated by dividing the number of positive-larva containers by the number of inspected containers. While, the BI was measured by dividing the number of inspected containers by a hundred inspected houses.

The larva survey was carried out by mapping survey locations, and the examination was then done by checking all water reservoirs which possibly become the mosquito breeding sites. Prasetyowati et al. (2014) stated that an *Aedes aegypti* mosquito is anthropophilic or usually bites humans during a few hours of the dawn and before dusk. Inspection of mosquito larva was carried out to large water reservoirs (drums, jars, and bathtubs) and small water reservoirs (flower vases and pots filled with cloudy water), the inspection was done by moving the water to other buckets or scoops. The larva in dark places and cloudy waters were checked using a flashlight.

The results are in line with research by Nadifah et al. (2016) stating that *Aedes aegypti* larva were found in many containers inside the house. This was due to the habit of collecting water for daily use in an open-air house, thus attracting adult mosquitoes to lay eggs.

The SOP stated that the larva survey should use a single larva method. This method is performed by checking water reservoirs, taking 1 larva from each container using a pipette, putting it in a petri dish, and storing it in a bottle labelled by location.

### **Identification of Mosquito Larva**

Mosquito larva was identified after water reservoir survey and sampling. Mosquito larva was identified using a

microscope in an entomology laboratory. First, the chloroform was put onto cotton and then onto a petri dish containing mosquito larva. The dead mosquito larva was then taken slowly with a needle, put on a preparatory slide, and covered with a slide cover. Their characteristics were identified as written in the larva identification guidebook.

According to Sianipar et al. (2018), *Aedes aegypti* mosquito larva has a pair of siphon hairs, a short and fat siphon, comb scales without lateral spines, and an open saddle on the anal segment. The method of mosquito larva identification complied with the SOP.

### Larva eradication

Larva eradication was carried out at the same time as the larva survey. It was done by putting larvicide powder packaged in 10-gram plastic bags with small holes and dropped into a water reservoir. The larvicide powder would stick to the walls of the water reservoir for up to 3 months. The volume of larvicide given must be appropriate. According to research conducted by Fuadzy et al. (2015), the resistance ratio analysis, which was obtained by comparing each LC50 and LC99 larva with the standard larva, indicated that in general *Ae larva. aegypti* began to be resistant to Temephos (RR>1). Then, the larva-monitoring cadres distributed the larvicide powder to residents who were taught about how to use it.

### Fumigation

Fumigation was carried out in a total area of 20 hectares each year or estimated at 5 hectares each month. Adult *Aedes aegypti* mosquitoes were controlled by fumigation. According to Syamsir and Daramusseng (2018), fumigation requires spatial-based mapping of the dengue fever to identify susceptible areas. Fumigation was carried out in the afternoon or morning where the wind was calm. Such a condition

is the perfect time for the *Aedes aegypti* mosquitos breeding. Fumigation was carried out using the Swingfog SN 50 which uses gasoline for the fog engine and diesel fuel as an insecticide mixture (*Lamda Cyhalotrin*). How to work using a pulsed burst pattern. When the fuel mixed with air, it resulted in the combustion chamber vibrating at 90 pulses per second. The gas produced from the chamber would then exit through a small pipe. The chemical solution used would be placed at the end of the resonator and go through the gas pulse. After that, the chemical would be scattered into smaller pieces which were immediately blown into the air through as a thick fog. Inside, the machine was set at about 40-60°C.

All parts outside the house, such as the yard, were targetted as the *Aedes aegypti* mosquitoes fled from outside into the building. The fumigation works through a knock down effect, in which after the mosquito encounters the insecticide droplets, it is likely to die in 24 hours (Indonesian Ministry of Health, 2012). According to the Class 1 Surabaya Port Health Office, fumigation for yards and houses in urban areas usually requires 3-5 minutes of time per house. In one-working day, one worker can fog 20-25 houses on average; however, this is influenced by conditions such as settlement density and location (Rahmadi, 2017). The fumigation complied with the SOP.

### Tools

The equipment used to conduct larva survey, larva identification, and fogging was explained in this section.

### Larva Survey

The equipment included a larva inspection form, stationery, and a larva survey kit such as a scoop, a flashlight, and a small bottle. The larva inspection form and stationery were used to record the number of visited houses and the survey locations. The scoop was used to take

water samples in a reservoir which may contain mosquito larva. A flashlight was used as lighting aids in identifying larva in a dark water reservoir. The small bottle was used to store mosquito larva taken from a water reservoir for further laboratory examination. Overall, the equipment was already in accordance with the SOP.

### **Mosquito Larva Identification**

The equipment used in the identification of mosquito larva was petri dishes, needles, preparatory slide, slide cover, and a microscope. The mosquito larva was put onto a petridish and was then given a chloroform. The needle was used to carefully collect chloroformed mosquito larva body and keep it intact and easy to identify. Slide cover was used to keep the specimen, i.e., the larva, in the desired position for easy identification, while the microscope could produce a closer look at small larva and identify their characteristics and types. The equipment used in the mosquito larva identification was suitable with the SOP.

### **Larva eradication**

The equipment used in larva eradication included a larvasidation form and stationery to record the amount of given larvicide and the number of residents who received bags of larvicide powder. The Class 1 Surabaya Port Health Office used the standardized instrument during this process.

### **Fumigation**

Fumigation was done using a jerry can, fumigation machine, and a fumigation report form. The jerry can functions as a mixing place for the insecticide (*Lamda Cyhalotrin*) and diesel fuel as well as a container for gasoline. The fumigation machine was used to spray the insecticide. The Swingfog SN 50 was chosen since it was effective for indoor use. Meanwhile, the fumigation result form was used to

record the control measures such as the number of used materials, location, and the number of house fumigation. The equipment used for fumigation complied with the SOP.

### **Materials**

#### **Larva eradication**

Materials used in larva eradication were larvicide powder that contains Temephos. Larvicide powder was put into a water reservoir to kill *Aedes aegypti* mosquito larva. The materials should be suitable with the needs for the procurement of material expenditures allocated from the 2019 Budget Implementation List.

Based on research conducted by Basri and Hamzah (2017), larvicide powder at 1% Temephos with a concentration of 300 mg/L can kill the entire sample of *Aedes aegypti* larva at the 4th hour (240th minute). It is more effective than the natural larvicide (*Bacillus thuringiensis israelensis*). The materials used for *Aedes aegypti* mosquito control accorded with the SOP.

#### **Fumigation**

Materials used in fumigation were *Lamda Cyhalotrin*, diesel dex, and gasoline. Twenty-five grams per liter of *Lamda Cyhalotrin* which belongs to the pyrethroid group were used as vector repellent for *Aedes aegypti* mosquitoes. The susceptibility test showed that adult *Aedes aegypti* mosquitoes were bred to the 3rd generation using insecticide with 0.05% of *Lamda Cyhalotrin* as the active ingredient, and they were categorized as resistant to the insecticide (Putra *et al.*, 2016).

Solar dex was used as a mixture medium for *Lamda Cyhalothrin*, and gasoline was used as fuel for the fog machines. The materials used in fumigation complied with the SOP.

#### **Socialization (Market)**

Socialization through lecture and kind of media may increase one's

knowledge (Mayasari and Wahyono, 2016). It aims to make the community understand the situation and benefits of the *Aedes aegypti* mosquito vector control in everyday life.

The socialization of the *Aedes aegypti* mosquito control had been practiced according to the SOP.

### Technology

The technological equipment used to support the *Aedes aegypti* mosquito control included a laptop or computer, printer, microscope, fumigation machine, Microsoft office software, Health Quarantine Information System (SINKARKES), and email. A laptop or computer was used to process data and to compile reports, and the printer was used to print the reports. Some tech-based equipment used were fumigation machines and microscopes. The Class 1 Surabaya Port Health Office had 3 microscopes to identify types of larva and 6 fumigation machines to eradicate adult *Aedes aegypti* mosquitoes. A soft trap technology was also used in processing data. Microsoft office software was required to recap and then process data, and the reports were disseminated via email and the Health Quarantine Information System website.

### Information

Technology advancement places information as a very important resource that needs to be managed properly (Amri, 2016). A good reporting system is necessary to present information accurately and realistically. The SOP stated that the reports of *Aedes aegypti* mosquito control measures should be written in forms of SINKARKES reports, annual reports, monthly reports, and Surabaya Port Health Office profiles. Further, information exchange is required to control and prevent dengue outbreaks. Reports are presented in narratives, study results, dengue vector entomological surveys, details on action plans for control or management, new

development in insecticide and spray equipment, and other related information (WHO, 2012).

### CONCLUSION

The personnel from the Class 1 Surabaya Port Health Office and the larva-monitoring cadres had implemented managerial components such as man, budget, tools and materials, technology (machine), socialization (market), and information according to the SOP. Meanwhile, the method was not following the standard. The researchers recommended carrying out one larva from each container during the larva survey.

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# PEER COUNSELING TRAINING AS A METHOD OF SEXUAL HEALTH PROMOTION IN ADOLESCENTS

**Khoiriyah Isni**

Faculty of Public Health, Ahmad Dahlan of University  
Jl. Prof. Dr. Soepomo, SH, Warungboto, Umbulharjo, Yogyakarta 55164, Indonesia  
Correspondence address: Khoiriyah Isni  
Email: [khoiriyah.isni@ikm.uad.ac.id](mailto:khoiriyah.isni@ikm.uad.ac.id)

## ABSTRACT

One characteristic of adolescents is their tendency to share information, tell stories, and gather with their peers. They may experience the negative effects of these habits when they do not have adequate life skills, especially in terms of sexuality. On the other hand, these activities present an opportunity for health promotion through peer-based approaches or peer counseling. The goal is to know the effects of peer counseling methods as media of information to increase adolescents' knowledge and attitude regarding sexual problems. The study used a quasi-experimental approach with a nonequivalent control group design. The sample consisted of 17 respondents between 15-24 years old living in Banguntapan, Bantul, Yogyakarta who fulfilled the inclusion and exclusion criteria. Data were collected with the purposive sampling technique. The research instrument used was a questionnaire. The results showed that there was a difference in the average knowledge level ( $p = 0.021$ ) and attitudes ( $p = 0.000$ ) of respondents related to sexuality before and after receiving peer counseling training. Methods and media used in delivering health information to adolescents should be diversified in schools, in the community, and in health services to generate interest in accessing and heeding appropriate health information.

**Keywords:** peer counseling, sexuality, adolescents, health promotion

## INTRODUCTION

The most critical types of development during the adolescent stage are biological and psychological development. The development of sexuality is an essential bio-psycho-social development, during which adolescents begin to take on the role of an adult. During adolescence, a person's thoughts, perceptions, and responses are 'colored' sexually (Kar, Choudhury, and Singh, 2015). Reproductive behavior can stem from social interactions between men and women. These social interactions can lead to the forming of unwritten norms, values, and rules over a long period of time. These can then be used as a reference for reproductive behavior, which is usually in line with the norms, standards, and values that apply in society. There are expected and unexpected behaviors. Likewise, interactions between boys and girls during this stage

relate to reproductive behavior. Reproductive behavior refers to sexuality and adolescent reproductive health, which can be influenced by various factors (Laksmiwiati, 2003).

Between 2011 and 2020, more than 140 million girls will become child brides, according to data from the United Nations Population Fund (UNFPA). If the current child marriage rate prevails, 14.2 million girls each year or 39,000 every day will marry underage. Furthermore, of the 140 million girls who will marry before they turn 18, 50 million will be under the age of 15. Every year, about 21 million girls aged 15 to 19 years and 2 million girls under 15 years become pregnant in developing countries. Around 16 million girls aged 15 to 19 years and 2.5 million under the age of 16 give birth in developing areas yearly. This is a global problem that occurs in high, middle, and low-

income countries. Worldwide, teenage pregnancies are more likely to occur in marginalized communities, generally driven by poverty and lack of education and employment opportunities (World Health Organization, 2018).

The government has a new benchmark in adolescent reproductive health, namely the difficulty of finding young people who are still virgins in large cities in Indonesia. A survey showed that more than 54% of adolescents in Surabaya claimed to have had premarital sexual relations. As many as 54% of adolescents in Medan, 47% of adolescents in Bandung, and 37% of adolescents in Yogyakarta also claimed to have had sexual relations before marriage between the ages of 13-18 years (Anonymous, 2010). The survey results also show a variety of reasons for adolescent girls aged 15-24 to have premarital sexual relations. Their reasons included that it just happened (38.4%) and they were forced by their partners (21.2%). Meanwhile, the reasons put forward by teenage boys were they were curious (51.3%) and it just happened (25.8%). BKKBN research shows that eighty-four respondents experienced an unwanted pregnancy (KTD), and as many as 60% of them had an abortion (National Population and Family Planning Agency (BKKBN), 2012).

According to the Center for Sexuality Studies of the Indonesian Family Planning Association, there has been a change in adolescents' perspective of sexual behavior before marriage in Yogyakarta. 3.4% of teenagers in Yogyakarta with male partners have had premarital sexual relations to have had premarital sexual relations. The Head of the Department of Secondary and Higher Education at the Yogyakarta Dikpora stated that, throughout 2013, there were 325 cases of unwanted pregnancy that occurred in adolescents (Thohari, 2013). Meanwhile, in the Bantul Regency, the rate of underage

marriages has been high in the past five years. This can be attributed to the unexpected pregnancies. In 2014, the Bantul Regency was ranked second after the Gunung Kidul Regency in terms of numbers of early marriages. In 2010, there were 115 cases of marital dispensation, in 2011 were 145, in 2012 were 151, and in 2013 were 174 cases. There was a decline between 2013 and 2014, but the figures were still quite high for the Bantul Regency, which is not an urban area (Ariyanti, 2015).

When viewed in terms of health services, not all primary health services provide adolescent health services. Primary health services that have offered special health services for adolescents are considered not optimal in reaching young people. Additionally, primary health services with various limitations lead to social gaps between non-adolescent health care providers and their targets. Adolescents may then become reluctant to access adolescent-specific health services. This may lead to adolescents trying to find information themselves through their peers.

Problem-solving in adolescents is necessary to promote community empowerment and sexual and reproductive health promotion efforts. This is not only for the objective of adolescents receiving information, but also because adolescents play an active role and contribute by becoming peer counselors.

Peer counseling focuses on teenage relationships with each other. It also focuses on adolescent relationship patterns that can enhance their knowledge, attitude, behavior, and skills. Peer counseling is essential for adolescents. Adolescents more frequently discuss and review various issues with their peers than their parents, teachers, or mentors at school. Severe problems are no exception. They will only talk to adults when solving problems with peers is deadlocked. Teenagers have a strong sense of attraction

and commitment, as well as the 'same boat' bond with their peers. Teenagers feel adults do not understand the problems they face, and only fellow teenagers can understand them. It is the closeness, openness, and similar feelings that create opportunities to improve knowledge, attitudes, behavior, and life skills through peer counseling training activities (Suwarjo, 2008).

Peer counseling allows teens to solve problems by receiving support from fellow teenagers. Peer counseling programs train and equip youth with skills to enable them to help their peers. Unlike professional counselors, peer counselors are available to help their colleagues at any time, and peer counseling sessions are informal discussions and conversations that are not threatening (Beatrice K et al, 2016).

Based on these problems, it is necessary to study the effect of peer counseling training on improving knowledge and attitudes of adolescents towards sexuality.

## **METHODS**

This study used a quasi-experimental approach, with a nonequivalent control group design. The study was conducted in 2017 in Dukuh Karang Bendo, Banguntapan, Bantul, Yogyakarta. The selection of the research sample was based on recommendations from local stakeholders, namely the Hamlet Head, and it was adjusted according to the inclusion and exclusion criteria; therefore, the sampling technique used was purposive sampling. The inclusion criteria used in this study were teenagers aged 15-24 years, not married, and domiciled for a minimum of 6 months in the area of Karang Bendo Hamlet, Banguntapan, Bantul. Meanwhile, the exclusion criteria were to follow the research activities from start to finish and complete the pre-test and post-test questionnaires completely. Based on these criteria, a sample

size of 17 respondents was obtained from 35 respondents.

Data collection was carried out twice, before and after peer counseling training was given. Peer counseling training was conducted by providing education and skills through lectures, discussions, case studies, and role-playing. The material provided included juvenile delinquency, reproductive health and adolescent sexuality, peer counseling skills, necessary communication skills, and communication through social media. What differed the peer counseling training in this study from other studies was the provision of the required communication skills, including communication through social media. The respondents were given training on how to frame health messages using 'youthful language' on social media.

Primary data were obtained by having the respondents fill out questionnaires containing questions related to the knowledge and attitude of adolescents towards sexuality issues. Data were tested using SPSS software version 17. Univariate data analysis verify by laying out the frequency distribution of each variable studied, i.e., demographics of respondents (age, sex, level of education, and occupation), their level of knowledge, and attitudes of respondents. Then, the Kolmogorov-Smirnov normality test was carried out to determine the normality of the data. The data normality test results state the data were normally distributed; therefore, the bivariate analysis utilized a paired-T test.

This study has received an Ethical Approval Letter from the Ahmad Dahlan University Research Ethics Committee with the number 021705083, for health research that uses humans as research subjects.

## **RESULTS**

The data were analyzed quantitatively using univariate and bivariate tests. Most

respondents (58.8%) were included in the early adolescent category (15-18 years), and 70.6% were male. Their level of education varied from the junior secondary level to the bachelors level. However, 47.1% of the respondents had completed or were undertaking secondary education (high school), and 23.5% were undertaking junior secondary education.

The internet, social media, and television were the primary sources for health information most commonly accessed by respondents (94.1%). The secondary sources of data were parents, friends/relatives/neighbors, and newspapers/magazines/tabloids (88.2%), followed by radio (82.4%). There were four

respondents (23.5%) who obtained health information from their campuses, both from lecture material and seminars.

The problems of reproductive health and sexuality are comprehensive, including relationships with the opposite sex. This study analyzed the relationship of respondents with the opposite sex. 47.1% of respondents claimed to have had a romantic relationship. Only 23.5% of the respondents who had had a romantic partner had their family and peers be aware of it. When they first dated varied greatly in ages starting from 15 years, 17 years, 18 years, and 21 years. The characteristics of respondents are presented in Table 1.

**Tabel 1.** Respondent Characteristics

Respondent Characteristics	Category	N	%
Age	Young Teenagers	10	58.8
	Older Teenagers	7	41.2
Sex	Male	12	70.6
	Female	5	29.4
Education	Junior High School	4	23.5
	Senior High School	8	47.1
	Associate Degree	2	11.8
	Bachelor's degree	3	17.6
Job	Student	14	82.4
	Worker	3	17.6

Source: Primary Data

The variables studied on when evaluating the effect of peer counseling training were the respondents' level of knowledge and attitudes towards sexuality. Measurement of variables were taken through questions from the questionnaire filled out by respondents before and after peer counseling training.

The univariate test results showed that nearly half of the respondents (41.2%) lacked knowledge about adolescent sexuality. This

percentage decreased after being given peer counseling training (17.6%). This result is in line with the attitude variable. A similar number of respondents (41.2%) had a negative attitude towards adolescent sexuality problems prior to counseling training. This number decreased to 23.5% of respondents still having a negative attitude after undergoing peer counseling training. These results are presented in Table 2.

**Table 2.** Univariate Analysis Results

Variable	Category	N	%
Knowledge of sexuality before the intervention (Pre-test)	Sufficient	10	58.8
	Insufficient	7	41.2
Knowledge of sexuality after the intervention (Post-test)	Sufficient	14	82.4
	Insufficient	3	17.6
Attitudes towards sexuality before the intervention (Pre-test)	Positive	10	58.8
	Negative	7	41.2
Attitudes towards sexuality after the intervention (Post-test)	Positive	13	76.5
	Negative	4	23.5

Source: Primary Data

This study examined the effect of peer counseling training on the level of knowledge and attitudes of adolescents on sexuality. Before the bivariate analysis, the data normality test was performed. The data normality test aimed to determine whether

the distribution of data was normal or not using the Kolmogorov-Smirnov test. Data were categorized as normal if their p-value was higher than 0.05. The data normality test results stated the data were normally distributed as presented in Table 3.

**Table 3.** Data Normality Test Results

Variables	Mean	Z scores	P values
Sexuality knowledge (pre-test)	32.82	0.710	0.694
Sexuality knowledge (post-test)	34.94	0.860	0.451
Attitudes towards sexuality (pre-test)	58.12	0.586	0.883
Attitudes towards sexuality (post-test)	62.59	0.682	0.742

Source: Primary Data

**Table 4.** Bivariate Analysis Results

Variables	Mean	CI (95%)		T count	Sign.
		Lower	Upper		
Sexuality knowledge (before and after intervention)	-2.118	-3.870	-0.366	-2.562	0.021
Attitudes towards sexuality (before and after intervention)	-4.471	-6.395	-2.546	-4.924	0.000

Source: Primary Data

Based on the data normality test results, the bivariate analysis fulfilled the requirements for using the paired t-test. The results of bivariate testing using the paired t-test showed a significant influence on the

provision of peer counseling training methods to increase respondents' knowledge about adolescent sexuality ( $p = 0.021$ ). This also indicated that there were differences in the respondents' average knowledge about

sexuality before and after the peer counseling training. This had a mean deviation of 2.118 (Table 4).

The attitude variable was measured twice, before and after the peer counseling training. The categorization of attitude variables was divided into two: positive attitude and negative attitude towards adolescent sexuality. The univariate analysis results showed that seven respondents (41.2%) had negative attitudes towards teenage sexuality before being given peer counseling training. However, this number dropped to only four (23.5%) after being given peer counseling training.

The results of the bivariate analysis using paired T-tests showed that the provision of interventions in the form of peer counseling training could significantly influence respondents' attitudes towards sexuality ( $p = 0.000$ ). This result also suggested that there were differences in the attitudes of respondents before and after being given peer counseling training. The mean deviation for attitude was 4.471.

Through the bivariate analysis using paired t-tests on the variables of respondents' knowledge and attitudes towards sexuality, it can be concluded that the provision of peer counseling training can increase the level of knowledge and change the attitudes among the respondents who were initially unknowledgable of and/or negative towards the issue.

## DISCUSSION

Growth and development are a continuous and concurrent process that brings change to each individual. The development of sexuality begins as early as in intrauterine life after conception, and continues through childhood, adolescence, and adulthood until death. During infancy, there is no gender awareness. Children recognize their sex in early childhood;

starting at the age of three, self-awareness about sexuality (gender roles and gender identity) develops during childhood. Adolescence is a transition phase during which the leading development of sexuality takes place. Puberty is achieved during adolescence, which is a significant marker of the development of sexuality. The hypothalamus-pituitary-gonad axis is crucial for sexual development during puberty. Youth is divided into three stages: early adolescence (10-13 years), middle adolescence (14-16 years), and late adolescence (17-19 years). Physical changes begin in early adolescence when individuals become very concerned about their self-image. During puberty, cognitive development occurs; adolescents develop abstract thinking and reasoning. Emotionally, they develop self-identity during late adolescence. Social involvement, peer interaction, and sexual interest are also developed in this phase. Experiments for different behaviors are seen in early adolescents, risk-taking is seen in mid-teens, and assessment of their risk-taking is seen in later adolescents (Kar *et al.*, 2015).

One of the biggest influences in adolescence is peers. Peer influence can lead to maladaptive behavior, including risky sexual behavior. Research shows that the use of internet chat rooms is where adolescents become most vulnerable to having sexual behavior triggered. Furthermore, adolescents may be more likely to engage in risky sexual activities when there is support or examples from their peers. Nearly three-quarters of girls and more than 85% of boys respond to risk in public than in private. Differences in sexual risk behavioral responses in adolescents can be influenced by gender, ethnicity, puberty development, and peer and cultural experiences (Laura *et al.*, 2017).

The peer counseling training method relied on the respondents' activeness by using the lecture method, active discussion,

frequently asked questions, and practice. During the training, the materials presented in peer counseling training activities covered adolescent delinquency, reproductive health and sexuality, necessary communication skills, and peer counseling skills. Provision of young delinquency materials, reproductive health, and adolescent sexuality used lecture methods, active discussion, questioning, and answering. Content for basic communication skills and peer counseling, in addition to using the lecture method, intense debate, and question and answer, also used the roleplay method. Roleplay is a method of learning by involving people directly to portray a character, intended to maximize communication skills. The respondents were divided into four groups and given cases to discuss solutions for the problem. Next, each group played a role in presenting the results of the discussion. Each group played the roles of client, counselor, and observer.

In line with other studies, sexuality knowledge of respondents in this study became significantly higher after the intervention (67.7%). Significance was calculated to have a Z score of 4.82 (Amelia, 2014). Moreover, Harini's research mentioned that the peer counselor training method had a significant impact on increasing knowledge, changing attitudes, and increasing PIK KRM administrators (Harini, 2014).

Research involving two unrelated samples, which were the intervention group and the control group, showed that the intervention group experienced a significant increase in knowledge about HIV compared to the control group. This was followed by an increase in positive attitudes towards HIV in the intervention group in comparison to the control group. Meanwhile, HIV risk behaviors were significantly reduced in the intervention group. Differences in knowledge were observed during three periods of time, before the intervention, immediately after the

intervention, and three months after the intervention. The interventions provided consisted of peer education (Ibrahim et al , 2012).

Other research states that reproductive and sexual health education, counseling, and contraception determination were very effective in increasing knowledge about sexuality and contraceptive use, and reducing teenage pregnancy. However, in health issues such as female circumcision, the interventions that can be used are community mobilization and women's empowerment, which aim to increase awareness of the adverse health consequences of female circumcision. This is done to reduce the prevalence of female circumcision (Salam *et al.*, 2016).

Sexuality and adolescent reproductive health education conducted by peer counselors should be carried out in an environment that provides comfort and pleasure. Information submitted by peer counselors can be justified. Teenagers experience changes physically and psychologically. Providing guidance and appropriate information can prevent teens from the dangers of free sex. Peer counselors can be one of the solutions to many problems experienced by adolescents. For teens, friends are trusted people instead of parents. Thus, peer counselors' activities can increase adolescent knowledge about the dangers of free sex and how to avoid it (Husodo and Widagdo, 2008). Other research stated that the peer group was a social group consisting of a group of people of the same age who have the same interests, as well as are equal in education and social class. Peer groups are relevant because they tend to provide a means to make friends. Peer groups can provide social and emotional support. Besides that, they can also give an identity and sense of belonging in social groups, especially during adolescence (Peci, 2017).



Health education on issues such as HIV/AIDS can be done through youth empowerment. The method used in this case is peer counseling training, which aims to improve adolescent knowledge and skills. Knowledge and skills need to be continually enhanced among members of the youth group at the village level. This training is vital as an effort to overcome the problem of the high incidence of HIV/AIDS from an early age. Training is a form of health education that involves the learning process. The training is practice-based and functions to increase knowledge and skills outside the formal education system in a relatively short time (Fitrianingrum et al, 2018).

Green and Kreuter explain there are three main categories in influencing a person's behavior. One of these is knowledge. They introduce knowledge into one of the predisposing factors for the formation of new behavior, that is, an internal element of a person that influences behavioral change to conduct behavior following the knowledge acquired. Individuals need knowledge as a form of support in growing individual confidence, attitudes, and behavior every day. Knowledge can support individuals in acting (Green and Kreuter, 1999).

Another predisposing factor is attitude. Attitudes are formed as long as humans live and develop because humans are not born with individual attitudes or perspectives. Attitudes make humans perform actions specifically against an object. Attitude is a product of socialization, to which a person responds according to a stimuli received. Before people get information or see the purpose, attitudes are impossible to emerge. Although it can be said to precede action, attitude does not always precede effective action. Attitude is a factor that makes it easier for someone to act happy or unhappy about a particular object, which can include cognitive, affective, and will components.

Intrinsic and extrinsic factors influence an individual's attitude towards an object. Intrinsic factors include personality, intelligence, talents, interests, feelings, needs, and motivations. Extrinsic factors include environmental factors, education, ideology, economics, politics, and defense and security. In this study, most of the respondents were positive about adolescent sexuality. These positive attitudes were influenced by the respondents' individual factors, one of which was knowledge. If the respondents' level of knowledge had been classified as good, it can lead to good attitudes and behavior in responding to adolescent problems related to sexuality.

Increasing knowledge and attitudes of adolescents to encourage behavioral changes towards issues of sexuality and adolescent reproductive health requires support from schools. This can be done through approaches from the physical aspects, sexual behavior, and social and mental changes of adolescents that are incorporated into the school curriculum (Hatami et al, 2015). Education on sexuality and adolescent reproductive health is the shared responsibility of parents, schools, the community, and the government. At schools, teachers can separate male and female students during the process of delivering sexuality and reproductive health lesson. Collaboration is needed between teachers in schools, parents, the community, and the government in the implementation of this curriculum. At school, teachers need to be given training related to sexuality and adolescent reproductive health materials. Families at home need to provide reproductive health education. Then, the community needs to provide supervision for adolescents in the surrounding environment (Fitriana and Siswantara, 2018).

All sectors, including parents, schools, community institutions, religious institutions, the media, business, health service providers,

and policymakers, have the responsibility to promote healthy sexuality in adolescents. Strong evidence shows that a comprehensive approach to sex education helps teens resist the pressure to have sex too early. This approach includes knowledge about sexuality, courtship, the opposite-sex, decision making, communication, methods of controlling unwanted pregnancy, and sexually transmitted infections. Comprehensive sexual education encourages adolescents to foster healthy and responsible relationships with mutual protection whenever they decide to become sexually active (Tulloch and Kaufman, 2013).

When compared with traditional education methods, peer education leads to more positive outcomes such as increasing adolescent knowledge about health issues and providing referrals to health services. Despite its strengths, this approach can have limitations that require further attention. The importance of adolescence and problems surrounding this period should be noted. The critical role of peer education in promoting adolescent health needs to be emphasized. A more comprehensive evaluation of this program is needed in terms of strengths and limitations. The effectiveness of peer education programs depends on the selection of educators and peer groups, the quality of education delivered by educators, the evaluation of the education process, and the collaboration of stakeholders, parents, and the community. The study proposed planned action programs at regional, national, and international levels, including the contents of reproductive health material (Azizi et al, 2016).

Adolescent reproductive health material is a priority for high school students. It follows the characteristics of adolescents, while the content included in the peer counseling module is as follows: adolescent reproductive organs and functions, maintenance of adolescent reproductive

organs, puberty in adolescents, risky sexual behavior, drug use, and teenage life. Education and information on reproductive health needs to be given as early as possible in Indonesia. In this case, the BKKBN is implementing the GenRe (*Generasi beRencana*) program that can help youth obtain accurate sources of information about reproductive health through peer counseling. The reproductive health information in the Adolescent Reproductive Health module talks about three primary threats to adolescent reproductive health (three basic threats/Triad), including sexuality, HIV/AIDS, and drug abuse (Nurfazriah, Sunjaya, and Susanah, 2018).

Innovations in the methods and media used to deliver health information to adolescents need to be supported to attract the attention of and spur interest in adolescents to access specific health activities and services. It is hoped that this can increase the knowledge and attitudes of adolescents to ensure their behavior does not lead to negative things and they remain productive as teenagers.

## CONCLUSION

Peer counseling training is influential as a medium for the delivery of information on sexuality in terms of adolescents' level of knowledge ( $p = 0.021$ ) and attitudes ( $p = 0.000$ ) in Banguntapan, Bantul, Yogyakarta. Adolescents need health promotion methods and media that are proactive towards them in order to optimize their utilization.

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# IMPLEMENTATION OF WATER SUPPLY SUPERVISION IN CLASS 1 PORT HEALTH OFFICE IN JUANDA AIRPORT WORKING AREA, SURABAYA

Rizky Nugrahanik<sup>1</sup>, Bangun Cahyo Utomo<sup>2</sup>

<sup>1</sup>Departement of Enviromental Health

Faculty of Public Health, Airlangga University, Surabaya, Indonesia

<sup>2</sup>Port Health Office Class 1 Surabaya Juanda Airport Work Area, Surabaya, Indonesia

Correspondence Adress: Rizky Nugrahanik

E-mail: Rizkynugrahanik@gmail.com

## ABSTRACT

The provision of clean water in the Class 1 Surabaya Port Health Office is supervised in accordance with the existing regulations to identify sources that could potentially cause pollution and prevent the occurrence of illness caused by unstandardized water quality and unsafe water supply. This study aimed to describe the implementation of clean water supply supervision in the Class 1 Surabaya Port Health Office in the Juanda Airport working area, Surabaya. This was an observational study which analysis was descriptive in nature. The clean water was tested for physical, chemical, and microbiological parameters, and the results showed that the water quality was in accordance with the Regulation of the Indonesian Ministry of Health No. 416 of 1990 about the Terms and Monitoring of Water Quality. However, the result from the simple chemical inspection test of the water showed that it did not fulfil health standards i.e., the residual chlorine score not equal to 0 (zero). It is suggested that more attention and supervision are conducted by water management authorities to ensure the standard residual chlorine level of 0 (zero). Additionally, expired reagents or reagents that have already changed color should not be used as it will affect the parameters tested.

**Keywords:** Quality of clean water, clean water supply facilities, water sampling process

## INTRODUCTION

Water has an important role in the lives of all living things. For humans, water can be used for drinking, cooking, bathing and others. Many benefits can be obtained from water. It can maintain the health of the human body as it contains various important substances. If individuals always consume water regularly, it can help the metabolic process in their body run smoothly and avoid diseases to attack (Geost, 2018). Therefore, the water for consumption must be of good quality and meets health requirements. Based on the Regulation of the Indonesian Ministry of Health No. 416 of 1990 concerning the Requirements and Monitoring of Water Quality, water can be used for daily needs if its quality meets health requirements and has been boiled.

Until now, poor water quality has become a major problem as it has negative consequences for human health. Water is a medium that could also spread disease such as the pathogenic bacteria i.e.,

*Escherichia coli* (*E. coli*) (Zikra, 2018). Therefore, the availability of clean water must always be monitored in order to maintain its quality and ensure that it is safe enough for human consumption.

The emergence of some health problems in humans is also caused by poor sanitary conditions and unclean housing conditions, especially diarrheal diseases (Hatifah, 2019). Some diseases that are prevalent in Indonesia and can cause outbreaks are still difficult to control and can spread through water sources contaminated by *E. coli* (Dewanti, 2017).

The efforts that can be taken to determine the quality of water supply facilities include supervising or inspecting the quality of water sources or supply. The aim is to identify various sources that have the potential to cause pollution or contamination of water. The supervision is carried out in clean water supply facilities. Various physical, chemical, and bacteriological parameters must meet health requirements in order for the water to be safe for consumption (Natalia, 2013).

The purpose of monitoring the quality of water is to prevent water downgrade and improve water quality.

The Port Health Office is the Technical Implementation Unit of the Ministry of Health which is under and reports to the Directorate General of Disease Control and Environmental Health. Based on the Regulation of the Indonesian Ministry of Health No. 2348/Menkes/Per/XI/2011 concerning Amendments to the Regulation of the Indonesian Ministry of Health No. 356/Menkes/Per/IV/2008 concerning the Organization and Administration of the Port Health Office, one of the duties of the Class 1 Surabaya Port Health Office is to supervise the provision of clean water carried out by the Environmental Risk Control Division. The monitoring of clean water significantly becomes one of the preventive efforts taken to minimize the occurrence of diseases caused by below-standard water quality and facilities. Monitoring also prevents the emergence of waterborne diseases and cross contamination. The supervision of clean water supply must be carried out from the water source supplying to distribution to consumers.

Clean water supply supervision must be continuously monitored and carried out regularly in order to maintain the quality of clean water. A common waterborne disease is diarrhea as *E. coli* contaminates the water. Such incidents must be prevented by monitoring the provision of clean water and clean water supply facilities. Therefore, the implementation of supervision of clean water supply in the Class 1 Port Health Office in Surabaya must be carried out following the existing regulations to identify various pollution sources and prevent health problems in humans due to below-standard water quality. This study aimed to describe the implementation of clean water supply supervision in the Class 1 Port Health Office in Surabaya, Juanda Airport Working Area.

## METHOD

This study was observational research with a descriptive research analysis. The population was the means of providing clean water by the Class 1 Surabaya Port Health Office in the Juanda Airport working area. The sample of the research was the provision of clean water in the aforementioned location.

The research was carried out in the Class I Surabaya Port Health Office in the working area of Juanda Airport, which is located at Jalan Raya Juanda Airport, Sedati Agung, Sedati, Sidoarjo Regency, East Java. The study was conducted from February to July 2019. The variables studied were location of clean water supply facilities, monitoring activities of clean water supply by the person in charge, and the quality of clean water including physical, chemical, and microbiological qualities.

This study used primary data and secondary data. The primary data included observations and inspections of clean water quality and supply facilities. Meanwhile, the secondary data were literature studies obtained from archives, profiles, monthly reports, annual reports, standard operating procedures (SOP), related laws and regulations, applicable field inspection forms, and other supporting documents.

The data collection instrument used was clean water quality and facility inspection forms adjusted to the Regulation of the Indonesian Ministry of Health in the Class 1 Surabaya Health Office.

The data obtained were analyzed descriptively based on the related theory and Regulation of the Indonesian Ministry of Health No. 416 of 1990 concerning the Requirements and Supervision of Water Quality and Decree of the Ministry of Health No. 431 of 2007 concerning Technical Guidelines for Environmental Health Risk Control at Ports/Airports/Cross-Border Posts in the

Context of Health Quarantine. The research data have passed the eligibility test at the Faculty of Dental Medicine, Universitas Airlangga with the number: 347/HRECC.FODM/VI/2019.

## RESULTS

The Class I Surabaya Port Health Office, has several working areas, which include Tanjung Perak Seaport, Gresik Seaport, Tuban Seaport, Kalianget Seaport, and Juanda Airport. Its main office is in the Juanda Airport.

The vision of the Class I Surabaya Port Health Office is to establish a port health office that is strong, professional and trustworthy in disease prevention and control at the entrance to Indonesia. The main tasks of the Class I Surabaya Port Health Office are to carry out prevention of entry and exit for disease and potential disease outbreaks, conduct epidemiological surveillance, quarantine, control environmental health impacts, provide health services, supervise drugs, food, cosmetics, medical devices and addictive materials (OMKABA), as well as observe new diseases and re-emerging diseases, bioterrorism, biological elements and chemical and radiation safeguards in the area of airports, seaports, and across national land borders. The Class-1 Surabaya Port Health Office consists of the Administration Division, the Quarantine Control and Epidemiological Surveillance Division, the Environmental Risk Management Division, and the Health and Cross-Regional Efforts Division. Clean water monitoring activities are routinely carried out by the Environmental Risk Management Division.

Clean water supply supervision consists of checking the quality of clean water and monitoring the clean water supply facilities. It is routinely carried out once a month. The inspection of clean water quality includes examination of several parameters such as physical quality parameters (clarity, taste, smell, and color),

simple chemical parameters (pH and residual chlorine), and microbiological parameters (*E. coli* and coliform/Total coliform bacteria). A reference for examining physical, chemical, and microbiological parameters is the Regulation of the Indonesian Ministry of Health No. 416 of 1990 concerning the Requirements and Monitoring of Water Quality.

Simple physical and chemical quality checks are regularly carried out by officers at Environmental Risk Management Division. Complete microbiological and chemical quality checks are carried out at the Surabaya Center for Health Laboratory or Surabaya BBTKL-PP. Water samples were taken at Reverse Osmosis PT. Angkasa Pura I (RO PAP), PAP Water Reservoir, PAP distribution water, water car, food processing place (TPM), and public places (TTU). The water quality inspection was carried out in the water car, and the water sample was extracted from the manhole in the water car. Meanwhile, for the water quality inspection at the food processing facility, samples were taken directly from the water gallon and domestic water. For the inspection of water quality in public places, water samples were taken from toilet water, sinks, and others.

Whereas, for monitoring on the location of clean water supply facilities, the quality was observed from the presence or absence of pipe leakage between the source and the reservoir, the condition of the release basin, reservoir manhole (whether or not there is chlorination in the reservoir tub), air holes (whether or not there are cracks in the reservoir tub), and the distribution pipes. Additionally, it was conducted to look into the conditions around the clean water supply facilities/facilities, namely puddles of liquid waste, pesticides, piles of garbage, and other types of waste around the reservoir. The supervision of clean water supply was carried out simultaneously with the inspection of clean water quality.

PT. Angkasa Pura I (Persero) is a company that manages the Juanda-Surabaya International Airport. The first location from which clean water samples were taken was at Reverse Osmosis (RO) PAP which consisted of 2 large reservoirs with a water capacity of 25 m<sup>3</sup> or 25,000 liters each, the source of which was well water. The well water collected was given chlorine to remove bacteria, and it then flew into a filter to remove mud or dirt and

manganese. After that, it flew to the Clean-In-place (CIP)-Tank which acted as a reservoir for filtered water. Next, it went directly to the membrane to be processed into clean water. Then, from the membrane, the water would flow to the Reservoir Tank (mixture of RO and PDAM) with a volume of more than 2,600 m<sup>3</sup>. The water would then be distributed to the Surabaya Juanda International Airport Branch Office.

**Table 1.** Results of Physical Quality Inspection of Clean Water at Class 1 Surabaya Port Health Office

Location	Physical Quality			
	Clarity	Taste	Smell	Color
Water Car 047	Clear	Tasteless	No smell	Colorless
Water Car 052	Clear	Tasteless	No smell	Colorless
Tandon Lanudal	Clear	Tasteless	No smell	Colorless
Water Car PT. Sriwijaya	Clear	Tasteless	No smell	Colorless
Water Car PT. CAS No. 1007	Clear	Tasteless	No smell	Colorless
Reverse Osmosis PAP	Clear	Tasteless	No smell	Colorless
Tandon PAP	Clear	Tasteless	No smell	Colorless
Distribution of PT. PAP	Clear	Tasteless	No smell	Colorless
<i>Isi ulang Kantin Bunda</i>	Clear	Tasteless	No smell	Colorless
<i>Warung Cak Mat</i>	Clear	Tasteless	No smell	Colorless



**Table 2.** Results of Simple Chemical, Chemical, and Microbiological Quality Inspection of Clean Water, Class 1 Surabaya Port Health Office

Location	Simple Chemistry		Chemistry Inspection	Microbiology	
	pH	Residual Chlorine			
Water Car 047	7.6	0	are not done	Meet requirements	the
Water Car 052	7.6	0.2	are not done	Meet requirements	the
Tandon Lanudal	7.8	0	are not done	Meet requirements	the
Water Car PT. Sriwijaya	8	0	are not done	Meet requirements	the
Water Car PT. CAS No. 1007	7.6	0.2	are not done	Meet requirements	the
Reverse Osmosis PAP	7.1	0.3	Meet the requirements	Meet requirements	the
Tandon PT. PAP	7.1	0.3	Meet the requirements	Meet requirements	the
Distribution of PT. PAP	7.8	0	Meet the requirements	Meet requirements	the
Refill Mom's Canteen	7.1	0	are not done	Meet requirements	the
Stand's Cak Mat	6.8	0	are not done	Meet requirements	the

Based on Table 1, the results of the inspection of clean water on ten locations showed the water clarity, taste, smell, and color were in accordance with the Regulation of the Indonesian Ministry of Health No. 416 of 1990 concerning the Requirements and Supervision of Water Quality that should be clear, tasteless, odorless, and colorless.

Table 2 explains a simple chemical inspection of water quality by using a water test kit. It showed that the pH of the water examined on ten locations has met the health standards which pH-values should be 6.5-9.0. While the examination for residual chlorine showed that on 6 locations the values were below 0.2

mg/liter or 0.2 ppm. There were also 2 locations with residual chlorine values of 0.2 ppm, and 2 remaining locations with the values of 0.3 ppm. Chemical examination was only carried out on 3 locations, namely RO PT. PAP, Tandon PT. PAP, and distribution area of PT. PAP. Based on the laboratory examination, the water quality met the requirements and was in accordance with the regulation.

The parameters examined were mandatory parameters that are directly and indirectly related to health. The directly-related health parameters were inorganic chemicals such as fluoride, cadmium, total chromium, nitrite (as NO<sub>3</sub><sup>-</sup>), and nitrite (as NO<sub>2</sub><sup>-</sup>) based on the laboratory test results

on drinking water requirements. The indirectly-related health parameters were physical and chemical parameters. Physical parameters included temperature, odor, total dissolved solids (TDS), turbidity in water, taste, and color. Meanwhile, chemical parameters were pH, iron, manganese, copper, zinc, ammonia, hardness, chloride, and sulfate. A physical examination of water included a complete chemical examination. Moreover, the microbiological examinations stated the water samples taken from 10 locations met health requirements and were in accordance with the standard.

### Sanitary conditions of piping system facilities by types

**Table 3.** Results of Sanitation Inspection of Types of Piping System Facilities

Locations	Total risk score	Sanitary inspection results (Pollution risk level)
Reverse Osmosis PT. PAP Water Reservoir	0	Low
PT.PAP Tandon lanudal PT. Gapura Angkasa Water car 047	0	Low
Water car 052	0	Low
Water car 0 PT. Sriwijaya	0	Low
Water car 0 PT. CAS No. 1007	0	Low
Water car 0 PT. CAS No. 1007	0	Low

Table 3 exhibits the results of observations and assessments of clean water supply facilities on seven locations. The findings showed the total risk level score for the seven locations was 0 (zero). The total risk score ranges from 0-8 and is divided into two criteria: low risk level (R) (score 0-4) and high risk level (T) (score 5-8). The smaller the score, the lower the risk level for water pollution.

## DISCUSSION

### Inspection of the physical quality of clean water

The physical quality of clean water was inspected by testing the clarity, taste, smell, and color. The samples were tested by using a water test kit. The results indicated that the quality of the water was in accordance with the standard.

#### Clarity

The quality of the water can be determined based on how cloudy the water is. The cloudier the water, the worse the quality. The clean water turbidity standard is 5 NTU. If the water is cloudy, this indicates that the TDS in the water is high. The cloudier the water, the higher the TDS value of the water. If the turbidity in the water is less than 5 NTU, the mineral content will be low. Biochemists also have explained that minerals play an important role in various bodily functions. In addition to bodily functions, minerals are used as raw material for enzyme performance. The results mentioned the quality of clean water on ten locations was good as it was clean and not cloudy.

#### Taste, smell and color

Turbid water indicates that the water is polluted. If the water is cloudy, it will smell and have a color. For example, water that is polluted by sewage from factories will smell bad, and the smell is often associated with the taste of water. Smell, taste, and color are parameters that are used to determine contamination in

water (Caesar, 2017). Water that smells and tastes bad when used and consumed by humans can interfere with human health. The physical inspection of clean water showed the water was odorless and tasteless. There was no contamination in the water around the clean water supply facilities, and thus it could be used in everyday life.

### **Simple chemical check of clean water quality**

Simple chemical tests included pH and residual chlorine testing. The technical guidelines adopted by Class 1 Surabaya Port Health Office were following the Decree of the Indonesian Ministry of Health No. 431/MENKES/SK/IV/2007 concerning the Technical Guidelines for Environmental Health Risk Control at Ports/Airports/Cross-Border Posts in the Context of Health Quarantine. It states that if the results are less than 0.2 ppm, then chemical status does not meet the health standards and indicates an imperfect chlorination process.

### **Residual chlorine and pH**

Water for human consumption must have a balanced pH, which must not be too acidic or too alkaline because it can affect the consumer health. If water has a pH of below 6.5, it is considered too acidic. If the pH is above 8.5, it is too alkaline for consumption. As corrosion can be caused by too acidic water, pH adjustment can help control the corrosion in the pipes of the water distribution system (Syahputra, 2012). This study found that the clean water available in the clean water supply facilities had a fulfilled pH level.

Moreover, there were several tests in which the residual chlorine level was 0 (zero). There were several possible reasons for the results. 1) The additional chlorine in the water evaporated due to exposure to sunlight even though the water system was closed. 2) Only a small amount of chlorine was added to the water. Therefore, when

the inspection was conducted, the result was 0 (requirements: 250 mg/l); 3). The use of unsuitable reagents, such as using expired reagents will affect the quality of the water being examined (SNI, 7828: 2012). 4) There was a means of providing clean water that is not given enough attention so that it can be used. Many facts affect water quality such as pipe leakage, distribution distance, and winding pipe shape which affects the chlorine content in the water (Afrianita, 2016). It is important to ensure that residual chlorine levels are up to standard. If the remaining chlorine in the water is 0 (zero), the water can be easily contaminated with bacteria. Conversely, if the remaining chlorine in the water is in excess, it can have an impact on human health, one of which is bladder cancer because chlorine is carcinogenic (Winati, 2014).

### **Chemical and microbiological examination**

Based on the laboratory test results, the water samples met the clean water requirements. The results of the examination were in accordance with the standard. Humans can experience diarrhea if they have consumed water that has an excess of the *E. coli*. The bacteria can also spread to other organ or body systems and can infect the urinary tract to cause urinary tract infections (UTI). Moreover, the presence of coliform is closely related to the presence of feces in the water because coliform can come from feces. These types of bacteria are found everywhere, such as clean water, foodstuffs, and even in other materials used for human purposes. If coliform are found in clean water, foodstuffs and other ingredients, they have been contaminated by human feces. Therefore, the clean water standards require the amount of *E. coli* to be 0/100 ml (Sunarti, 2016).

If the water tested has met the requirements, then the number of *E. Coli*/100 ml and total coliform/100 ml in water is 0 (zero). Based on the standard,

the presence of *E. Coli* and coliform in the water must be 0 (zero) so as not to endanger human health. *E. coli* is a bacterium that is present in the human colon as a normal flora. However, this bacteria can cause primary infections in the human intestine and other body tissues outside the intestine.

Therefore, the quality of clean water must always be maintained, especially in regard to the contamination of *E. Coli* and coliform for their impacts to human health. Regular monitoring and testing are an example of the preventive measures from diseases due to water contaminated with *E. coli*. The laboratory test results demonstrated the clean water at Juanda Airport in Surabaya was of good and was suitable for the community consumption.

#### **Sanitary conditions of the piping system facilities**

The supervision in the piping system facilities was carried out together with the inspection of clean water quality. Overall, the clean water supply facilities did not obtain negative results as there was no pipe leakage between the source and reservoir. Therefore, the water was not contaminated by dirt or bacteria. Additionally, the release tub was properly closed, and the man-hole reservoir was tightly closed. The air holes were protected, and there were no cracks in the reservoir tub. Chlorination was also carried out in the reservoir tub to remove bacteria in the water, and there was no leakage in the distribution pipe. There was no puddle of liquid waste that could pollute the water, and there were no pesticides that could contaminate the water and endanger human health. Moreover, there were no piles of garbage nor other types of waste around the reservoir.

However, from the interview results, the main problem was chlorination process in the reservoir. In the interview, the officers mentioned the chlorination process was correct. However, when

checking the remaining chlorine in the water, it turned out that the result was zero. While the residual chlorine in the water should be 0.2 ppm. The remaining chlorine in the water will prevent water from being contaminated with bacteria.

If all clean water supply sites have been inspected through laboratory tests and all physical, chemical, and bacteriological parameters have met the requirements, the Class 1 Surabaya Port Health Office will issue the Certificate of Water Quality Control, which is valid until the officer re-checks and provides the results of the inspection together with a new certificate. Based on the Decree of the Indonesian Ministry of Health No. 431/MENKES/SK/IV/2007 concerning Technical Guidelines for Environmental Health Risk Control at Ports/Airports/Cross-Border Posts in the Context of Health Quarantine, water sampling activities for chemical examinations should be conducted more frequently if there is a water-borne disease outbreak, pollution, and leakage/repair of the water distribution system.

#### **Compliance with the implementation of clean water supply supervision by the Class 1 Surabaya Port Health Office with Standard Operating Procedures (SOP)**

The clean water quality inspection (physical, chemical, simple chemical, and microbiological examinations) and the pollution level in the clean water supply facilities of Class 1 Surabaya Port Health Office met the standard requirements. The results of the inspection were also closely related to the preparation and implementation process of clean water supply supervision. From the observations and interviews, the implementation of clean water supply supervision was according to the Decree of the Indonesian Ministry of Health No. 431/MENKES/SK/IV/2007 concerning Technical Guidelines for Health Risk

Control as Standard Operating Procedures (SOP).

There are 4 processes involved when supervising clean water supplies to check the quality of clean water and clean water supply facilities. In the preparation process, 1) a map/situation plan is created in advance to supervise the supply of clean water at the port/airport; 2) a schedule needs to be made for each activity undertaken, and thus the time and where water will be taken, when monitoring is carried out on the components of the water supply and distribution system, when and where guidance and direction are carried out, can be determined for inspection purposes; 3) tools and materials in the supervision will also need to be prepared. These include a water test kit, water inspection form, bacteriological sampling equipment (sample bottles, Bunsen burner, labels and sample flasks), tools for taking chemical samples (jerry cans and labels), and letters of assignment.

In the implementation process, the method used for taking water samples for bacteriological examination from a faucet or hydrant is as described below: a) Let the water flow for 2-3 minutes; b) Flame the faucet/hydrant first so that it is sterile (especially the mouth of the faucet/hydrant); c) Flow hot water through the faucet for about 2 minutes; d) Allow the water to fill the bottle until it reaches the neck of the bottle (at least 100 cc); e) Flush bottle mouth again and flame the lid before immediately closing the bottle (ensure that the lid is also not touched by bare hands); f) Add a label on the sample bottle which includes the number, date, time of collection, location of collection and the name of the water sample; g) The examination of bacteria is carried out in the laboratory and not by the officers themselves.

The method used for taking water samples for bacteriological examination on water boats or barges and cars or water tanks is as described below: a) Samples are taken through the main hole on the water

boat or barge and car or water tank; b) Bottles, bottle caps, wrapping paper and other tools must be sterile; c) Hold the bottle using the left hand, then open the wrapping paper, open the bottle cap and the mouth of the bottle will be filled; d) Collect the water directly from the manhole; e) Flame the mouth and cap of the bottle; f) Add a label on the bottle that has been filled with water samples including the number, date, time of collection, location of collection and name of the person who collects the sample; g) Send the sample to the laboratory in within 24 hours of collection. If the delivery cannot be carried out immediately or if the laboratory is far away, the sample may be stored in a refrigerator or ice thermos to avoid the development of bacteria in the sample.

The method used for taking water samples for chemical examination of the water from a faucet or hydrant is as described below: a) Allow water from the tap to fill the jerry can up until five liters; b) Label the jerry can with information such as sample number, date, time of collection, location of collection and the name of the person who collects the sample.

The method used for taking water samples for chemical examination of the water from water boats or barges and cars or water tanks is as described below: a) Collect water samples through the main holes on the water boats or barges and cars or water tanks; b) Rinse the jerry cans three times before filling the jerry cans with water samples; c) Fill the jerry can with five liters of sample water; d) Label the jerry with information such as sample number, date, time of collection, location of collection and name of the person who collected the sample; e) Add a sodium thiosulfate preservative if the sample is sent to the laboratory more than 24 hours since its collection.

The results of bacteriological examinations of the water sample for residual chlorine should not be less than

0.2 mg/liter or 0.2 ppm (if using chlorine as a disinfectant). The residual chlorine in the water should be less than 0.2 mg/liter or 0.2 ppm. Then, the State in full must provide advice as well as a suggestion for corrective action.

The third process is supervision of the drinking water supply from source supplying to distribution to consumers. This includes supervising the conditions of the water facilities, maintenance of water facilities and repairs (if they do not meet the set standards), supervision and counseling on how to supply clean water, as well as hygiene and sanitary water handling practice.

The fourth process is implementation. The supervisor of clean water supply are civil servants at the Class 1 Surabaya Port Health Office who have a minimum education of Diploma 1 in Sanitation and/or has received training in sanitarian positions.

Overall, the implementation of clean water supervision at Class 1 Surabaya Port Health Office was in accordance with the SOP. The Class 1 Surabaya Port Health Office officers prepared the equipment, implemented set procedures, and supervised clean water supply facilities. However, there were some aspects that were not done by the officers because they were carried out by laboratory staff at BBTKL or BBLK Surabaya. The Class 1 Surabaya Port Health Office officers only took samples and sent them to the laboratory for examination.

The Class 1 Surabaya Port Health Office holds a significant role in supervising the provision of clean water to maintain its quality. Clean water monitoring is a preventive measure from water contamination. Moreover, when there are problems related to water such as water-borne disease, pollution, and leakage/repairs of the water distribution system, the Class 1 Surabaya Port Health Office will control and supervise the clean water supply.

## CONCLUSION

The clean water quality inspection conducted at the Class 1 Surabaya Port Health Office discovered the physical, chemical, and microbiological statuses met the health requirements and were in accordance with the Regulation of the Indonesian Ministry of Health No. 416 of 1990 concerning the Requirements and Monitoring of Water Quality. Meanwhile, the simple chemical examination showed there was 0 (zero) chlorine residue which did not follow the standard. In terms of piping systems, the level of risk for water pollution was low. To minimize the occurrence of errors when adding chlorine to clean water, the Class 1 Surabaya Port Health Office should pay greater attention and supervise the chlorination of water conducted by the clean water supply manager at the airport to meet the standard residual chlorine level. Moreover, expired reagents or reagents which color has changed should not be used when performing a clean water inspection because it will affect the results of the parameter testing.

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# THE CORRELATION BETWEEN HEALTHY HOUSES AND ACCESS TO SAFE DRINKING WATER WITH THE INCIDENCE OF DIARRHEA IN EAST JAVA IN 2016

Siti Fera Irawati<sup>1</sup>, Arief Wibowo<sup>1</sup>

<sup>1</sup>Department of Biostatistics and Population,  
Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia  
Correspondence Address: Siti Fera Irawati  
Email: irawatifera@yahoo.com

## ABSTRACT

Diarrhea is a common endemic disease in Indonesia. In developing countries, the high prevalence of diarrhea can be attributed to the lack of clean water and proper sanitation. This study determined a correlation between access to safe drinking water and healthy houses with the incidence of diarrhea in East Java in 2016. The study applied a correlation study design. The population consisted of all diarrhea patients treated in East Java in 2016; thus, the population was used also as a sample. The data were obtained from secondary data, namely the 2016 East Java Provincial Health Profile. Pearson correlation test was used in analyzing the data. There was a correlation between healthy homes ( $p = 0.000$ ) and sustainable access to safe drinking water ( $p = 0.000$ ) with the incidence of diarrhea. Pearson correlation coefficient for the healthy house variable was 0.798, while the Pearson correlation coefficient for sustainable access to safe drinking water was 0.722. It can be concluded that the relationship between healthy homes and access to safe drinking water with the incidence of diarrhea in the Province of East Java in 2016 was strong enough.

**Keywords:** diarrhea, healthy houses, access to safe drinking water.

## INTRODUCTION

Diarrhea is the dominant cause of pain and death among children (Yu, Lougee, and Murno, 2017). Globally about 1.7 billion children suffer from diarrhea; as many as 525,000 of them die every year. On average, children under three years old experience diarrhea three times a year in low-income countries. This condition might lead to malnourishment due to nutrients loss required for children growth. Children who are malnourished are at a higher risk of experiencing diarrhea (WHO, 2017).

Diarrhea is a common endemic disease in Indonesia (Indonesian Ministry of Health of Republic of Indonesia, 2016). The prevalence of diarrhea increased during the period from 2000 to 2010 in Indonesia. The Incidence Rate (IR) of diarrhea was 301 per 1,000 population in 2000 and reached 411 per 1,000 population in 2010 (Indonesian Ministry of Health of Republic of Indonesia, 2011). In 2016, reports showed three diarrhea outbreaks with high Case Fatality Rate (CFR)

(3.04%) (Ministry of Health of Republic of Indonesia, 2016). In East Java, the number of diarrhea cases was 865,249 in 2016 which was lower than the number in 2015 (887,184 cases) (East Java Provincial Health Office, 2016).

In diarrhea, the person experiences bowel movement with a liquid consistency at least three times a day. Rotavirus is the most well-known agent of diarrhea, causing up to 50% of acute diarrhea incidents. There are three clinical types of diarrhea; first, acute watery diarrhea, including cholera, which lasts several hours or days and can cause dehydration; second, acute bloody diarrhea or dysentery, which causes intestinal damage, sepsis, malnutrition, and dehydration; and third, persistent diarrhea (Yu, Lougee, and Murno, 2017). Body fluid loss and severe dehydration are the leading causes of death from diarrhea. Furthermore, other factors such as septic bacterial infection may promote death from diarrhea among children (WHO, 2017).

Preventive measures of diarrhea may include providing safe drinking water,



managing suitable sanitation facilities, and washing hands with soap. Diarrhea can be treated with ORS, which is a solution of water, salt, and white sugar. Additionally, intake of zinc tablets (20 mg) for 10 to 14 days can reduce the sickness span (WHO, 2017).

The high prevalence of diarrhea in developing countries may be inferred to lack of both clean water and proper sanitation (Cairncross *et al.*, 2010). Although the global efforts over the past decade to achieve the MDG targets related to clean water coverage, sanitation prevails is still a big challenge and the coverage percentage is still below the target (77%). In 2015, about 2.4 billion people did not have access to proper sanitation facilities and around 1 billion of them were practicing open defecation (Cha *et al.*, 2017).

In Indonesia, 18% of households drink water that comes from surface sources, with high exposure to contamination, such as springs, rivers, ponds, and lakes (Central Body of Statistics, 2014), and merely 11% of households have access to piped water in their homes (Surjadi, 2003). However, the water quality usually does not meet the minimum requirements for drinking water, containing fluctuating discharges and frequent disruptions. Moreover, piped water is vulnerable to contamination with fecal bacteria and dangerous for consumption without treatment (Komarulzaman, Smits, and Jong, 2017).

In Indonesia, many households still depend on drinking water sources that are unsafe and easily contaminated with bacteria, such as rivers. The contamination can also occur during the collection, transportation, storage, and presentation of water due to fecal contaminated hands and tools (Shaheed *et al.*, 2014).

Moreover, globally Indonesia has the second-highest population practicing open defecation (54 million). Young children's stools are considered less dangerous than adults' due to their

diminutive size and mild odor. However, according to Gil *et al.* (2004), children's stools are more infective than adults. Formative studies in Eastern Indonesia found that 80% of respondents agreed or strongly agreed with the statement "Baby droppings can spread disease" which reflected the high knowledge level about the health hazard of children's stools. However, knowledge is not always enough and should be followed by practice. Unfortunately, 48% of Indonesian households do not practice safe disposal for the stools of their children under five years old. However, the safe disposal level in Indonesia (52%) is lower than the safe disposal level in East Java (66%). Another study from 3 districts in Indonesia; Java, NTT, and Papua, found only 43.4% of households practicing safe disposal of the children's stools (Cronin *et al.*, 2016). This situation increases the possible risk of environmental and water pollution. As a result of the poor water quality and sanitation, the prevalence of diarrhea is still high in Indonesia, responsible for 31% of postnatal deaths and 25% of children deaths (Komarulzaman, Smits and Jong, 2017).

This study aimed to determine the correlation between access to safe drinking water and healthy houses with the incidence of diarrhea in East Java in 2016. The study results could be used for planning programs or formulating policies related to diarrhea control and as material for other studies related to risk factors of diarrhea.

## METHODS

This study applied a correlational study design. All diarrhea patients in East Java who were treated in 2016 were involved in the population. Thus, the population also acted as the study sample. The independent variables were the number of people who have sustainable access to safe drinking water and the number of healthy houses, while the

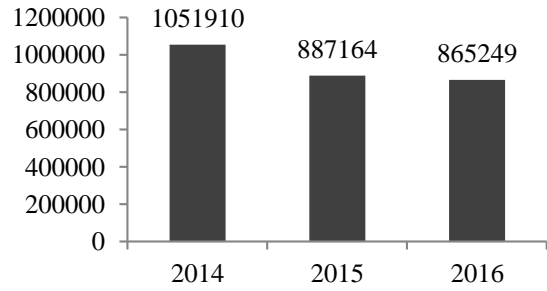
dependent variable was the number of diarrhea cases. Residents with sustainable access to safe drinking water referred to individuals who got their water from piped networks (PDAM, BPSPAM) or not piped networks (protected dug wells, pumped dug wells, pumps with pump wells, water terminals, protected springs, and collected rainwater tanks). Healthy houses referred to residential buildings that met health requirements including the housing components, sanitation, and household facilities such as healthy latrines, landfills, clean water facilities, wastewater disposal facilities, proper ventilation, suitable residential density, and houses with non-clayed floors. The diarrhea cases were the reported and treated cases in East Java Province in 2016.

The data source was the secondary data from the East Java Provincial Health Profile in 2016. Data were analyzed using univariate and bivariate analyses. Bivariate analysis was performed using the Pearson's Correlation Coefficient. Before data analysis, the Kolmogorov Smirnov test was conducted to test the data normality. Ethical approval for the research protocols was obtained from the Research Ethics Committee of Faculty of Dental Medicine Universitas Airlangga on 23rd August 2019 with a certificate number of 578/HRECC.FODM/VIII/2019.

**RESULTS**

**Overview of the Number of Treated Diarrhea Patients in East Java in 2014-2016 according to Gender**

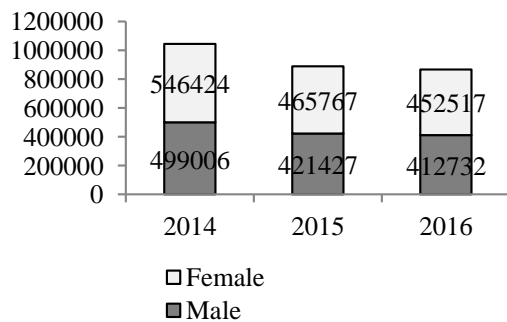
The number of diarrhea cases was decreasing in (2014-2016). The number was 1,051,910 cases in 2014; 887,164 cases in 2015; and 865,249 cases in 2016 (Figure 1).



Source: East Java Provincial Health Profile (2014-2016)

**Figure 1.** Total Number of Cases of Diarrhea in East Java (2014-2016)

Based on gender, diarrhea prevalence was more in women than men. The number of women who suffered from diarrhea was 546,424 in 2014, decreased to 465,767 in 2015, and declined to 452,517 in 2016. While in men, the number was 499,006 in 2014, lowered to 421,427 in 2015, and reduced again to 412,732 in 2016 (Figure 2).



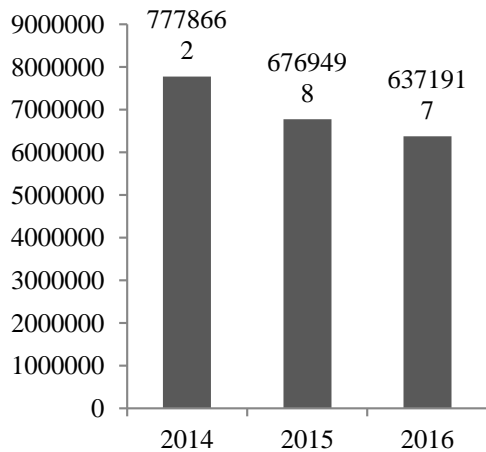
Source: East Java Provincial Health Profile (2014-2016)

**Figure 2.** Total Number of Cases of Diarrhea based on Gender in East Java (2014-2016)

**Overview of Number of Healthy Houses and Number of Population with Sustainable Access to Safe Drinking Water in East Java in (2014-2016)**

The number of healthy houses in East Java was decreasing (2014-2016), starting from 7,778,662 healthy homes in

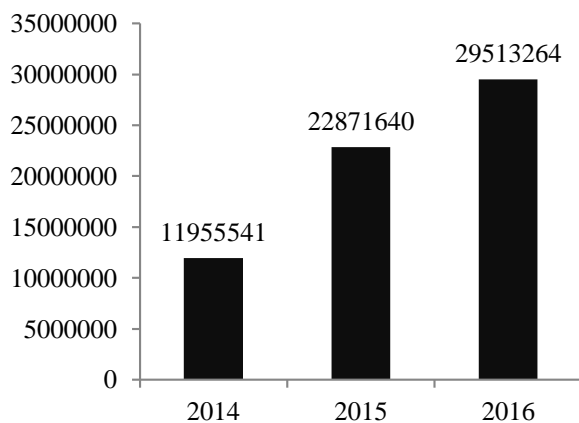
2014, followed by 6,769,498 in 2015, and dropped to 6,371,917 in 2016 (Figure 3).



Source: East Java Provincial Health Profile (2014-2016)

**Figure 3.** Total Number of Healthy Houses in East Java in (2014-2016)

The number of people with sustainable access to safe drinking was increasing in (2014-2016), started with 11,955,541 residents in 2014, raised to 22,871,640 in 2015, and increased again to 29,513,264 in 2016 (Figure 4).



Source: East Java Provincial Health Profile (2014-2016)

**Figure 4.** Total Number of Population with Sustainable Access to Safe Drinking Water in East Java (2014-2016)

### Analysis of Correlation Between Healthy House and Sustainable Access to Safe Drinking Water with the Incidence of Diarrhea in East Java

The normality test showed that a p-value was 0.439 for incidence of diarrhea, 0.741 for healthy houses, and 0.526 for sustainable access to safe drinking water (Table 1). Thus, the three variables had regular distribution, and thus Pearson's correlation coefficient could be used to estimate their correlation strength.

**Table 1.** Normality Test Results for the Variables of Incidence of Diarrhea, Healthy Houses, and Sustainable Access to Safe Drinking Water

Category	Results
<b>Incidence of Diarrhea</b>	
Kolmogorov-Smirnov Z	0.868
Asymp. Sig. (2-tailed)	0.439
N	38
<b>Healthy Houses</b>	
Kolmogorov-Smirnov Z	0.682
Asymp. Sig. (2-tailed)	0.741
N	38
<b>Sustainable Access to Safe Drinking Water</b>	
Kolmogorov-Smirnov Z	0.811
Asymp. Sig. (2-tailed)	0.526
N	38

The p-value of the healthy houses was 0.000. Thus, there was a correlation between healthy houses and the occurrence of diarrhea with a correlation coefficient score equal to 0.798. This result reflected that the relationship between these variables was stable enough as the

correlation coefficient was close to 1 (Table 2).

The p-value for sustainable access to safe drinking water was 0.000. Thus, there was a correlation between sustainable access to safe drinking water and the incidence of diarrhea. The correlation coefficient score was 0.722. This result indicated that the relationship between these variables was relatively stable since the correlation coefficient was close to 1 (Table 2).

**Table 2.** Pearson's Correlation Results between Healthy House, Sustainable Access to Safe Drinking Water, and the Incidence of Diarrhea in East Java 2016

	Incidence of Diarrhea	Healthy House	Sustainable Access to Safe Drinking Water
Sig. (2-tailed)	0.000	0.000	0.000
Pearson Correlation	0.798	0.722	
N	38	38	38

## DISCUSSION

### Analysis of Correlation between Healthy Houses and Sustainable Access to Safe Drinking Water with the Incidence of Diarrhea in East Java

Healthy houses are houses with adequate ventilation and a smoke-free and CO-free environment, clean water accessibility, and adequate sanitation facilities. Healthy houses should be clear from pollution, humidity, and noise and featured by non-clayed grounds (CDC, 2017).

This study showed a correlation between healthy houses with the incidence of diarrhea. These results are confirmed by Setyaningsih and Sulistyaningsih (2016) showing that infants had a 20.8 higher risk of diarrhea in unhealthy houses than others in healthy homes.

Saleh and Rachim (2014) presented that the provision of both clean water ( $p = -$ ) and rubbish bins ( $p = 0.947$ ) were not risk factors for diarrhea, while latrines use ( $p = 0.000$ ) and sewerage ( $p = 0.000$ ) were risk factors for diarrhea. Human waste also was categorized as a significant factor. Therefore, it is a priority to provide proper disposal facilities for stools. Stools are high infectious sources of diarrhea (Saleh and Rachim, 2014). Littering also can contaminate both water and soil. The children's stools may be considered as a low-risk infectious factor compared to adults due to their small size and mild odor; however, according to Gil et al. (2004), children's stools were more infective than adults.

A study in Ethiopia revealed that open dumping around houses could be a risk factor for diarrhea. Moreover, domestic wastewater discharge from households to public roads was another diarrhea risk factor. Solid waste disposal and wastewater evacuation on public roads might become a breeding site for insects spreading diarrheal pathogens from open waste to drinking water or food (Thiam et al., 2017). Since diarrhea is caused mainly by contaminated water sources, water sources should be protected to reduce the direct contact or the formation of vector breeding sites. Safe drinking water supply and wastewater treatment are the main solutions to avoid diarrhea (Naik and Stenstrom, 2012).

Rego, Moraes, and Dourado (2005) stated that garbage disposal had an influential relationship with diarrhea incidence, with a prevalence ratio (PR) of 2.74 (95% CI 1.28-5.87). The Presence of toilets and applying of garbage disposal techniques inside houses decreased

diarrhea incidence but with a insignificant confidence interval (95%).

According to Curtis et al. (2000), the four transmission routes of diarrhea are first through human-to-human via the environment, second through human-to-human multiplying in the environment, third human-to-animal-to-human via the environment, and finally through animal-to-human via the environment.

Sewage, liquid, and solid waste management are the elements of environmental sanitation that involve several stages: collection, transportation, treatment, and disposal. Organic waste facilitates the proliferation of diarrheal vectors, such as flies. However, the proximity of houses to landfills can play a role in the increase of insects number. This increase could, in turn, facilitate disease transmission among the residents near landfills (Rego, Moraes, and Dourado, 2005). A study conducted in Pakistan has stated that flies control was enough to reduce 23% of diarrhea prevalence among children.cha

Moreover, the proximity of dumps to houses increases children's exposure to pathogens, both directly (through personal contact with garbage or waste), and indirectly (through the contamination around households). Young children were mainly exposed to pathogens directly due to playing near the dumps (Rego, Moraes, and Dourado, 2005). Indirect exposure of children to pathogens might happen due to the presence of human waste in household waste. Households contamination may occur through clothing or direct contact of hands with the surrounding garbage or solid waste, followed by direct pathogens transmission to young children (route 1 or route 2). Garbage also tends to attract animals (dogs, chickens, and pigs), whose droppings act as pathogenic vectors of diarrhea (route 3) (Curtis, Cairncross, and Yonli, 2000). Guinea-Bissau, found that children were more vulnerable to diarrhea caused by *Cryptosporidium* in households with pigs (2.5 times) in addition to

households with dogs (2.1 times). Several studies showed an association between animal waste and diarrhea, particularly related to cross infections in developing countries (Curtis, Cairncross, and Yonli, 2000). Additionally, stools are likely to attract flies, which carry enteric pathogens to food. The Salvador City Animal Disease Control Center, which is responsible for controlling animals around landfills, often reports about the animals' proximity to waste consequences (Rego, Moraes, and Dourado, 2005).

The results showed that there was a correlation between sustainable access to safe drinking water and the incidence of diarrhea. Showed that children under five whose families utilized water from unsafe sources had a 1.21 times greater risk of diarrhea than others whose families utilize water from protected sources.

Piped water contamination is not common due to the constructive characteristics of the piped water system that protect it from external interferes. Moreover, households with piped water tend to maintain health due to the high availability of clean water. However, many households in deprived areas suffer from water unavailability. Consequently, many households store water at home enhancing the vulnerability to contamination (Shaheed et al., 2014).

Water treatment by boiling, chlorination, filtering or others is crucial, especially in poor-quality water supplies. Water treatment enhances water safety before drinking by killing the bacteria and reducing the risk of diarrhea, especially in developing countries. However, the water treatment only is not always enough since the cleanliness preservation is not often maintained accurately during storage and presentation. For instance, water can be contaminated by hands during container placement or removal, reducing the treatment efficiency (Sodha et al., 2011).

In addition to clean water, proper sanitation facilities can prevent diarrhea transmission by reducing the fecal

contamination risk. Those facilities separate human from direct contact with human waste and ensure the safe disposal of stools. However, a recent cluster-randomized trial study in rural Odisha, India, demonstrated that adequate household sanitation facilities did not always improve health. Suitable facilities at home are not enough if the community is still exposed to fecal contamination (Clasen *et al.*, 2014).

However, a more positive impact can be noticed if households allow access to clean water for their neighbors who do not have such access enhancing a healthier environment for their children. Thus, the sanitation at the community level may also be a determinant of the influence scope (Alderman, Hentschel, and Sabates, 2003).

Conventional lavatories can improve the cleanliness level of households, however, elimination of feces in the environment cannot be fully achieved if other households do not possess those facilities (Clasen *et al.*, 2014). Those factors affect health indirectly at the community level. Similarly, Alderman, Hentschel, and Sabates (2003) approved that water access only is not enough and should be combined with the lavatories access to get the required positive health effects.

## CONCLUSION

It can be concluded that there was a decrease in diarrhea cases in (2014-2016) in East Java. Women experienced diarrhea more frequently than men. The number of healthy houses was decreasing, while the number of people with sustainable access to safe drinking water was increasing in (2014-2016). It can also be inferred that there was a correlation between access to safe drinking water, healthy houses, and diarrhea contamination. The relationship between the three elements was considerably compelling.

To control diarrhea cases in East Java, it is suggested working with

community leaders to increase public awareness about the importance of healthy houses (especially healthy latrines and landfills ownership indicators) and sustainable access to safe drinking water. To get the required health impact, it is essential to cover the community needs of both drinking water ownership and lavatories access.

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# THE CORRELATION BETWEEN WATER, SANITATION, AND HYGIENE WITH SOIL-TRANSMITTED HELMINTHS INFECTION AMONG ELEMENTARY SCHOOL CHILDREN OF ARU ISLANDS DISTRICT, MALUKU

Tiffany Konstantin<sup>1</sup>, Indah Setyawati Tantular<sup>2</sup>, Alpha Fardah Athiyah<sup>3</sup>, Lynda Rossyanti<sup>2</sup>

<sup>1</sup>Faculty of Medicines, Airlangga University, Surabaya Indonesia

<sup>2</sup>Departement of Parasitology, Faculty of Medicines, Airlangga University, Surabaya, Indonesia

<sup>3</sup>Departement of Child Health Sciene, Dr. Soetomo General Hospital, Surabaya, Indonesia

Correspondence Address: Tiffany Konstantin

Email: tiffanykonstantin@yahoo.com

## ABSTRACT

Soil-Transmitted Helminths (STH) infection is the most common intestinal parasite infection in Indonesia. STH infection can interfere with child development and cause cognitive impairment in severe cases. The school-age group is the most susceptible to STH infection because of direct contact with soil in the school yard. STH infection incidence can be avoided by adequate water, healthy latrines, and good hygiene and can be improved by proper interventions. This study aimed to analyze the correlation between Water, Sanitation, and Hygiene (WASH) with STH infection in Aru Islands District, Maluku. This study used a cross-sectional design and was conducted in Elementary Schools in Karangguli and Wokam villages, Aru Islands district, Maluku. One hundred and six stool samples were collected from both villages. The sociodemographic and WASH data were collected using the interview method. Stool samples were collected and examined for STH infection using a direct smear technique on the light microscope. Data statistical analysis was performed by the SPSS program using the Chi-square or Fischer's Exact test. The examination results showed that 73 students (68.9%) were infected with STH. The bivariate analysis showed that water source ( $p = 0.000002$ ), defecation place ( $p = 0.002$ ), and washing hands after defecation ( $p = 0.048$ ) were all significantly correlated with STH infection. This study concluded that WASH variables which were water source, defecation place, and washing hands after defecation had a significant correlation with STH infection.

**Keywords:** Water, Sanitation, and Hygiene (WASH); soil-transmitted helminths infection; elementary school students.

## INTRODUCTION

Helminthiasis is one of the most common infectious diseases in the world, especially in developing countries due to poor sanitation and low awareness of a healthy lifestyle. The most dominant helminthiasis is the Soil-Transmitted Helminths (STH) due to the quick eggs or larvae transmission fecal-orally or through the skin. There are more than 1.5 million people infected by STH up to now, distributed in tropical and subtropical regions, especially in warm and moist places (World Health Organization, 2017).

STH infection usually causes mild gastrointestinal symptoms that can be easily treated using recent drugs. However, STH infection can become severe if left untreated. Severe infection is accompanied

by symptoms such as stomachache, loss of blood and protein, rectal prolapse, and impaired cognitive development (Centers for Disease Control and Prevention, 2013). According to experimental research, worms inside the digestive tract can change the composition of gut microbiota and impair food absorption leading to malnutrition. Furthermore, the composition changes of gut microbiota may trigger the human vulnerability to the pathogenic bacteria causing coinfection (Glendinning et al., 2014).

The school-age group has a high susceptibility to STH infection due to the direct contact with soil, as in the schoolyard. Moreover, elementary school students do not have enough awareness of personal hygiene and sanitation (Samarang, Nurjana, and Sumolang, 2016). Besides,

poor sanitation in school toilets and improper sewage systems can facilitate STH transmission through stools carrying the STH eggs to students who do not wash their hands after defecation. A study in Malaysia showed that STH infection prevalence was higher among people who had no toilets or used the shared ones. However, people may avoid using shared or poorly maintained toilets and prefer to defecate in a river resulting in water pollution (Rajoo et al., 2017).

Indonesia is the fourth populous country in the world. However, the uneven population distribution causes social inequalities, including economy, health facilities, food availability, and education. This gap creates a social imbalance and a high number of poor people, reaching 26.58 million in September 2017 (Central Body of Statistics, 2018). Poverty is the root of STH infection due to its correlation with sanitation, food and clean water availability, education, and hygiene behavior in the community (Sanchez et al., 2016). Yet, sanitation, clean water, and hand washing are associated with a low incidence of STH infection (Strunz et al., 2014).

Common species of STH in Indonesia are *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms (*Ancylostoma duodenale* and *Necator americanus*). The prevalence of STH infection, according to a study in 2005, was 49.02% in North Jakarta, 15.45% in South Jakarta, 33.2% in West Jakarta, and 9.37% in East Jakarta. Thus, it can be concluded that the STH infection has a quite high prevalence and variant distribution in different regions (Mardiana and Djarismawati, 2012).

Maluku is a unique province formed of many small islands in Indonesia. Maluku has the fourth-highest poverty rate among Indonesian provinces (19.26%) (Central Body of Statistics, 2018). Poverty triggers STH infection due to the inability to obtain a good education, adequate number of

shelters, and nutritious food (Sanchez et al., 2016).

Dobo is the capital city of the Aru Islands District in Maluku. Environmental health indicators in the operational areas of the Dobo Primary Healthcare Center are below the standards with a percentage of 30.6% healthy homes, 98.6% families with clean water accessibilities, 1.9% families with wastewater disposal facilities, and 13.3% families with standard latrines. Villages in the operational areas of the Dobo Primary Healthcare Center are distributed in many small islands around Dobo city including Karangguli and Wokam villages. Unfulfilled healthy home indicators and improper conditions in rural areas are accompanied by a high prevalence of STH infection. The infection rate increases in areas with poor environmental management and low infrastructure development (Waris, Rahayu, and Indriyati, 2012).

Since 2014, the helminthiasis control program providing albendazole has been conducted twice a year targeting the preschool and elementary school children (1 -12 years old) in all operational areas of the Dobo Primary Healthcare Center. In 2017, the program coverage in the Dobo Primary Healthcare Center was 96% targeting 3257 children, 3135 of them were successful. This program has merely been evaluated through the program coverage proportion. However, the number of STH infection cases after drug intake in the operational areas of the Dobo Primary Healthcare Center is not available yet due to the lack of routine stool examinations. However, the evaluation can be used to estimate the capability of the helminthiasis control program in overcoming the problem (Indonesian Ministry of Health, 2017a).

The number of STH infection cases in the operational areas of the Dobo Primary Healthcare Center is unknown up to now. However, the data are needed to determine the frequency of STH infection among children in relation to factors such as Water, Sanitation, and Hygiene (WASH), and

evaluate the effectiveness of the existing helminthiasis control program (Zerdo, Yohanes, and Tariku, 2016). Hence, this study aimed to analyze a relationship between WASH and STH infection among elementary school students in Karangguli and Wokam villages, Aru Islands District, Maluku.

## METHODS

This study was an analytical observational study using a cross-sectional design. The analytical observational study aims to analyze the correlation between the variables without a direct intervention. This study analyzed the correlation between Water, Sanitation, and Hygiene (WASH) and Soil-Transmitted Helminths (STH) infection among elementary school students in Karangguli and Wokam villages. The study used the cross-sectional design to collect and analyze data in one-point time.

The study population was students from Karangguli Public Elementary School and Wokam Public Elementary School, Aru Islands District with total numbers of 55 and 79 students consecutively in 2018. The study used the total sampling technique. The study included students who had the will to participate and excluded students who did not collect their stool samples or those who did not answer all the interview questions.

This study was conducted in August 2018. One hundred and six stool samples were collected from both villages. Interviews with the students and their parents were conducted to collect data on last anthelmintic drug administrations; sociodemographic variables (age, gender, grade, parents' last education, and parents' occupation); water variables (physical characteristics of water quality, water source, and boiled drinking water); sanitation variable (defecation place); and hygiene variables (handwashing before eating, handwashing with soap, handwashing after defecation, handwashing after playing with soil/dirt, cutting nails

routinely, wearing footwear outdoors, and playing with soil/dirt). Collected stool samples were analyzed to check STH species according to the presence of STH eggs or larvae (*Ascaris lumbricoides*, *Trichuris trichiura*, and/or *hookworms*) using a light microscope with a direct smear technique. Data on WASH and STH infection were analyzed by the SPSS program using the Chi-square or Fischer's Exact test if the Chi-square could not be used. The bivariate statistical analysis would show the relationship between WASH variables and STH infection was significant if a p-value was  $< 0.05$ . Contingency coefficient score was used to determine the strength of the correlation among significant variables.

This study ethical permission was approved by the Research Ethics Committee, Faculty of Medicine, Universitas Airlangga with an ethical clearance number of 189/EC/KEPK/FKUA/2018. The subjects' parents were given written information and asked for informed consent regarding the data collection.

## RESULTS

Out of the 106 students, 73 students were infected (68.9%) and 33 students were not (31.1%) with STH. Based on STH species, the number of students infected with *Ascaris lumbricoides* was 56 students, with *Trichuris trichiura* was 50 students, and with *hookworms* was 12 students. Of all students, 31 students had a single infection, 33 students had a double infection, and 6 students had a triple infection. The distribution of STH species is shown in Table 1.

**Table 1.** Distribution of STH Species

STH Species	Total (n = 73) (%)
<i>Ascaris lumbricoides</i> and <i>Trichuris trichiura</i>	27 (36.9)
<i>Ascaris lumbricoides</i> and <i>hookworms</i>	4 (5.4)

<i>Trichuris trichiura</i> and <i>hookworms</i>	2 (2.7)
<i>Ascaris lumbricoides</i> , <i>Trichuris trichiura</i> , and <i>hookworms</i>	6 (8.2)
<i>Ascaris lumbricoides</i>	19 (26)
<i>Trichuris trichiura</i>	15 (20.5)

The helminthiasis control program in both villages was conducted in February and August every 6 months since 2014. A total of 89 students took the anthelmintic drug in the past 6 months as this study was conducted in early August, while the next program was conducted in the following month. The other 17 students did not take

the drug in the past six months but in the past 12 months during the previous program.

The sociodemographic distribution of subjects is presented in Table 2. The percentage of STH infection was a bit higher in males (69.2%) than females (68.5%). The highest percentage of STH infection was in Grade I (73.3 %) followed by Grade VI (72.2%), II (70.6%), III (68.8%), IV (65.4%), and V (64.3%). The average age of subjects was 8.75 years, the youngest (6 years old) and the oldest (13 years old). The percentage of STH infection was higher among students aged 10 years old or older (74.3%) compared to others under 10 years old (65.6%).

**Table 2.** Sociodemographic Distribution of the Subjects

Sociodemographics of the Subjects	STH Infection		Total (n = 106) (%)
	Infected (%)	Not Infected (%)	
<u>Gender</u>			
Male	36 (69.2)	16 (30.8)	52 (49.1)
Female	37 (68.5)	17 (31.5)	54 (50.9)
<u>Grade</u>			
I	11 (73.3)	4 (26.7)	15 (14.2)
II	12 (70.6)	5 (29.4)	17 (16.0)
III	11 (68.8)	5 (31.2)	16 (15.1)
IV	17 (65.4)	9 (34.6)	26 (24.5)
V	9 (64.3)	5 (35.7)	14 (13.2)
VI	13 (72.2)	5 (27.8)	18 (17.0)
<u>Age (years)</u>			
6	10 (71.4)	4 (28.6)	14 (13.2)
7	8 (61.5)	5 (38.5)	13 (12.3)
8	14 (66.7)	7 (33.3)	21 (19.8)
9	12 (63.2)	7 (36.8)	19 (17.9)
10	17 (77.3)	5 (22.7)	22 (20.8)
11	9 (63.2)	4 (30.8)	13 (12.3)
12	2 (100)	0 (0)	2 (1.9)
13	1 (50)	1 (50)	2 (1.9)

The sociodemographic distribution of subjects' parents is presented in Table 3. The highest percentage of STH infection was among students whose parents did not finish elementary school (100%) while the lowest percentage was among subjects

whose parents finished college education (60%). The highest percentage of STH infection was among students whose parents were farmers (75.3%), followed by fishermen (70%), and government employees (42.1%).

**Table 3.** Sociodemographic Distribution of the Subjects' Parents

Sociodemographics of the Subjects' Parents	STH Infection		Total (n=106) (%)
	Infected (%)	Not Infected (%)	
<u>Lastest Education</u>			
Not completed Elementary School	1 (100)	0 (0)	1 (0.9)
Elementary School	17 (65.4)	9 (34.6)	26 (24.5)
Junior High School	24 (80)	6 (20)	30 (28.3)
Senior High School	22 (64.7)	12 (35.3)	34 (32.1)
College	9 (60)	6 (40)	15 (14.2)
<u>Occupation</u>			
Fishermen	7 (70)	3 (30)	10 (9.4)
Government Employees	8 (42.1)	11 (57.9)	19 (17.9)
Farmers	58 (75.3)	19 (24.7)	77 (72.6)

Data on water variables and the bivariate analysis results are presented in Table 3. Water variables include the water source, physical water quality, and boiled drinking water. The Chi-square test was used to determine the correlation between all water variables and STH infection. Results showed that 26 students used inadequate physical water quality. Nevertheless, all students consumed boiled drinking water.

In this study, the water sources were piped water, dug wells, rainwater, and

spring water. The percentage of STH infection from high to low based on the water source was piped water (95%), spring water (85.1%), dug wells (62.5%), and rainwater (0.9%), consecutively. The Chi-square test results showed that the correlation between the water source and STH infection was significant ( $p = 0.000002$ ). The correlation strength was then assessed using a contingency coefficient score (0.463); thus, the correlation strength was moderate.

**Table 3.** Bivariate Analysis of Water Variables and STH Infections

Water Variables	STH Infection		Total (%)	p-value
	Infected (%)	Not Infected (%)		
<u>Physical Water Quality</u>				
Adequate	56 (70)	24 (30)	80 (75.5)	0.659
Inadequate	17 (65.4)	9 (34.6)	26 (24.5)	
<u>Water Source</u>				
Piped water	19 (95)	1 (5)	20 (18.8)	<0.000
Dug wells	30 (62.5)	18 (37.5)	48 (45.3)	
Rainwater	1 (0.9)	10 (99.1)	11 (10.4)	
Spring water	23 (85.1)	4 (14.9)	27 (25.5)	
<u>Boiled drinking water</u>				
Yes	73 (68.9)	33 (31.1)	106 (100)	N/A
No	0 (0)	0 (0)	0 (0)	

The bivariate analysis between sanitation and STH infection is presented in Table 4. Defecation place was classified

into three categories: land or sea, shared latrines, and private latrines. The percentage of STH infection was 84.6%,

50%, and 59% among students who defecated on land or sea, in private latrines, and shared latrines, respectively. Chi-square results reflected the significant correlation between defecation place and

STH infection ( $p = 0.002$ ). Then, the correlation strength was assessed using the contingency coefficient score (0.323), and thus the correlation strength was moderate

**Table 4.** Bivariate Analysis of Sanitation Variable and STH Infection

Sanitation Variable	STH Infection		Total (%)	p-value
	Infected (%)	Not Infected (%)		
<u>Defecation Place</u>				
Land/sea	44 (84.6)	8 (15.4)	52 (49.1)	0.002
Shared latrines	13 (59)	9 (41)	22 (20.7)	
Private latrines	16 (50)	16 (50)	32 (30.2)	

**Table 5.** Bivariate Analysis of Hygiene Variable and STH Infection

Hygiene Variable	STH Infection		Total (%)	p-value
	Infected (%)	Not Infected (%)		
<u>Handwashing before eating</u>				
Always	36 (65.5)	19 (34.5)	55 (51.9)	0.431
Not always	37 (72.5)	14 (27.5)	51 (48.1)	
<u>Handwashing with soap</u>				
Always	39 (66.1)	20 (33.9)	59 (55.7)	0.491
Not always	34 (72.3)	13 (27.7)	47 (44.3)	
<u>Handwashing after defecation</u>				
Always	34 (59.6)	23 (40.4)	57 (53.8)	0.027
Not always	39 (79.6)	10 (20.4)	49 (46.2)	
<u>Handwashing after playing with soil/dirt</u>				
Always	31 (63.3)	18 (36.7)	49 (46.2)	0.248
Not always	42 (73.7)	15 (26.3)	57 (53.8)	
<u>Cutting nails routinely</u>				
Always	38 (69.1)	17 (30.9)	55 (51.9)	0.959
Not always	35 (68.6)	16 (31.4)	51 (48.1)	
<u>Wearing footwear outdoors</u>				
Always	25 (64.1)	14 (35.9)	39 (36.8)	0.419
Not always	48 (71.6)	19 (28.4)	67 (63.2)	
<u>Playing with soil/dirt</u>				
Always	68 (67.3)	33 (32.7)	101 (95.3)	0.322
Not always	5 (100)	0 (0)	5 (4.7)	

The Bivariate analysis between hygiene variables and STH infection is presented in Table 5. The percentages of STH infection were 65.5%, 72.5%, 66.1%, and 72.3% among students who always washed their hands before eating; who did not always wash their hands before eating; who always washed their hands using soap; and who did not always wash their hands using soap, respectively. These two variables had no significant correlation with STH infection according to the Chi-square test results.

The percentage of STH infection among students who did not always wash their hands after defecation (79.6%) was higher than others who always did (59.6%).

The Chi-square test showed that the correlation between washing hands after defecation and STH infection was significant ( $p = 0.027$ ). The contingency coefficient score (0.210) reflected a weak correlation among the variables.

Based on interviews, the percentage of STH infection was higher in students who did not always wash their hands after playing with soil/dirt (73.7%) than those who always did (63.3%). However, the Chi-square test showed no significant correlation between handwashing habit after playing with soil/dirt and STH infection.

The interview showed that the percentage of STH infection among students who always cut their nails routinely once a week was higher than those who did not. However, no significant correlation among variables was determined according to the Chi-square test.

Data also stated that the percentage of STH infection was lower among students who always used footwear outdoors (64.1%) than others who did not (71.6%). The statistical analysis with the Chi-square test showed no significant correlation between footwear use outdoors and STH infection.

Based on the interview data, the number of students who always played with soil/dirt

was 101 students, and 68 of them had STH infection. On the other hand, all students who did not always play with soil/dirt were infected by STH. The statistical results using the Fischer's Exact test showed no significant correlation among the variables ( $p = 0.322$ ).

## DISCUSSION

The STH infection prevalence among elementary school students in Wokam and Karangguli villages was 68.9%. In these two villages, the helminthiasis control program was implemented in February and August by administering Albendazole 400 mg every 6 months. The study data were collected in early August before the August helminthiasis control program. Therefore, most students got the drug 6 months before data collection while the others got the drug 12 months. This study showed that STH infection was higher among students who took the drug more than 6 months ago compared to those who took it in the last 6 months. Nevertheless, STH prevalence ( $> 50\%$ ) is considered high according to the Indonesian Ministry of Health (Indonesian Ministry of Health, 2017a).

A study in Uganda showed a significant decrease in STH infection prevalence and intensity after biannual helminthiasis control program application (Adriko et al., 2018). However, after a short time of treatment, STH re-infection occurred especially for *Trichuris trichiura* and *Ascaris lumbricoides* species. Thus, integrated preventive treatment along with hygiene and sanitation interventions using health education is mandatory to reduce STH infection prevalence (Jia et al., 2012).

In this study, the Chi-square test showed no significant correlation between the physical water quality and the STH examination results in the two villages. Despite adequate physical water quality, many students were infected with STH as a result of other STH transmission factors. All students were drinking water after

boiling. However, a meta-analysis study approved that drinking boiled water was accompanied by lower STH infection rate (Strunz et al., 2014).

The highest percentage of STH infection was among students whose water source was piped water, followed by water springs, dug wells, and rainwater. The bivariate analysis with the chi-square test results showed a significant correlation between the water source and STH infection, but the correlation was weak with a contingency coefficient score of 0.463. This result opposed the theory which categorized the piped water as a clean and safe source. A meta-analysis study showed that piped water source was associated with low STH infection caused by both *Ascaris lumbricoides* and *Trichuris trichiura*, but not hookworms (Strunz et al., 2014). The high percentage of STH infection among students who use piped water can be related to poor water quality in pipes in rural areas (Belyhun et al., 2010). Based on the observation of the study locations, the used piped water was from mountains not from the Regional Water Company (PDAM) with no further treatment, and the water was stored in the household water tanks increasing the possibility of water being contaminated. Water tanks in both villages were not closed and usually located beside latrines. This might stimulate STH infection among students who used piped water. Rainwater reservoirs, based on observations in this study, were also located next to houses and not near latrines. The low prevalence of STH infection among students who used rainwater was related to the closed water storage with low exposure to contamination. A high percentage of STH infection among students whose water sources came from water springs and wells were related to wells and water springs that were open and located close to the ground surface exposing them to contamination. A study in Kenya found that using pre-treated water was one of the protective factors against STH infection (Worrell et al., 2016).

The sanitation variable in this study was the defecation place. The results showed that most students were mostly defecating on land or sea, followed by private latrines and shared latrines. The Chi-square test showed a significant correlation between defecation place and STH infection. This goes along with a study conducted in 2018 where higher STH infection was among students who did not defecate in a latrine. Open defecation is accompanied by soil contamination that makes a favorable environment for the growth of STH eggs and larvae that can enter the body through food, drink, or the skin. Similar to this study, a study in Kenya also found that higher STH infection was among students who defecated in shared latrines (Worrell et al., 2016). This was inferred to poor cleanliness of shared toilets accompanied by high exposure to STH eggs since more people use latrine toilets more than private ones (Steinbaum et al., 2019).

The bivariate analysis results showed no significant correlation between the habit of washing hands before eating or washing hands with soap with STH infection. This opposes a study in Ethiopia where STH infection was higher in the group who did not wash their hands before eating. Washing hands can prevent STH transmission especially in *Ascaris lumbricoides* and *Trichuris trichiura* species since the eggs can attach to hands or nails and then enter the body with food (Alelign, Degarege, and Erko, 2015). The percentage of STH infection was higher in the group that did not always wash their hands before eating or using soap than the group that always did, but the correlation was not significant. A meta-analysis study found that washing hands with soap was one of the protective factors against STH infection (Strunz et al., 2014).

Students who did not always wash their hands after defecation had a higher percentage of STH infection than others who always did. The bivariate analysis using the chi-square test showed a significant correlation between washing



hands after defecation and STH infection. This result is confirmed by a study in rural Uganda where the STH infection possibility was 2.6 times more in the group that rarely washed their hands after defecation where STH transmission might occur fecal-orally or through the skin. STH eggs attach to non-washed hands or nails after defecating followed by transmission to the mouth (Ojja et al., 2018).

Most students in these two villages always washed their hands after playing with soil/dirt. The bivariate analysis with the chi-square test showed no significant correlation between the habit of washing hands after playing with soil/dirt and STH infection. Nevertheless, STH infection was lower in the group that always washed their hands after playing with soil/dirt compared to the group that did not. However, handwashing habit was associated with a lower prevalence of fecal-oral STH infection (Strunz et al., 2014).

Interviews with students and their parents showed that the majority of students from both villages had the habit of cutting nails routinely once a week. The chi-square test showed no significant correlation between the habit of cutting nails routinely and STH infection. However, a study in Medan showed that not cutting nails routinely was one of the risk factors for STH infection since nails could contain soil depositions that may have STH eggs which are difficult to clean (Wiryadana et al., 2018). The insignificant results could be inferred to the presence of other hygiene factors affecting STH transmission such as hand washing. This was consistent with a case in Salatiga where no significant relationship was found between nail hygiene and STH infection but with handwashing habits instead (Sofiana, 2010).

The majority of students in these two villages had the habit of playing with soil/dirt (95.2%). The bivariate analysis with the Fischer's Exact test showed no significant correlation between the habit of playing with soil/dirt and STH infection.

This was related to other hygiene factors that influence STH infection such as hand washing and footwear use. In this study, most students did not wear footwear outdoors (63.2%). The Chi-square test showed no significant correlation between footwear wearing outdoors and STH infection. However, the percentage of STH infection was higher in the group who did not always use footwear outdoors than those who always did. These results were confirmed by a study in Medan, where no significant correlation was found between playing habits with soil/dirt and STH infection, but a significant correlation with footwear use (Wiryadana et al., 2018). The habit of playing with soil/dirt and using footwear was also associated with hookworms infection more than infection with *Ascaris lumbricoides* and *Trichuris trichiura* (Strunz et al., 2014). In this study, the non-significant correlation between STH infection and footwear habit or playing with soil/dirt was inferred to the low hookworm infection.

## CONCLUSION

It can be concluded that the prevalence of STH infection among students in Elementary Schools of Karangguli and Wokam villages was 68.9% in 2018. Moreover, the WASH variables that had significant correlations with STH infection were water source, defecation place, and the habit of washing hands after defecation. The helminthiasis control program has been carried out routinely twice a year. Nevertheless, the persistent high STH infection (> 50%) could be due to STH re-infection. Therefore, it is necessary to guide students of Karangguli and Wokam Public Elementary Schools to defecate in toilets and wash their hands after defecation. The government could play a crucial role in providing education integrated with helminthiasis control programs to reduce the prevalence of STH infection.

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# COST EVALUATION OF STROKE THERAPY COMPARED TO INA-CBGs ON INPATIENTS AT ANUTAPURA HOSPITAL

Muhamad Rinaldhi Tandah<sup>1</sup>, Alwiyah Mukaddas<sup>1</sup>, Dewi Angriani<sup>1</sup>, Gaby Nathania Angela Mangoting<sup>1</sup>

<sup>1</sup>Department of Pharmacy, Tadulako University, Palu, Sulawesi Tengah, Indonesia  
Corresponding address: Muhamad Rinaldhi Tandah  
Email: prof.aldhi@gmail.com

## ABSTRACT

Stroke is the third cause of death in the world after heart disease, cancer, and disability including disability categorized based on its severity: mild (I), moderate (II), and severe (III) severity. This study aims to determine the difference total cost of ischemic and hemorrhagic stroke therapy, each, with INA-CBGs rates. The method of data collection was conducted retrospectively taken from medical record data, and on patient medical expenses. The subject were ischemic and hemorrhagic stroke patients hospitalized from 2016-2017 at Anutapura Hospital who met the inclusion and exclusion criteria. There were 134 patients who met the inclusion criteria, 68% were ischemic stroke patients and 32% were hemorrhagic stroke patients. The result of research showed that there were significant differences in costs ( $p < 0.05$ ) between hospital real costs and INA-CBGs rates. The average total real cost of treatment for ischemic stroke therapy was IDR 7,360,196.70 and the cost of the INA-CBGs was IDR 7,427,251.65 for 91 inpatients; and the average total cost of patients with hemorrhagic stroke therapy took IDR 10,606,834.34 with average of INA CBG's rate at IDR 4,399,393.02 for 43 inpatients. The conclusion is both of stroke therapy proved significant difference compared to BPJS claimed amount of money.

**Keywords:** pharmaco-economic, cost analysis, ischemic stroke, haemorrhage stroke, INA-CBG's rate.

## INTRODUCTION

Stroke is a term used to define neurological changes caused by the interruption of blood flow to the brain. Stroke is classified into two categories, namely ischemic and haemorrhagic. Ischemic stroke occurs due to a blockage of blood flow; the blood flow to the brain is suddenly blocked caused by atherosclerosis (Powers et al., 2015). Haemorrhagic stroke rarely happens, it may cause severe

consequences and high mortality rates. Typical clinical symptoms of haemorrhagic stroke include headache, vomiting, consciousness disturbance, and mental disorders. Most bleeding sites are located in cerebellar hemisphere and temporal lobe. A cerebrospinal fluid (CSF) leakage caused by surgeries may be the key to intracranial haemorrhages happening. Early diagnosis and treatments are very important for patients to prevent the further progression of intracranial

haemorrhages. Several patients need a hematoma evacuation and their prognosis is not optimistic (Yang et al., 2017).

Nationally, the prevalence of stroke in Indonesia in 2018 based on a doctor's diagnosis in the population aged  $\geq 15$  years old is 10.9%, or an estimated 2,120,362 people. The provinces of East Kalimantan (14.7%) and Special Region of Yogyakarta (14.6%) are provinces with the highest prevalence of stroke in Indonesia. Meanwhile, Papua and North Maluku have the lowest stroke prevalence compared to other provinces, respectively 4.1% and 4.6% (Budijanto et al., 2019).

The older an individual get, the more cardiovascular problems they experienced. In a limited study in an urban community clinic, 72% of elderly people with hypertension were found to be higher than prevalence of the national report which is 25%. Amount of respondent as much as 38% gave abnormal ECG images, which are 5% of those had myocardial infarction and 3% had inferior ischemic (Armalina et al., 2020). A research at Panembahan Senopati Hospital (Bantul) obtained a relationship between hypertension (RP = 9,000; CI = 4,866-16,645; p value = 0,000) and diabetes mellitus (RP = 4,226; CI = 3.089-5,780; p value = 0.000) due to stroke occurrence (Sofiana & Rahmawati, 2019). The funding of the treatment of stroke which has been regulated based on the rates of INA-CBGs requires the hospital to carry out

quality control and maintenance costs as efficient as possible. Thus, this study aims to determine difference between cost of treatment (both type of stroke) with the amount of money that can be claimed by the hospital, and also count with t-test to confirm it statistically.

## METHOD

This study was a pharmacoeconomic study using a descriptive research design with retrospective data collection. Data were collected taken from the medical record room and the financial department of Anutapura Hospital within year of 2016 and 2017. This study was conducted using CA (Cost Analysis). The population were the inpatients of stroke which were BPJS recipients. The inclusion criteria were patients with the main diagnosis of ischemic stroke or haemorrhagic stroke, which got treatment in room class I, II, and III, have completed proof of payment, and severity levels I, II, and III. There were 483 stroke patients who were hospitalized from 2016-2017, which were 91 ischemic patients and 43 haemorrhagic patients who met the criteria. This research has been given permitted by the ethics committee of Faculty of Medicine, University of Tadulako No. 8718/UN28.1.30/KL/2020 at December 11 2020.

Data analysis was performed descriptively to determine patient characteristics,

treatment features, and cost during treatment.

## RESULTS

**Table 1.** Demographic Characteristics

Characteristics	Ischemic (n=91)		Haemorrhagic (n=43)	
	Amount	Percentage	Amount	Percentage
<b>Sex</b>				
Male	47	51,65%	19	44,19%
Female	44	48,35%	24	55,81%
<b>Age</b>				
22-30	3	3,30%	3	6,98%
31-39	4	4,40%	7	16,28%
40-48	14	15,38%	16	37,21%
49-57	34	37,36%	7	16,28%
58-66	27	29,67%	5	11,63%
67-75	9	9,89%	5	11,63%
<b>Educational Background</b>				
Not educated	2	2,20%	0	0,00%
Elementary school	5	5,49%	0	0,00%
Middle school	18	19,78%	7	16,28%
High school	41	45,05%	25	58,14%
Higher Education	25	27,47%	11	25,58%
<b>Occupation</b>				
Civil servants	21	23,08%	8	18,60%
Retirement	4	4,40%	4	9,30%
Private employee	15	16,48%	10	23,26%
Housewife	21	23,08%	15	34,88%
Entrepreneur	30	32,97%	6	13,95%

The description of the research subjects in table 1 showed that 118 patients who met the inclusion criteria. Patients with a primary diagnosis of ischemic stroke were 91 patients (68%) and haemorrhagic strokes were 43 patients (32%).

Ischemic stroke can occur at any age. The result indicates that age increases the risk of stroke.

Stroke did not only occur in elderly people, but also occurs at productive age under 54 years; there are even stroke patients under the age of 30 years old.

Duration of patients been taking care by the hospital play a significant role which charge as long as they have been treated, since it was calculated per day of hospitalization (as seen in table 2).

**Table 2.** Length of Stay

Length of Stay	Ischemic patient (n=91)	Hemorrhagic patient (n=43)
< 5 days	15	4
5-10 days	66	14
> 10 days	10	25

To conduct cost analysis comprehensively, this research needed to choose its point of view. The study used hospital perspective, parts of cost that collected were the expense of laboratory, consultation,

radiology, medicine, medical devices, medical treatment, doctor visit, physiotherapy, and treatment room. Specifically, it can be seen in the table below.

**Table 3.** Cost components by each type of stroke patient

Cost Components	Ischemic stroke		Hemorrhagic stroke	
	Cost (IDR)	%	Cost (IDR)	%
Laboratory	33,248,000	8.55	21,371,378	4.54
Consultation	1,210,000	0.31	990,000	0.21
Radiology	33,380,000	8.59	31,550,000	6.70
Medicine	87,019,468	22.38	146,115,094	31.01
Medical devices	19,114,749	4.92	20,043,971	4.25
Medical treatment	48,791,800	12.55	75,796,002	16.09
Doctor visit	5,005,200	1.29	19,412,800	4.12
Physiotherapy	10,919,000	2.81	4,725,000	1.00
Room	150,090,000	38.61	151,120,000	32.08

The cost of haematological examinations issued by each patient varies depending on the type of examination and the frequency of examination. And as for the types of haematological examinations carried out, namely examination of total glucose, intermittent glucose, fasting glucose, total cholesterol, creatinine, Na, K, Cl, uric acid High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), Serum Glutamic Oxaloacetic Transaminase (SGOT), Serum Glutamic Pyruvate Transaminase (SGPT), triglycerides, urea N, Hepatitis B Surface Antigen (HBsAG), blood type, clotting time, bleeding time, anti HCV, Red Blood

Cell (RBC), haemoglobin, haematocrit, Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin Concentration (MCHC), Red blood cell Distribution Width Coefficient Of Variation (RDWcv), Red blood cell Distribution Width Standard Deviation (RDWsd), platelets, Mean Platelet Volume (MPV), Procalcitonin (PCT), Platelet Distribution Width (PDW), and White Blood Cell (WBC).

To be compared properly, all of those fees in table 4 grouped into the room where the patient healed. Preference room of treatment of each patient were



depending on which grade of BPJS had been paid. Otherwise, Anutapura Hospital located on capital city of Central Sulawesi and

has become referral hospital for years, which is being one of preferable health care in the city.

**Table 4.** Class of Treatment

Characteristics	Ischemic (n=91)			Hemorrhagic (n=43)		
	Amount	Total cost	Average	Amount	Total cost	Average
<b>Treatment</b>						
Class I	41	71.000.000	1.731.707	8	24.000.000	3.000.000
Class II	15	18.000.000	1.200.000	1	1.950.000	1.950.000
Class III	35	34.800.000	994.286	21	24.120.000	1.148.571
ICU	-	-	-	13	57.600.000	3.840.000

To explore the impact of cost by both type of stroke, it can be seen in table 5 below. Even though ischemic stroke gave added value to

the hospital, the loss generated by haemorrhagic stroke treatment cannot be ignored.

**Table 5.** Comparison between Real Cost and INA-CBGs in Stroke Patients

Rate	Total cost (IDR)	
	Ischemic stroke	Hemorrhagic stroke
INA-CBGs	675,879,900.00	189,173,900.00
Real cost	669,777,900.00	456,093,877.00
Difference	-6,102,000.00	266,919,977.00

Using Microsoft Excel to see the difference statistically, it has  $t_{count}$  3.99 and  $t_{table}$  1.98 which mean there was significant difference between stroke therapy which paid by the hospital and the insurance.

## DISCUSSION

Incident of stroke did not tend to any gender. Group of ischemic stroke dominated by men, but hemorrhagic stroke cases showed either way. Probable reason of men underlined in ischemic

stroke is might caused by several risk factors in daily lifestyle such as smoking, hypertension, diabetes mellitus, dyslipidemia, and other diseases. Strokes tend to occur to men due to smoking habits. Estrogen in women plays as a protector in preventing the process of atherosclerosis. The reason women were more susceptible to stroke was related to contraception, obesity, pregnancy, and menopause.

The age correlated with stroke due to the unhealthy lifestyle such as smoking, unhealthy food,

and lack of physical activities. This result is supported by Sairaoka (2012) stated that strokes can be experienced by various age groups. Stroke at productive age often occurs due to busy work that causes a person to insufficient time to rest, irregular eating patterns, lack of exercise, excessive working hours, severe stress, and consumption of fast food (Dourman, 2013). Age is a risk factor for stroke, the higher the age, the risk for stroke also increases. Stroke can affect all age groups, especially the largest cases occur in elderly patients, which is related to the process of degeneration (aging) that occurs naturally, where at certain age all organs of the body experience a decline in function.

This can also be seen from the average value which shows that there was significant difference between each group. Of the total hospital costs per patient, it is showed that age affect the cost of stroke therapy. Only the average cost for each age group is different. This result is supported by Baroroh & Fauzi (2017) which shows no significant difference in the total cost of each patient in the age group.

Hematological examination was carried out on the first day the patient was admitted to the hospital, the aim was to find out any abnormalities that occurred in the patient. However, in patients with a history of certain diseases, hematological examinations were carried out more than once to control the patient's condition until it improved. The type of

hematological examination above is carried out with the aim of knowing what factors can affect the occurrence of ischemic stroke. For the parameters of recovery of ischemic stroke patients at Anutapura General Hospital, the most important is determined based on the general condition of the patient such as monitoring of neurological development such as failure to have the ability to have neurological functions that should be possessed due to lesions (defects) of the brain that occur in the early period of brain growth and monitoring blood pressure.

Radiological examination was the main supporting examination to establish the diagnosis in ischemic stroke patients. There are 3 types of radiological examination, namely CT-Scan examination, radio diagnostic, ultrasonography examination. The cost for a one-time CT scan is Rp. 925,000.00 the cost for one time radio diagnostic/simple examination is Rp. 188,000.00 and the fee for a one-time examination is 188,000.00. The purpose of CT-Scan examination is to distinguish the type of stroke and identify the type of stroke that occurs due to blockage of blood vessels in the brain. Therefore, the costs incurred for this CT-Scan examination are quite expensive compared to radiology/simple examinations and radiological/ultrasonographic examinations.

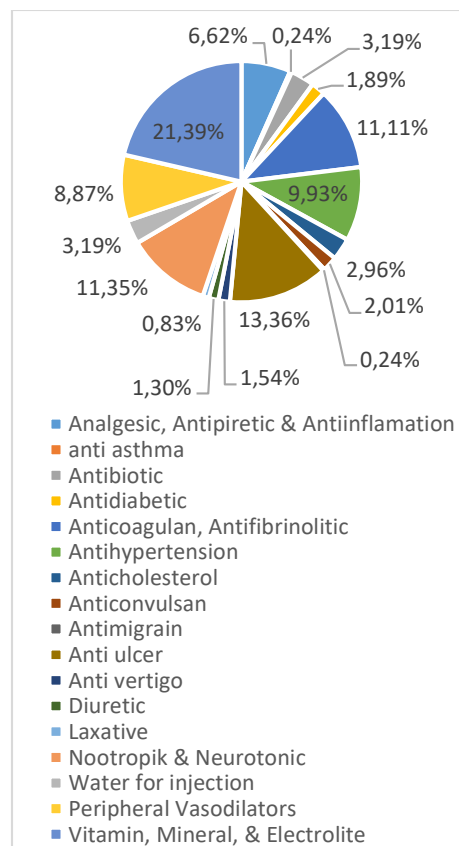
Medical treatment or rehabilitation was only reserved for

patients who need to receive medical rehabilitation, of which only 54 patients received with a total cost Rp. 10,919.000.00 and an average of Rp. 202,203.70. Types of medical rehabilitation that patients receive in the form of physiotherapy include exercise therapy, which consists of balance and coordination exercises, and functional exercises. This medical rehabilitation is carried out on patients who need special training to improve nerve (neurological) function in achieving maximum improvement through physical therapy and other techniques. Medical rehabilitation is very important to return patients to be independent, take care of themselves, and do the activities of daily life without being a burden to their families.

The length of stay is based on the patient being registered as an inpatient. The length of treatment is likely to be affected by the presence of other risk factors (comorbid), because other risk factors also need to be treated, besides the stroke. Patient multimorbidity, specifically hypertension, is a strong predictor of longer stay and cost after ICH. The non-linear relationship between cost and time should also be considered when forecasting healthcare spending in these patients (Specogna et al., 2017).

Seeing more detail to the medicine that has been taken, diagram 1 illustrates utilization of the drug based on the indication. The use of peripheral vasodilators and cerebral activators is used as the focus of therapy in ischemic stroke

patients. This class of drugs works as an activator of brain function and functions as a dilate of peripheral blood vessels (Junaidi, 2011). Citicolin is useful for treating one of the diseases, namely stroke to reduce the accumulation of fatty acids in the area of nerve damage.



**Diagram 1.** Drug utilization

The nootropic and neurotonic drugs are also used as a focus of therapy in ischemic stroke patients, neurotropic drugs are used in cerebral insufficiency, which refers to a decrease in blood supply to the brain such as forgetfulness, lack of concentration, and vertigo. This class of drugs also functions as a brain booster or brain vitamin, in

this study piracetam became the main choice for ischemic stroke patients at Anutapura Hospital, piracetam can improve motor skills and prevent wider brain damage in patients

In this study, the use of antihypertensive drugs in ischemic stroke patients can improve the patient's functional output when cerebral vasospasm occurs and can inhibit the occurrence of atherosclerosis which is one of the causes of ischemic stroke. The main reason for lowering blood pressure is to prevent bleeding in the brain. The drug amlodipine can work to lower high blood pressure and help prevent stroke.

Mannitol is an osmotic drug with a diuretic class which is used as the main therapy in ischemic stroke to reduce brain and intracranial edema by withdrawing fluid from edematous and non-edematous brain tissue, a diuretic drug that is also used in anutapura hospital, namely furosemide tablets.

Antibiotic therapy is necessary for stroke patients due to infection. In general, patients who are hospitalized with this type of infection occur because of the severity of the underlying neurological disease such as bleeding from a subarachnoid aneurysm or severe trauma due to brain injury, cross contamination, contaminated instruments and needles, and also the environment (Qayyum, 2010). Ceftriaxone is an antibiotic used to treat a variety of bacterial infections.

Analgesic, antipyretic and anti-inflammatory drugs are applied as supportive therapy for ischemic stroke. Moreover, Ketorolac, santagesic, and kamolas as non-steroidal anti-inflammatory drugs function to treat moderate and severe pain. Paracetamol functioned as analgesic and antipyretic which lower body temperature and prevent fever in ischemic stroke patients. Analsik can also be used for pain relief. It contains two combinations of active substances that reacted on the brain and nerves (central nervous system) to produce a calming effect. Dexamethasone is a class of corticosteroids that prevent and reduce the inflammatory process and reduce histamine release.

Antiulcer is used in ischemic stroke therapy to reduce stomach acid. The drug used is omeprazole, which belongs to the anti ulcerative class. It treats gastric ulcers by reducing gastric acid secretion, while other supporting drugs in ischemic stroke therapy used to control stomach acid are the proton pump group. Inhibitors can be specified into types such as antacids.

In ischemic stroke therapy, the use of tranexamic acid is the main choice as an antifibrinolytic that functions to reduce the risk of rebleeding. The antiplatelet used is clopidogrel. Generally, this class of drugs is used in stroke patients to prevent recurrent strokes and prevent platelet aggregation (Jauch, 2013).

Anticoagulants, antiplatelets & Fibrinolytics are utilized to repair blood clots in infarcted brain areas. Rinclo contains CPG, which is widely used to prevent atherothrombotic events in ischemic stroke myocardial infarction. Thrombo aspirin functions as a blood-thinning drug that functions to prevent blood clots and reduce the risk of heart attack and ischemic stroke to relieve and treat nausea and gastrointestinal disorders.

Anticholesterol is also a supporting therapy in ischemic stroke patients, where the statin group is used, this group is one of the strong cholesterol-lowering drugs (Low Density Lipoprotein/LDL) in the blood. Antidiabetic is a stroke support therapy to reduce excessive blood sugar levels. In the case of hemorrhagic stroke, hyperglycemia must be reduced immediately because it can expand the infarct area due to a lack of oxygen forces.

Stolax suppo is a supportive therapy as a laxative to overcome problems in the digestive tract, not only stolax but also other drugs are used to treat the digestive tract in stroke patients, such as dulcolax suppo.

In this study, the use of anticonvulsant drugs in ischemic stroke patients is to restore the stability of nerve cell excitability and overcome seizures. Gabapentin is used to prevent and control seizures in ischemic stroke, while alpentin works by reducing the release of neurotransmitters (signal carriers) that cause seizures.

Impaired fluid and electrolyte balance are serious problems affecting the pathophysiology of ischemia in the brain and often cause brain herniation and death. The use of electrolyte fluids serves to replace fluid loss due to dehydration and hypovolemic shock in stroke patients. The electrolyte fluids used here are Ringer's lactate infusion, INF asering fluid, Nacl fluid, Nacl infusion fluid, futrolite fluid, and M20 infusion. In ischemic stroke therapy, neutropic vitamins such as mecobalamin, neurodex, selesbion, vitamin B1, vitamin B6, vitamin B12, and vitamin C are involved. To treat hypoglycemia in stroke patients, Martos infusion is given. Other supporting drug, aquadest, is used as a drug solvent.

Presidential Regulation of the Republic of Indonesia No.12/2013 on Health Insurance organized by the Health Social Security Organizing Agency (BPJS Kesehatan) states that per January 1st, 2014 all citizens of Indonesia will receive guarantees in the form of health maintenance and protection in meeting basic health needs. Thus, health facility payment for inpatients is based on Indonesian Case-Based Groups (INA-CBGs). In the INA-CBGs system, the cost component being included in BPJS insurance. Such insurance consists of treatment, stay, medicine, medical devices, and services calculated integrated with the package.

The Regulation of the Minister of Health of the Republic

of Indonesia No. 52 2016 has stipulated the standard of health service rates in the implementation of health insurance programs that regulate the rate of INA-CBGs that is the number of claims paid by BPJS Kesehatan to the Advanced Level Health Facilitator Reference for service packages based on diagnosis and procedure. In the main diagnosed group ischemic stroke with the code INA-CBGs, there is G-4-14 for non-specific cerebral blood vessels. In pre-cerebral blockages without infarction and hemorrhagic stroke with the code INA-CBGs, there is G-4-13 for intracranial hemorrhage rather than traumatic. The classification of it is as follows: mild (I), moderate (II), and severe (III). Based on the Regulation of the Minister of Health of the Republic of Indonesia No. 52 2016, the rate of INA-CBGs for ischemic strokes with code G-4-14-I class 3 is IDR 6,146,000, class 2 is IDR 7,375,700, class 1 is IDR 8,604,400, for G-4-14-II code class 3 is IDR 7,334,900, class 2 is IDR 8,801,900, class 1 is IDR 10,268,900, and code G-4-14-III class 3 is IDR 10,352,600, class 2 is IDR 12,423,100, class 1 is IDR 14,493,600; and the rate of hemorrhagic stroke with the code of G-4-13-I INA-CBGs in class 3 is IDR 3,658,700, class 2 is IDR 3,658,500, class 1 is IDR 4,268,200. The rate of INA-CBGs of G-4-13-II for class 3 is IDR 5,316,400, class 2 is IDR 6,379,600, class 1 is IDR 7,422,900, and for INA-CBGs of G-4-13-III in class 3 is IDR 6,305,300,

class 2 is IDR 7,566,400, and class 1 is IDR 8,827,500.

The admission of hospitalization incurred at Anutapura Hospital varies. It depends on the room class and the stay length of the patient. The total cost of ischemic stroke in class 1 is IDR 71,000,000.00 for 41 inpatients and hemorrhagic stroke patients in class 3 is IDR 24,120,000.00 for 21 inpatients. There is correlation between costs and treatment (Dumpapa, et al., 2010). However, seven hemorrhagic stroke patients received two different treatments at the same time: three patients in class I and ICU, and four patients in class III and ICU. Based on the calculation, the average cost of hospitalization for each treatment class is different, in which the most costly treatment room is the ICU room. The room is used for hemorrhagic stroke patients in critical conditions who require intensive care and continuous monitoring. If the condition has improved, the patient will be transferred based on each treatment class. It is revealed that the actual cost for hemorrhagic stroke was higher than the INA-CBGs rate. On the contrary, ischemic stroke's expense made a huge gap with BPJS insurance. Moreover, its difference could not compensate for the loss generated by hemorrhagic stroke cases.

## CONCLUSION

Ischemic stroke hospitalized patients can not be fully covered by

BPJS health insurance and are also unbeneficial to cost casualty that has been produced by the actual rate of Hemorrhagic stroke utilization hospital resources. Additionally, there was a significant difference between the total actual cost in the hospital and the INA-CBGs that were proven statistically.

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# FACTORS RELATED TO BREASTMILK PRODUCTION ON POSTPARTUM MOTHERS IN EAST PONTIANAK, WEST KALIMANTAN

Otik Widyastutik<sup>1</sup>, Yuwan Chartasim<sup>1</sup>, Elly Trisnawati<sup>1</sup>, Selviana<sup>1</sup>

<sup>1</sup>Public Health Study Program,

Pontianak Muhammadiyah University, Pontianak, Kalimantan Barat, Indonesia

Corresponding address: Otik Widyastutik

Email: otik@unmuhpnk.ac.id

## ABSTRACT

Producing breastmilk is a mother's ability for the next six weeks after giving birth. Based on data from the Health Office of Pontianak City, exclusive breastfeeding coverage is 25% in East Pontianak District. A preliminary study conducted in East Pontianak Sub district, seven out of ten respondents who underwent breastfeeding, their breastmilk was not running well. There are 70% of babies experienced weight increment below 500 grams/month. In addition, 70% mothers drinking less than twelve glasses/day, 70% mothers do not receive support from their husbands in breastfeeding process, 60% mothers have never been exposed to breastfeeding information, and 50% mothers experienced moderate anxiety levels after giving birth. The research aimed to determine the determinants of postpartum mother's milk production in East Pontianak District. This research is observational research with a cross-sectional approach, and the research subject is 48 postpartum mothers. The results showed that the determinant factor could be seen from the relationship of fluid intake (p-value = 0.000), husband's support (p-value=0.000), information exposure (p-value=0.010), supplement (p-value=0.000), and energy intake (p-value=0.000), to breast milk production. Recommendations addressed to the community health center such as work more active in providing counselling, activating cadres by providing practices. Therefore, they can assist in providing knowledge about breastfeeding and making creative promotional media.

**Keywords :** breast milk production, postpartum, nutrition intake

## INTRODUCTION

Regarding the Sustainable Development Goals (SDGs) 2030, breastfeeding is one of the first steps for a prosperous human being. Providing exclusive breastfeeding has a role to prevent hunger and malnutrition, improving the development of mental, babies' cognitive, and reduce the number of death of children. The successful achievement of giving exclusive breastfeeding needs goodwill,

sincerity, commitment, and determination of the mother to always take into consideration the procedure how to bluish, storing and giving pumped breastmilk (Salamah and Prasetya, 2019).

In 2015, the mortality rate of infants in the world was approximately 4.5 million cases, as much as 75% of them aged less than five years. Results of the Survey of Demography and Health of Indonesia (IDHS) 2017 figure showed infant mortality rate (IMR)

is 24 death per 1,000 births alive. It means one of 42 children died prior to year one (Rahmayanti, 2018). The high neonatal mortality rate (IMR) will affect 59% of infant mortality. The high death of infants is due to vulnerability to disease. One of the efforts to prevent a baby's mortality is by providing breast milk to a newborn baby. In 2018, World Health Organization recommended that newly born infants be given breastmilk until the age of six months without any foods or liquids, except for vitamins, minerals, drugs that have been permitted for any reason a medical and could continue giving breast milk until the age of two annually (Indonesian Ministry of Health, 2018).

West Kalimantan province occupies ratings to four the lowest percentage of achievement Award breastfeeding exclusively, namely by 28%, the target of the strategic plan of the year 2018 amounted to 37.3% (Risksdas, 2018). Based on the data in 2018 in West Kalimantan percentage of coverage breastfed exclusively supreme in Melawi Regency at 74.19% and the lowest in Landak Regency at 24.13%, while in the city of Pontianak it was ranked nine with the lowest percentage of exclusive breastfeeding coverage which was 59.89% (West Kalimantan, 2018).

Breastmilk production is the mother's ability to produce breast milk to meet the baby needs. Breastmilk production is the process of releasing breastmilk. Giving breastmilk is an interaction

that is significantly complex between stimuli mechanics, nerve and hormone (Kurniati, Marsinova Bakara and Susanti, 2019). A sufficient breastmilk takes place if the babies' weight grows to 500 grams per month or 125 grams per week (Yanti, Yohanna and Nurida, 2018).

Several factors influence breastmilk production, both the direct (behavioral breastfeeding, psychological mother) or indirect (social-cultural and baby, which will affect the psychological mother). Furthermore, the other factor is the baby's ability to suck. A healthy baby can empty one breast about 5-7 minutes and the milk in the baby's stomach will be empty in two hours. The previous study explains that giving breastfeed the babies is unnecessarily scheduled. It will be on babies' demand. The often to provide the breastfeed, the better the breastmilk will come out. Limitations subjected to the schedule in undertaking breastfeeding will influence babies' sucking movement and breast milk production (Senewe, Rompas and Lolong, 2017). Postpartum is the period after childbirth which lasted for six weeks. During this period, lactation occurs, which is the whole process of breastfeeding, starting from breast milk production to the operation of the baby sucking and swallowing breast milk. The period of lactation has a purpose, namely to increase the provision of breastfeeding exclusively and continue giving breast milk to

children age two (Bogen and Whalen, 2019).

Based on the preliminary study of the Public Health Center in East Pontianak district, seven out of ten respondents who experienced breastmilk production suffer the impediment. 70% of infants experienced a weight increase fewer than 500 grams per month. It is due to several things: the intake of fluid in the capital, 70% of the ten mothers drank less than 3000 ml in a day. The 70% of respondents did not receive a husband's support in giving breast milk. 60% of respondents were unexposed to information about breastfeeding indirectly / through the media. Therefore, based on the background above, the researchers focused on such topic "Factors Associated with Breastmilk Production Post Maternity in Public Health Center District of East Pontianak (Saigon)".

## METHOD

This research was observational with Cross-Sectional approach. The background of the research is Public Health Center (Puskesmas) District of Pontianak East in September 2019. The research population is a mother who is still in the postpartum period in Public Health Center (Puskesmas) District of East Pontianak (Saigon). The period in July - August 2019 of 48 people. Samples in this research are mothers, able to communicate well and still in the postpartum period. The sampling was the total

sampling with 48 mothers post childbirth. The exclusion sample criteria was postpartum mother who did not breastfed her baby since the birth of the baby. However, no mothers has excluded from this research.

The data collection was undertaken using interviews, questionnaires, and observation. Then the data is recorded systematically to discover the factors that affect the production of breastfeeding after childbirth. Data analysis used univariate and bivariate with chi-square test and 95% confidence level.

There are five characteristics of respondents: the mother's age, husband's age, mother's occupation, husband's occupation and income. Meanwhile, the main variables in this study which were analyzed univariately and bivariate were fluid intake, husband's support, information exposure, supplement intake and energy intake, and milk production. Data collection was undertaken using a questionnaire consisting of open-ended questions. Breastmilk production variables were collected through a questionnaire consisting of eight questions that had been tested for validity and reliability. Variables of fluid intake, supplement intake, and information exposure used open-ended questions consisting of 1 - 2 questions. Energy intake variables were collected through a semi-quantitative FFQ questionnaire. While the husband's support variable used a questionnaire consisting of 5 questions that had

been tested for validity and reliability. The dependent variable in this study was milk production, while the independent variables were fluid intake, husband's support, information exposure, supplement intake, and energy intake. The dependent variable is milk production, measured based on current and non-current standards. It is said to be smooth if 6 out of 8 question items are stated accordingly. Independent variables were measured using a self-made questionnaire through self-development, with validity and reliability tests. The validity and reliability tests of the question instruments were undertaken from 30 different respondents out of 48 samples. The results of the instrument validity test showed that all questions used to measure the variable milk production (8 questions) were valid, provided that r-count was greater than r-table ( $n = 30$ ;  $r\text{-table} = 0.361$ ). Likewise, with the Cronbach Alpha reliability test, the value was 0.685, which was greater than 0.600 (the standard used). Therefore, all question items in the variable of milk production were inconsistent. As for the husband's support variable (5 questions), all question items were proven to be valid, provided that r-count was greater than r-table ( $n = 30$ ;  $r\text{-table} = 0.361$ ). The Cronbach Alpha value was 0.692, greater than 0.600 (the standard used). Therefore, that all question items in the husband support variable can be said to be consistent. The range of validity for the variable milk

production was 0.428-0.724, while the value for the husband's support variable was 0.591 - 0.786. Chi-square test was used for bivariate analysis using the statistical product and service solution (SPSS) 24.0 for Mac, with a significance of  $P < 0.05$ . Breastmilk production comes out through the nipples, and the breasts will feel tense if you have enough breastmilk. Usually, the baby will fall asleep three to four hours after breastfeeding. Babies will urinate six to eight times a day with clear yellow urine. Babies will defecate three to four times a day. Babies suckle 8-10 times within twenty-four hours. Babies will gain at least 500 grams per month. An interview with a questionnaire instrument was undertaken to collect data. If the answer is 'breastmilk production is impeded', then a score of one will be given. If the milk production is smooth, then a score of two will be given (Indonesian Ministry of Health, 2013).

Fluid intake is the average amount of fluid drunk by the mother for 24 hours in a 250 ml glass. The collection of fluid intake data was carried out by interview using a questionnaire and measuring cup. The result of measurement for this variable is represented by scoring. Mothers who drink less than twelve glasses per day are equal to one. In contrast, mothers who drink more significant than 12 glasses per day are similar to two (Indonesian Ministry of Health, 2013)

Husband or family support is obtained from interviews using a questionnaire. The measurement

results state that if the answer is less supportive or the answer is "yes" less than four, then a score of one is given, whereas if the "yes" answer is greater than or equal to four, then a score of two is provided.

Information exposure about breastfeeding is information that has been obtained by mothers either directly communicating or from the media (print, electronic, online). Measurement results were obtained from interviews using a questionnaire. If the answer is 'unexposed to information', then a score is given.

Vitamin A supplement is given to breastfeeding mothers during the puerperium that has significant benefits for both mother and baby. Measurement results were obtained from interviews using a questionnaire instrument. If the answer does not take vitamin A supplements, then a score of one is given, while the mother who says yes consumes vitamin A and others, will be given a score of two.

Vitamin A is one of the most crucial intakes as it plays an important role and determines mothers' breastfeeding success. The measurement results were obtained from interviews using the FFQ (food frequency questionnaire) questionnaire. If the energy intake is less than 2250 cal per day, then a score of one is given, whereas if the energy intake is greater equal to 2250 cal per day, then a score of two is presented.

Protein intake was an additional protein needed to produce breast milk. This variable

was measured using interviews using the FFQ questionnaire instrument (food frequencies questionnaire). If protein intake was less 20 grams per day, then a score of one was given, whereas if protein intake was greater equal to 20 grams per day, then a score of both was provided.

Fat intake was an energy reserve to produce breast milk. This variable was measured using an interview using the FFQ (food frequency questionnaire) questionnaire. If the fat intake was less than 11 grams per day, then a score of one was given, whereas if the fat intake was  $\geq 11$  grams/day, then a score of both was provided.

FFQ method assessed the relationship between the intake of certain foods and certain nutrients' content to the risk of disease events. FFQ was not intended to determine nutrient intake alone but is more specically to determine the correlation between exposure to certain foods and malnutrition incidence. Exposure to nutrient intake for a long time has implications for general health conditions. If the result of exposure to unbalanced nutrient intake is chronic, then clinical symptoms of nutritional disorders (pathological conditions) will occur (Sirajuddin, Surmita and Astuti, 2018)

FFQ form used in the consumption survey was the one that has gone through standardized preparation stages. FFQ form stipulated nine options for FFQ method: the choice of the frequency of meals, namely how many times

per proportion a day, how many times per balance a week, how many times per a month, how many times per balance a year, never. The researchers were using food catalogue to carry out the consumption survey using the FFQ

## RESULTS

This study illustrated the respondents' characteristics and all the variables by tables. All data

method. It may overcome the language barrier between the respondent and the interviewer. Nomor Keterangan Kelaikan Etik ("Ethical Clearance"): 014/KEPKFIKES/KET/2019

presented will be essential to be used as material for discussion in this study. As can be seen from table number 1 until table number 3 below:

**Table 1.** Characteristic frequency distribution of research respondents

<b>Respondent characteristic</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>Mother's age</b>		
<25 years	18	37.5
≥ 25 years	30	62.5
<b>Husband's age</b>		
<25 years	6	12.5
≥ 25 years	42	87.5
<b>Mother's type of work</b>		
Private	9	18.7
Civil servants	6	6.3
Teacher	3	12.5
Housewives	30	62.5
<b>Husband's type of work</b>		
Private	33	68.7
Civil servants	7	14.6
Teacher	8	16.7
<b>Income</b>		
<2,300,000	9	18.6
≥ 2,300,000	39	81.4
Total	48	100

Based on the table 1 above, from 48 respondents obtained the average age of the mother ≥25 years was higher (62.5%). Similar to the average age of husbands ≥25 years,

there were 42 (87.5%) respondents higher than under 25. Based on the type of work of the mother, mostly mothers be a house wife (62.5%).

**Table 2.** The frequency distribution of the univariate analysis result study

<b>Respondent Characteristics</b>	<b>Frequency (N)</b>	<b>Percentage (%)</b>
<b>Energy intake</b>		
Less	35	72,9
Enough	13	27,1
<b>Fluid intake</b>		
Less	28	58,3
Enough	20	41,7
<b>Vitamin A intake</b>		
Less	29	60,4
Enough	19	39,6
<b>Exposure to Information About Breastmilk</b>		
No	31	64,6
Yes	17	35,4
<b>Husband support</b>		
Yes	17	35,4
No	31	64,6
<b>Breastmilk Production</b>		
Not smooth	30	62,5
Smooth	18	37,5

Mostly, occupation of the respondent's husband was private sector (68.7%). The average income of a family that was > Rp.2.300.00 (81.4%). Table above showed that the proportion of respondents who consume intake of energy less over a lot that was 35 people (72.9%) compared to enough energy intake that for 13 (27.1%).

Based on Table 3, it was found that the proportion of respondents that the intake of liquid was less than 12 cups per day tend to experience un-smooth production of breast milk (92.9%) was larger than the respondents that the intake

of fluid greater equal to 12 cups per day (20%). Statistical test Chi-square shows the significance of p-value = 0.000 > 0.05 means that there was a relationship between the intake of fluids and the production of breastfeeding mothers after childbirth. The analysis results obtained by value PR = 4.643 implies that the prevalence of events un-smooth production of breast milk group intake of liquids less than 12 cups per day was larger than the prevalence un-smooth production of breast milk group intake of fluids greater and equal to 12 cups per day.

**Table 3.** The frequency distribution of the bivariate analysis result study

Variables	Breastmilk Production				PR	P value
	Not smooth		Yes			
	n	%	n	%		
<b>Fluid Intake</b>						
< 12 glasses	26	92.9	2	7.1	4.643 (1.921-11.222)	0.000
≥ 12 glasses	4	20	16	80		
<b>Husband's Support</b>						
No	28	90.3	3	9.7	7.677 (2.078-28.366)	0,000
Yes	2	11.8	15	88.2		
<b>Exposure to Information About Breastmilk</b>						
No	24	77.4	7	22.6	2.194 (1.121-4.292)	0,006
Yes	6	35.3	11	64.7		
<b>Vitamin A intake</b>						
No	28	96.6	1	3.4	9.172 (2.468-34.088)	0.000
Yes	2	10.5	17	89.5		
<b>Energy</b>						
Less	28	80	7	20	5.200 (1.438-18.807)	0.000
Enough	2	15.4	11	84.6		

The proportion of respondents who did not get the support of husbands tend to experience un-smooth production of breast milk (90.3%) was large compared with respondents who got the husband support (11.8%). Test results statistics obtained  $p\text{-value} = 0.000 > 0.05$  mean a significant relationship between husband support and breastfeeding mothers' production after childbirth. The results of the

analysis obtained a value  $PR = 7.677$ . That means the prevalence of events un-smooth production of breast milk in the group that did not receive the support of husband, and 7.677 was enormous compared with the prevalence of un-smooth production of breast milk in the group get the support of her husband.

The proportion of respondents who did not get information about



breastfeeding were likely to experience un-smooth production of breast milk (77.4%) is large compared with respondents who get information about breastfeeding (35.3%). Test results statistics obtained  $p\text{-value} = 0.000 > 0.05$  mean a significant relationship between husband support and breastfeeding mothers' production after childbirth. The results of the analysis obtained by value  $PR = 7.677$ . It means that the prevalence of events un-smooth production of breast milk in the group that did not receive the support of husband, and 7.677 was enormous compared with the prevalence un-smooth production of breast milk in the group who get the support of her husband.

The proportion of respondents who did not get the intake of supplements tended to experience un-smooth production of breast milk (96.6%) was large compared with respondents who get the input of supplements (10.5%). Test results statistics obtained  $p\text{-value} = 0.000 > 0.05$  mean a relationship between breastfeeding exposure and breastfeeding mothers' production after childbirth. The results of the analysis obtained by value  $PR = 2.194$ . It means that the prevalence of events un-smooth production of breast milk in the group that did not receive information about breastfeeding 2,194 larger than the prevalence of un-smooth production of breast milk in the group who get information about breastfeeding.

The proportion of respondents whose energy intake was less likely

to experience non-smooth production of breast milk (80%) was greater than that of respondents whose energy intake was sufficient (15.5). The statistical tests result obtained  $p\text{-value} = 0.000 > 0.05$  mean a relationship between energy consumption and breastfeeding mothers' production after childbirth. The analysis results obtained by value  $PR = 5.200$  mean that the prevalence of events un-smooth production of breast milk in the group that the intake of energy was approximately 5,200 larger than the prevalence un-smooth production of breast milk in the group that the consumption of energy is enough.

The respondents' proportion that the protein consumption sufficient and breastmilk production were not smooth as many as 30 people (62.5%) was larger than the breastmilk production smoothly as many as 18 people (37.5).

## DISCUSSION

### Relationship between fluid intake and milk production

Based on the research results obtained by the relationship significantly between the intake of fluids to the production of breast milk. Breastfeeding mothers are encouraged to drink 3000 ml of water per day according to the frequency of breastfeeding their babies because after breastfeeding the mother will feel hungry. As the previous study said that mothers are encouraged to drink each time they breastfeed and consume an additional 500 calories per day

(Kemenkes RI, 2013; Bardosono *et al.*, 2016)

Data shown above implies that from 30 respondents who experienced breast milk production is not smooth; four respondents consume more than 12 cups (one cup = 250 ml) per day. It also concluded 26 respondents rest consumes less than 12 cups (less than 3000 ml) per day. After giving birth, the mothers' fluid consumption, especially when breastfeeding is applied, influenced milk production. Fluid intake is a factor that influences the production of breast milk during the administration of breastfeeding, because when the liquid in the mother enough, it will result in the production of milk quite well.

The study is in line with the survey results earlier, which stated that the intake of fluids is a variable related to breast milk production in the mother post section caesarean. The fluid consumption is an essential factor that affects physical growth; both in the fetus and the mother were pregnant. Not only during pregnancy, but during lactation was also the mother still requiring a liquid; therefore, the process of breastmilk production can meet the needs of the baby (Zhou *et al.*, 2019).

Breastfeeding mothers need to meet nutritional needs, including the need for nutrients and fluids useful for postpartum health. Apart from that, breastfeeding mothers also need energy reserves to meet milk production. The demands that can meet breastfeeding mothers'

nutrition include consuming other food of approximately 500 calories per day. Foods with a balanced nutritional diet can also meet needs such as carbohydrates, protein, vitamins, fats and minerals and it is necessary to drink at least three litres every day (Kemenkes RI, 2013; Woolhouse *et al.*, 2016; Amir and Sulastri, 2019).

The intake of food consumed by the mother during pregnancy and after childbirth, primarily while breastfeeding, influences milk production. Nutrition and fluids are factors that influence the production of breast milk during the exclusive breastfeeding period because if nutrition and maternal fluids are fulfilled, it will result in insufficient milk production (Nurliawati, 2010; Ares Segura, Arena Ansótegui and Marta Díaz-Gómez, 2016).

The intake of food consumed by the mother during pregnancy and after childbirth, mainly while breastfeeding, influences milk production. Nutrition and fluids are factors that influence the production of breast milk during the exclusive breastfeeding period because if nutrition and maternal aids are filled, it will result in insufficient milk production (Nurliawati, 2010; Bardosono *et al.*, 2016).

Producing good breast milk, mothers need fulfilled food intake such as adequate amounts of calories, fat protein and vitamins and minerals. In addition, breastfeeding mothers are also advised to drink 8-12 glasses of water / day and increase it by 3000 ml / day (Kemenkes RI, 2013; Ares

Segura, Arena Ansótegui and Marta Díaz-Gómez, 2016)

### **Relationship Support Husband of Production ASI**

Support husband to the mother in success and provide food nutritionally balanced, giving spirit and motivation. Hence, the thing is to make the mother happy and unhappy. The oxytocin hormone comes from the back (posterior) of the pituitary gland. For instance, prolactin, oxytocin is generated when the tip of the nerves around the breasts are stimulated by suction. Babies will get inadequate milk if they rely on reflex prolactin alone. Both reflexes must run balanced. Reflex oxytocin is a reflex expense of milk in nature is more complicated than the reflex of prolactin. At the time of breastfeeding, hormone oxytocin will spur muscle contraction smooth on the alveoli walls and the duct wall thus the milk can come out (Kurniati, Marsinova Bakara and Susanti, 2019).

Some items of questions for all respondents explain the husbands' support. The data can elaborate that a husband who does not ever provide bleak food fruits, vegetables, and food more than 41 (85.4%). Husbands often help mothers when breastfeeding their babies, for example, carrying and giving them to mothers to breastfeed as many as 38 (79%). Husbands who encourage mothers always to breastfeed their babies are 37 (77.1%). Husbands often help the mother do the house's work as

much as 35 (72.9%). And husbands who often help take care of babies, for example, bathe the babies as many as 17 (35.4%).

Support and attendance husbands are essential for mothers to breastfeed to raise, trust, stabilize, and provide mothers' motivation to breastfeed. It is in line with research earlier that revealed that respondents who get the family's support in giving breastfed exclusively had the opportunity 166.67 times to provide breast milk solely compared with respondents who did not get the support of the family (Setyaningsih and Farapti, 2019).

Family support is the attitude, action, and acceptance of a family towards its members. Family Report: 23715-91898-5-ED Report was generated on Saturday, Feb 6, 2021, 05:34 AM Page 24 of 33 members perceive that supportive people are always ready to provide help and assistance if needed. Sources of support for families in which the family's support refers to the support that the family views as something that can be accessed or held for the family, but family members saw that the supporting people are always ready to provide help assistance if needed.

Support husband is a factor External most substantial influence on the success of breastfeeding exclusively. Breastfeeding mothers need support and assistance, both when starting and continuing breastfeeding for up to two years, namely support from family, especially husbands. Supports of

another person or people nearby were very instrumental in the success or not of breastfeeding. Support husband and family are a tremendous influence; getting generous support that obtained for breastfeeding meal will increasingly large also the ability to survive to continue to breastfeed. Support provided by experienced people around or on a breastfeeding woman's advice by an expert can positively impact. Family support is an external factor that can influence the success of exclusive breastfeeding because this can give the mother confidence to be able to breastfeed until the baby is six months old (Jama *et al.*, 2020)

The support given to mothers is one of the factors that can influence mothers in giving exclusive breastfeeding. Mothers who have positive thoughts will undoubtedly feel happy seeing their baby and then thinking about it with great affection, especially when the mother kisses and cuddles the baby. This phenomenon happens when the mother is in a calm state. It is The support from the environment around the mother to provide breast milk to her baby and the steady-state.

### **Relations Exposure Information about Breastmilk Against Breast milk Production**

A mother has the essential duty to breastfeed a baby because it dramatically determines her baby's survival. Breast milk is the best food and is following the baby's growth. Giving milk to the baby has not

been implemented with good; there are some problems in breastfeeding which are: the lack of mothers' knowledge about the benefits of breastfeeding, lack of support for the family, the lack of support personnel, and a lack of exposure to breast milk benefits, and many other problems.

From all the 48 respondents who collected data on information exposure about breast milk, there were 31 (64.5%) respondents who did not get information about breastfeeding. Of the 17 (35.5%) respondents who never obtain information about breastfeeding, there were 7 (14.5%) who received information about breastfeeding through television, and only 2 (28.6%) of them had smooth breast milk production. Will but grades are still much lower than the number of mothers who experienced the smooth production of breast milk after getting information about breastfeeding from officers of health, i.e.as many as nine (18.75%) of respondents.

A mother has the essential duty to breastfeed a baby because it dramatically determines her baby's survival. Breast milk is the best food and is following the baby's growth. Giving milk to the baby has not been implemented with good management. There are some problems in terms of breastfeeding, among others, due to lack of mothers' knowledge about the benefits of breastfeeding, lack of support for the family, the lack of support personnel health, and a lack of exposure to information about the

benefits breast milk. Information exposure is the existence of media to obtain information and communicate about breastfeeding in printed media, electronic media, and online media to facilitate breastfeeding messages for the community. Information about breastfeeding, any press that consists the promotion and information about breastfeeding will increase the breastfeeding mothers' knowledge. Sufficient knowledge will raise the mother's confidence to breastfeed her baby (Harding *et al.*, 2020).

Information about breastfeeding is a provision to mothers to prepare themselves in facing the future of lactation. Adequate knowledge will increase the sense of mothers' trust at the time of breastfeeding. A sense of confidence in yourself here will facilitate the production of breast milk. The information about the milk when breastfeeding on media and attendant health are also essential for the mother. If the mother already knows or understands breastfeeding, it will help the baby get breast milk exclusively (Akinyinka, 2016; Mundagowa *et al.*, 2019).

Obstacles in giving exclusive breastfeeding identified by factors such as lack of information from the providers of care of health, lack of care follow-up at the beginning of the period after the childbirth, lack of support social that broad that cause stress in mothers postpartum and influence the production of breast milk. This study is in line

with the results of previous studies which state that there is a significant relationship between exposure to information on exclusive breastfeeding and the behaviour of exclusive breastfeeding for six months.

### **Relations intake supplements of Vitamin a Against Production of Breast milk**

The supplements intake, such as vitamin A, has significant benefits for the mother and the baby during the postpartum period. At the time of the mother postpartum and the process of breastfeeding requires the intake of substances Report: 23715-91898-5-ED Report was generated on Saturday, Feb 6, 2021, 05:34 AM Page 27 of 33 of nutritional macro one of them vitamin A. Function vitamin A in the body to maintain a system of immunity of the body (immunity) and health to decrease the number of pain and the number of death. Vitamin A is contained in the mother's breast milk and becomes a primary source of babies' needs from zero months to infants aged two years. Postpartum mothers who consume a high intake of vitamin A will increase milk production. Functionality Award capsule of vitamin A dose high at the time of parturition are many unknown is to prevent VAD (Vitamin A deficiency) both in infants and the mother after childbirth(Sânzio Gurgel *et al.*, 2017; Rahmadani *et al.*, 2020)

It is necessary to give vitamin A to increase the amount of vitamin

A in breast milk during the puerperium. Vitamin A is also beneficial to the baby. During the postpartum, a mother breastfeeds her baby; therefore, automatically baby gets the vitamin A. Benefits of vitamin A and increasing the power hold the body may also improve the survival of children's lives. Vitamin A, which is given to the mother postpartum, is expected to meet vitamin A's needs either for mothers and babies. The baby will receive the contribution of vitamin A contained in breast milk. This study is in line with the results of previous studies which stated that vitamin A intake was significantly associated with breast milk production ( $p < 0.05$ ). The higher increase of vitamin A intake in the mother postpartum, the higher the breast milk production for infants. (Chahyanto and Roosita, 2014).

Vitamin A in breast milk is the primary source to meet infants' needs from the age of zero to the age of two. Postpartum mothers who consume a high intake of vitamin A can increase milk production. The function of giving high-dose vitamin A capsules during the puerperium is to prevent VAD (Vitamin A deficiency) both in infants and their mothers.

### **Relations Intake Energy Against Breast milk Production.**

According to AKG 2013 recommending additional needs of energy mothers breastfeeding at six months of first postpartum amounted to 330 Cal per day. Figures are relatively much smaller

than the recommendation extra energy for mothers to breastfeed is 2250 Cal. The study is in line with the research results previously, which states a relationship between technique, frequency, duration of breastfeeding, and energy intake- a mother with heavyweight infants one to six months (Yanti, Yohanna and Nurida, 2018):

The intake of energy sufficient at the time of post giving birth helps the mother meet enough milk for her baby. This research found a number of the average consumption of carbohydrates derived from rice 137.6 grams per day, Tempe 3.65 grams per day, the bread of 10.29 grams per day and banana 6.39 grams per day. Intake of energy significantly affects pregnancy and breastfeeding mothers. The better the mother's energy intake, the more it will guarantee the quality and quantity of breast milk. Breast milk contains macronutrients and micronutrients. Macronutrients which consist of carbohydrates, fats, and proteins will be metabolized by the body to produce ATP (Adenosine triphosphate, which is an organic compound and hydrotrope that provides energy to drive many processes in living cells, e.g. muscle contraction, nerve impulse propagation, condensate dissolution, and chemical synthesis) and will be used for the needs of operations in the body. If the energy consumption is more than what the body needs, it will be stored in glycogen in the liver and muscles,

affecting body weight (Williams *et al.*, 2017).

If food that the mother consumes meets the body's energy needs, this energy can turn into the prolactin hormone to stimulate cells in the alveoli to produce breast milk (Sanima, Utami, N.W., 2017). In meeting the needs of energy, protein, vitamins and minerals, breastfeeding mothers need to consume more various foods because they are used for maintaining maternal health and milk production. What often happens is that many mothers want to lose weight immediately after giving birth. The mother does this condition by reducing her food intake while breastfeeding her baby (Kemenkes RI, 2017; Amir and Sulastri, 2019)

## CONCLUSION

In this study, the Public Health Centre is expected to be more vigorous in giving consultation and enabling cadres to provide knowledge about breastfeeding to make promotion media enjoyable. The mothers who breastfeed to pay attention to all of the intakes that can increase breast milk production such as eating beans, spinach carrots, and others and the input of uid that is relatively greater equal to 3000 ml per day. The husband is expected to provide support to the mother after childbirth. Both support the physical and psychological. The next research is expected to use

glass measuring and food models catalogue.

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# EVALUATING TOBACCO ADVERTISING VIOLATIONS AND ITS CONTRIBUTION TO LOCAL REVENUE IN MAKASSAR

Musyarrifah Hamdani<sup>1</sup>, Sri Wahyuni<sup>1</sup>, Ismi<sup>1</sup>, M. Alimin Maidin<sup>1</sup>, Ahmad Wadi<sup>1</sup>, Hadijah Hasyim<sup>1</sup>,  
Ahmad Mawardi Shabir<sup>1</sup>

<sup>1</sup>Hasanuddin Center for Tobacco Control and NCDs Prevention  
(Hasanuddin CONTACT), Faculty of Public Health, Hasanuddin University, Makassar, Indonesia  
Correspondence address: Musyarrifah Hamdani  
Email: arahamdani11@gmail.com

## ABSTRACT

Around 50.82% of the age group 15-19 years were smokers in Makassar city, one of which was influenced by tobacco ads exposure (National Institute of Health Research and Development, 2019b). This study aimed to evaluate the violation of tobacco product advertising to Local Regulation of South Sulawesi No. 1 of 2015 on Smoke-Free Area (SFA) in 2019 and its contribution to local revenue of Makassar City in 2018. This was a descriptive study through a quantitative approach with cross sectional design. The observation was conducted on 21 major roads and the document review was performed by processing and analyzing the secondary data of the Regional Revenue Department of Makassar City 2018. Data were analyzed descriptively using IBM SPSS 22. This study found around 51% of 619 tobacco advertising (banner, billboard, name board, poster, pushcart, and video Tron) did not comply with the Local Regulation of South Sulawesi 1/2015. The violations were located in SFA (2%); near schools and healthcare facilities (14%); cut off the roads (16%); the size >72 m<sup>2</sup> (6%); and near government offices (40%). The contribution of tobacco advertising was only IDR 736,643,634,-, which was around 0.02% of the local revenue. The violation of tobacco advertising to the Local Regulation 1/2015 and a very small contribution to local revenue showed that Mayor Regulation on Total Tobacco Advertising, Promotion, and Sponsorship (TAPS) Ban should be carried out immediately to prevent children to be the target tobacco industries in Makassar City.

**Keywords:** tobacco advertising, TAPS contribution, local revenue

## INTRODUCTION

Tobacco consumption in Indonesia has increased significantly by ranking second after China, while America, Russia, and Japan have decreased (Tobacco Control Support Center-Indonesia Public Health Association, 2020). Indonesia also ranked first among Asian countries with the highest prevalence of male smokers with a percentage of 76%, while China and India with the larger population ranked 4<sup>th</sup> (48%) and 17<sup>th</sup> (20%) (DataLEADS/Asia News Network, 2017). This high consumption of tobacco was caused by various factors, namely increasing household income, population growth, low price of cigarettes, and the mechanization of the industry (Data and Information Center, 2018). In this country, the main form of tobacco consumption was smoking behavior with

the prevalence of smokers age over 10 years reaching around 24.3% in 2018, while the highest prevalence in Lampung Province (28.1%) and the lowest in Papua Province (18.8%) (National Institute of Health Research and Development, 2019b).

The highest prevalence of smoking behavior came from the poorest population group (27%), where cigarettes were the second largest expenditure after rice, both in urban and rural areas (Indonesia Ministry of National Development Planning, 2019). Even though cigarettes have become a risk factor for death and disability, as well as causing economic losses of up to IDR 378.75 Trillion (Indonesia Ministry of National Development Planning, 2019; Non-Communicable Diseases Prevention and Control of Indonesia Ministry of Health, 2018a). Smoking behavior was also one of the contributors to the poverty line

and the incidence of stunting among the children (Indonesia Ministry of National Development Planning, 2019; Non-Communicable Diseases Prevention and Control of Indonesia Ministry of Health, 2018b). The results of a study that was conducted by the Center for Health Economics and Policy Studies, the University of Indonesia in 2018 reported that the incidence of stunting was 5.5% higher among the children who had smoking parents (Non-Communicable Diseases Prevention and Control of Indonesia Ministry of Health, 2018b). It was also in line with the results of a study conducted in Bali Province in 2020 that smoking behavior among the parents would have a direct and an indirect impact on the child's growth process, especially for children aged 2-5 years (Sari and Resiyanthi, 2020).

The tobacco industry has also targeted children in its market. It was concluded from the increasing prevalence of child smokers in Indonesia. In the 5 years period from 2013 to 2018, tobacco consumption among smokers aged 10-18 years has increased by 126% from 7.2% to 9.1% (Tobacco Control Support Center-Indonesia Public Health Association, 2020; National Institute of Health Research and Development, 2013, 2019b). Meanwhile, the government's target in the National Medium-Term Development Plan 2015-2019 should only be around 5.4% of child smokers by 2019 (Indonesia Ministry of National Development Planning, 2017). The difficulty of decreasing the prevalence of child smoking caused the indicators of smoking behavior to fail to be achieved in 2019.

Makassar City as the capital city of South Sulawesi Province and the location of this study also reported that the prevalence of smokers over 10 years was around 21.01% based on the results of Basic Health Research 2018 (National Institute of Health Research and Development, 2019a). Meanwhile, the proportion of age at first smoking in Makassar City was the highest

in the age group 15-19 years, reaching around 50.83% in 2018 (National Institute of Health Research and Development, 2019b). The average cigarette consumption among child smokers was around 8 cigarettes per day (Hasanuddin Contact, 2018).

The increasing of the child smokers prevalence in Makassar City was influenced by many factors, including tobacco advertisements, promotions, and sponsorship (TAPS) everywhere, easy to access cigarettes due to the price was cheap, can be bought in anywhere and by anyone, and considered smoking as a common thing (Lentera Anak Foundation, 2020a). According to the data in 2019, the students saw tobacco advertisements everywhere, including around 61% looking at outdoor, 36% viewing on the internet, 57% viewing on television, and 65% looking at a point-of-sale (WHO, 2019). A survey that conducted to the student in Makassar city 2018 reported that the students' impressions about tobacco advertisements were attractive (64%), cool (59%), and masculine (48%) (Hasanuddin Contact, 2018).

The situation of child smokers was exacerbated due to there has been no sufficient regulations to protect child and adolescents from tobacco addiction and could decrease the prevalence of the beginner smokers, including in Makassar City. The Local Regulation of South Sulawesi No. 1 of 2015 and the Local Regulation of Makassar No.4 of 2013 concerning Smoke Free Areas (SFA) have not yet been optimal in protecting children and adolescents from tobacco exposure as well as TAPS (Government of Makassar City, 2014; Government of South Sulawesi, 2015). Based on the urgency in protecting children and adolescents from the tobacco industry targets, this study aimed to evaluate the violation of tobacco product billboards against the Local Regulation of South Sulawesi No. 1 of 2015 concerning SFA and to determine the contribution of TAPS to the local revenue in Makassar City in 2018.

## METHOD

This study was a descriptive study with a quantitative approach and cross-sectional design. This study was undertaken in Makassar city in April 2019. This study was a subsection of the Tobacco Control and Non-Communicable Disease Prevention Research in Makassar City 2018-2019, which was undertaken by Hasanuddin Center for Tobacco Control and Non-Communicable Disease Prevention (Hasanuddin CONTACT), in collaboration with Global Environmental Health LAB (GehLAB). This study has acquired ethical approval from *Northern Illinois University* (NIU) number HS16-0174.

The data collection was undertaken through observation and document review. Observations were undertaken in 2019 to obtain scientific evidence regarding the location of tobacco advertisements and promotion, such as billboards, name boards, posters, pushcarts (often used by vendors) “*rombong*”, banners, and video tron. The observation was undertaken in the major road of Makassar city: ten national roads, eight provincial roads, and three protocol roads (as depicted in Table 1). The observer took the picture of tobacco advertisements as the documentation of this study. The observation was undertaken using an instrument in the form of an observation guide made on a digital platform, the Kobo Toolbox, to obtain the actual point of location for the distribution of tobacco product billboards, which were then presented in map form.

Meanwhile, the document review was undertaken through secondary data processing to determine the contribution of TAPS to the local revenue of Makassar City in 2018. The secondary data were obtained from the Regional Revenue Agency of Makassar City in 2018, while data related to the amount of local revenue of Makassar

City in 2018 were obtained from the official website of the Government of Makassar City. Finally, the data from the observation and document review were analyzed descriptively using the statistical analysis software.

## RESULTS



**Figure 1.** Distribution of Tobacco Product Advertising in the All Major Roads of Makassar City in year 2019

The first step of the study was undertaken an observation of tobacco billboards product on the major roads in Makassar City. The observation was only undertaken on the major road since the Government Regulation No. 109 2012 and the Local Regulation of South Sulawesi No. 1 2015 only regulated the prohibition of tobacco advertisements in such road category.

According to the result of the observations, there were 619 tobacco billboards in 21 major roads in Makassar city: ten national roads, eight provincial roads, and three protocol roads (as depicted in Table 1). The tobacco product billboards were mostly located on provincial roads with a percentage of approximately 37.1% (n = 230), in the protocol roads with a percentage of approximately 32.6% (n = 202) and the third was national roads with a percentage of approximately 30.2% (n = 187) (as depicted in Table 2).

**Table 1.** The Major Roads of Observation Location in Makassar in 2019

Road Categories	Name of the Roads
National Road (n = 10)	Gn. Bawakaraeng
	Masjid Raya
	Bulusaraung
	Ahmad Yani
	Riburane
	Nusantara
	Ujung Pandang
	Veteran Utara
	Veteran Selatan
	Sultan Alauddin
Province Road (n = 8)	Dr. Ratulangi
	Jend. Sudirman
	Syekh Yusuf
	Tamangapa Raya
	Antang Raya
	Dr. Leimena
	A. Mappainga
	Abdul Kudus
Protocol Road (n = 3)	AP. Pettarani
	Urip Sumihardjo
	Perintis Kemerdekaan

Source: Primary Data, 2019

**Table 2.** Frequency of Tobacco Product Advertising by Major Road Categories in Makassar City 2019

Major Road Categories	Subtotal (n)	Percentage (%)
Provincial	230	37.1
Protocol	202	32.6
National	187	30.2
<b>Total</b>	<b>619</b>	<b>100.0%</b>

Source: Primary Data, 2019

Based on Table 3, it was discovered that banner was the most used tobacco advertisement type at the time of observation with a percentage of approximately 33.6% (n = 208), while horizontal banner was not found at the time of observation. The type of tobacco advertisement, name board, located in the front of shops, kiosks, stalls, café, or coffee

shop also was most often found after the banner with the percentage of approximately 30.4% (n = 188).

**Figure 2.** Name Board of Tobacco Product at Coffee Shop in Makassar 2019**Figure 3.** Banner of Tobacco Product at a Stall in Makassar City 2019**Figure 4.** One of the Tobacco Product Advertising Not Including Health Warnings in Makassar City 2019



**Table 3.** Frequency of Tobacco Product Advertising by Type of Advertisements in Makassar City 2019

Type of Advertisement	Subtotal (n)	Percentage (%)
Banners	208	33.6
Name Board	188	30.4
Poster	124	20.0
Billboards	91	14.7
Videotron	5	0.8
Horizontal Banner	0	0
<b>Total</b>	<b>619</b>	<b>100.0%</b>

Source: Primary Data, 2019

The results of observations also showed that many billboards still violated or not comply the Local Regulation of South Sulawesi No. 1 of 2015 concerning SFA. These violations can be seen in Table 4 and Table 5. Approximately 49.9% (n = 309) of tobacco product billboards violated Article 18 Paragraph (2) concerning the provisions of tobacco product billboards and around 50.1% (n = 316) tobacco product billboards violated Article 18 Paragraph (3) regarding the provisions for the installation of tobacco billboards.

Table 4 showed forms of violations of tobacco billboards in accordance to Article 18 (2): children involvement, adolescents and/or pregnant women in the form of picture and/or text (32.0%); demonstrating, using, and/or displaying the form of the cigarettes (28.8%); not including the symbol or the text "18+" (6.6%); describing or suggesting that smoking provided health benefits (5.7%); and not including health warnings in the form of pictures and text (5.5%).

Meanwhile, Table 5 showed the forms of violation of tobacco product billboards against the provisions of Article

18 (3). They were located inside SFA (2.3%); closed to schools and health service facilities (13.6%); cut off/across the road (16.5%); the size is  $>72 \text{ m}^2$  (5.8%); and located in front of or beside the local government offices (39.6%).



**Figure 5.** Tobacco Product Ads in Front of Hospital in Makassar 2019



**Figure 6.** Tobacco Product Ads Across Major Road in Makassar 2019



**Figure 7.** Tobacco Product Advertising at Entrance Gate of Sultan Hasanuddin Airport 2019

**Table 4.** The Compliance of Tobacco Advertising Criteria to Local Regulation of South Sulawesi No. 1 of 2015 Signage on SFA Article 3(2) in Makassar City 2019

Tobacco Products Advertising Criteria	Comply		Not Comply	
	n	%	n	%
There is a Health warning (picture and text)	585	94.5	34	5.5
There is sign/text "18+"	578	93.4	41	6.6
Not displaying, using and/or presenting the form of cigarettes	441	71.2	178	28.8
Not suggesting that smoking provides health benefits	584	94.3	35	5.7
Not showing the image of children, adolescents and/or pregnant women in picture/text	421	68.0	198	32.0
<b>Total</b>	<b>310</b>	<b>50.1%</b>	<b>309</b>	<b>49.9%</b>

Source: Primary Data, 2019

**Table 5.** The Compliance of Tobacco Product Advertising Installation to Local Regulation of South Sulawesi No. 1 of 2015 on SFA Article 3(3) in Makassar City 2019

Criteria for Tobacco Advertising Installation	Comply		Not Comply	
	n	%	n	%
Not placed inside smoke-free areas	608	97.7	14	2.3
Not placed on the major roads closed to the schools and/or healthcare facilities	535	86.4	84	13.6
Placed parallel to the shoulder of the road and not cut off or cross the roads	517	83.5	102	16.5
Not exceed the size of 72 m <sup>2</sup>	583	94.2	36	5.8
Not placed in front of/next to the government office building	374	60.4	245	39.6
<b>Total</b>	<b>303</b>	<b>48.9%</b>	<b>316</b>	<b>51.1%</b>

Source: Primary Data, 2019

After conducting the observation of tobacco product billboards, then the processing and analysis of the secondary data from the Regional Revenue Agency of Makassar City was undertaken. The aim was to determine the contribution of tobacco product billboards through taxes and retribution to the local revenue of Makassar city in 2018.

The data from Regional Revenue

Agency of Makassar City in 2018 showed that around 176 cigarette product billboards were recorded on all roads in Makassar City with total taxes and fees of Rp736,643,634.00. The total local revenue of Makassar City in 2018 was IDR 1,483,713,060,000.00. Therefore, the contribution of tobacco product billboards was only about 0.02%.



## DISCUSSION

Tobacco industry utilized all kinds of media to promote their products, whether in print, electronic, online, or outdoor media. Outdoor media included billboard, poster, video Tron, sticker, banner, neon box, decorative lights, signboard/board name, hot air balloon, cart, house, substation, tents, bus, car, motorbike, bus stop, and tire covers, which were located around schools, hospitals, offices, malls, tourist attractions, restaurants, and children's playgrounds. The tobacco industry utilized an advertising subliminal strategy through picture with a positive image that was shown repeatedly, thus the subconscious of the children normalized tobacco products (Lentera Anak Foundation, 2020a).

According to the observations, it was discovered that there were 619 tobacco advertising on ten national roads, eight provincial roads, and three protocol roads in 2018 (as depicted in Table 1). In the same year, it was reported that the prevalence of smokers aged above 10 years reached about 21.01% with the highest proportion of first smoking age group (10-15 years) reaching around 51% (National Institute of Health Research and Development, 2019b). The large number of tobacco product advertising located on major roads of Makassar City was an emergency issue due to many studies that proved the impact of tobacco advertising exposures on smoking behavior among the children.

Several studies reported that there was a significant correlation between tobacco advertising exposure and an increasing smoking behavior prevalence, especially beginner smokers (such as children and adolescents). A study in Nigeria reported that there was a significant association between exposure to cigarette advertisements and an increasing of tobacco use among Nigerian adolescents (AOR: 1.18; 95% CI 1.03 to 1.34) (Chido-Amajuoyi et al., 2017). This result was in line with the study in Myanmar that tobacco

advertising was a strong risk factor for the increasing of smoking behavior among high school students (AOR 0.17; 95% CI 0.10 to 0.30) (Cho et al., 2020).

Generally, the government had the strength and opportunity to support the implementation of tobacco control in Indonesia. There was Indonesia Minister of Health Regulation No. 40 of 2013 concerning the Roadmap for Controlling the Impact of Tobacco Consumption for Health by establishing smoke-free areas, increasing tobacco taxes, banning tobacco advertising and sponsorship, and pictorial health warnings (Indonesia Ministry of Health, 2013). The total tobacco advertising, promotion, and sponsorship (TAPS) ban was also one of the policy directions and strategies in the National Medium-Term Development Plan 2020-2024 (Indonesia Ministry of National Development Planning, 2019). Unfortunately, until the end of 2020, no sufficient regulations implemented to protect children and adolescents from the exposure of tobacco product advertising.

Moreover, Local Regulation of Makassar City No. 4 of 2013 on Smoke-Free Areas does not include TAPS ban in major roads, as stated in Government Regulation No. 109 of 2021 and Local Regulation of South Sulawesi No. 1 of 2015 concerning Smoke-Free Areas Article 18 Paragraph (3), (4), and (5). It was different from European countries which have total banned all types of TAPS, both on television, radio and billboards (Münzel et al., 2020).

In Indonesia, there were around 85% of 345 regencies/cities that have regulate TAPS Ban in their local regulation of smoke-free areas, such as Bogor city and Depok city (Tobacco Control Support Center-Indonesia Public Health Association, 2020). There were also some region in Indonesia that have issue regulation or policy for total ban tobacco product billboard in the form of governor regulation such as DKI Jakarta, major regulation such as Denpasar City, and

regent regulation such as Kulon Progo regency. So that, the local government of Makassar City should immediately issue a regulation or policy concerning TAPS Ban, especially for tobacco product billboards. The aim is to protect children and adolescents from the negative impact of tobacco product advertising exposure. So that, the prevalence of child and adolescent smokers can be reduced in Makassar City.

Although in Local Regulation of Makassar City No. 4 of 2013 does not yet regulate the prohibition of tobacco product billboards, the Government Regulation No. 109 of 2012 and Local Regulation of South Sulawesi No. 1 of 2015 can be used as a reference in controlling tobacco product billboards in Makassar City. The provisions regarding tobacco product advertisements and their installation have been regulated in Local Regulation of South Sulawesi No. 1 of 2015 in Article 18.

Based on the observation, this study found that some tobacco product advertising did not comply to Local Regulation of South Sulawesi No. 1 of 2015 Article 18 Paragraph (2) and (3). The violation of tobacco product billboards in Article 18 Paragraph (2) concerning the provisions of tobacco product billboards with percentage of around 49.9%. The provisions that were violated as follows: children involvement, adolescents, and/or pregnant women in the form of pictures and/or text (32.0%); demonstrating, using, and/or displaying the form of cigarettes (28.8%); did not include the sign or the words of "18+" in the advertisement (6.6%); describing or suggesting that smoking provided health benefits (5.7%); and did not include health warnings in the form of picture and text in the advertisements (5.5%).

The result of this study in line with a survey that conducted in DKI Jakarta on outdoor media for tobacco products. This study reported the violations of tobacco product advertising to Regulation of Governor DKI Jakarta No. 1 of 2015, among others were not including pictorial

warnings (11%) and age restrictions (12%), using animation (1%) and cultural references (5%), and using other designations that referred to tobacco product brands (Forum of Jakarta Citizen/FAKTA, 2015). There were still many violations to local regulations on smoke-free area by the tobacco industry so the local government should be stricter in enforcing the regulations, especially in imposing sanctions.

The violation by displaying symbols or images that referred to children and adolescents has made it clear that this industry was targeting children and adolescents in its market. Until now, there were still many events such as music concerts sponsored by the tobacco industry in Makassar city. The temptation to try cigarettes was even greater if children and adolescents attended those music concerts due to the distribution of free cigarettes at the venue entrance. However, tobacco industries denied targeting children and adolescents, but in fact they employed advertising as one of several important and interlocking ingredients that nurture smoking behavior among adolescents and children (WHO, n.d.).

Apart from Article 18 Paragraph (2), the violations also occurred in Article 18 Paragraph (3) concerning the provisions for the installation of tobacco product billboards with percentage of around 50.1%. The violations were located inside smoke-free areas (2.3%); closed to schools and healthcare facilities (13.6%); cut off/crossed the major road (16.5%); measured up to 72 m<sup>2</sup> (5.8%); and located in front of or beside local government office (39.6%).

This study in line with a survey of outdoor media for tobacco products in DKI Jakarta 2015 which reported violations of Governor DKI Jakarta Regulation No. 1 of 2015, including located inside smoke-free areas, located on the access road towards smoke-free areas (place of worships = 94%; schools = 91%) (Forum of Jakarta Citizen/FAKTA, 2015). Those type of

violations also reported in a study in Surabaya city that within 300 m of schools (27%) and campuses (31%) there were tobacco advertisements (Megatsari et al., 2019). The percentage of the visibility of tobacco advertisements within 300 m from schools in Semarang city was higher, which was around 74% (Nurjanah et al., 2020).

Tobacco product advertising that located close to smoke-free area, especially the school also happened in United States. The study in United States reported around 25% tobacco advertising located about 500 feet from a school, playground, or church and around 40% tobacco advertising located in major roads (Scott et al., 2008). Based on the result of these studies, it was concluded that currently children were being attacked by tobacco advertisements due to tobacco product billboards exposure in everywhere. Not only near schools, but also along the major roads, public transportation, city parks, sports venues and tourist attractions (Lentera Anak Foundation, 2020a). The placement of tobacco product advertising showed the intended marketing targets (Forum of Jakarta Citizen/FAKTA, 2015). Many tobacco product billboards close to the schools, even violated the regulation, proved that the children and adolescents have become tobacco industry target. Therefore, local government needs to optimize the monitoring and evaluation of their local regulation, especially on smoke-free areas and ban TAPS.

The evidence found in this study should serve as a reference to develop total ban TAPS in Makassar city in order to reduce the exposure of tobacco product marketing among the children and adolescents. It was in line with the recommendation of a study in Nigeria that the implementation of a comprehensive ban TAPS in all types of media was effective to prevent tobacco consumption among youth in Nigeria (Chido-Amajuoyi et al., 2017). In Indonesia until March 2020, as many as 16 regencies/cities have banned TAPS in various forms of regulations (appeal letter,

instruction letter, regent regulation, mayor regulation, and local regulation), namely DKI Jakarta, Bogor City, Depok City, Kulon Progo Regency, and Denpasar City (Lentera Anak Foundation, 2020b; National Tobacco Control Committee, 2019).

This study was conducted also to examine the contribution of TAPS through tobacco product billboard taxes and retribution to local revenue of Makassar City in 2018. It was done to strengthen the urgency of ratifying the Draft Mayor Regulation concerning the Prohibition of Tobacco Product Billboards in Makassar City which has currently been reviewed by the Law and Human Rights Division of Makassar City.

For information, the tobacco tax was one of the local taxes managed by the provincial and regency/city governments based on Law Number 28 of 2009 which was obtained from cigarette excise and was coercive (Maulida, 2018). The tax would be managed by the local government and allocated for public purposes, such as procurement or improvement of local infrastructure (Musdalifah et al., 2020).

Data from Regional Revenue Agency of Makassar City in 2018 showed that there were about 176 tobacco product billboards recorded on all roads in Makassar City. Total tax and retribution of tobacco product billboard was around IDR 736 million. Meanwhile the total of local revenue of Makassar City in 2018 was around IDR 3.4 billion. Hence, the contribution of taxes and retribution of tobacco product advertisements to local revenue of Makassar City in 2018 was only around 0.02% (See Table 4). This amount was very small, even insignificant. Thus, the total ban of tobacco billboards will not have any meaning to the local revenue of Makassar City.

The small contribution of tobacco advertising to local revenue has caused a number of regions banning tobacco product advertisements, namely DKI Jakarta, Bogor City, Kulon Progo Regency, and Denpasar City. After banning tobacco

advertisements, these areas actually experienced an increase in their local revenue. Denpasar city experienced increasing local revenue by 10.1% from IDR 658 billion in 2013 to IDR 776 billion in 2015. This happened because the contribution of tobacco advertisements to local revenue in Denpasar was only 0.18% in 2013 (Artawan Eka Putra et al., 2017). In addition, Bogor city in 2008 (before Major Regulation on the Prohibition of Tobacco Product Billboards took effect in 2014) had local revenue about IDR 97 million with 372 tobacco advertising billboards increasing to IDR 784 billion with 0 tobacco advertising billboards in 2016 (or 2 years after Major Regulation enforced) (Bogor City Government, 2017). It means that banning tobacco advertisements through the ratification of Regulation on Ban Tobacco Product Billboards will not have any impact, especially on local revenue because tobacco advertisements will be replaced by advertisements from other products.

Therefore, local government of Makassar City is expected to take firm action against tobacco product advertisements that violated and immediately ratify the Mayor Regulation for ban tobacco product billboards in Makassar City, hence the public health status can be further improved and children are no longer as the target of tobacco industry in Makassar City.

## CONCLUSION

This study found that there was still tobacco industry not complying Local Regulation of South Sulawesi No. 1 of 2015 on SFA in Article 18 Paragraph (2) and (3), especially in terms of advertisements that cross/cut roads and were near schools/healthcare facilities. Therefore, it is expected that local government of Makassar City will be serious in monitoring the compliance of tobacco product billboards, including the enforcement of sanctions for anyone who violated it. If necessary, it is

better to take action to reduce non-compliant tobacco advertising. Moreover, the results of this study also proved that the contribution of tobacco advertisements to local revenue in Makassar was very small or insignificant (around 0.02%).

Hence, local government of Makassar City was expected to immediately ratify the Draft Mayor Regulation concerning the Prohibition of Tobacco Product Billboards, thus we can successful increasing local revenue as well as other regencies/cities after ban tobacco advertising in order to enjoy the demographic bonus 2020-2030 in Makassar City.

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# LITERATURE REVIEW: THE ROLE AND EFFECTS OF HOSPITAL HEALTH PROMOTION ON HEALTH POLITICS

**Neula Armyttha Rizki Ramadhani**

Department of Health Promotion and Behavioral Science  
Faculty of Public Health, Airlangga University, Surabaya, Indonesia  
Correspondence address: Neula Armyttha R  
Email: neulaarmyttha@gmail.com

## ABSTRACT

An applicable health system must be integrated with existing health facilities in the community, such as health facilities at hospitals. One of the efforts made by the hospital is hospital health promotion aimed to enable patients and their families to prevent health problems, improve health more independently, and be active in the healing process, of course while being supported by policy regulations. This study aimed to describe the implementation of hospital health promotion as a health political product that certainly affects the degree of public health. This study was a literature review. Data were collected by library research. Based on the results, making a political decision (especially in the health sector) would affect the health of the community, in addition to politics being influenced by the state of public health. The role of hospitals as health promoters could be realized through hospital health promotion with a new preventive paradigm. Moreover, health promotion could also help improve fair and equal health services while still prioritizing quality and promoting preventive and promotive efforts. More numbers of health personnel both in the curative and preventive treatment should be considered for health policymaking to improve health services, especially in hospital settings.

**Keywords:** health promotion in hospital, health politics

## INTRODUCTION

Article 52 paragraph (1) of Law No. 36 of 2009 concerning Health states that there are 2 types of health services, namely individual and community services. Health services are promotive, preventive, curative, and rehabilitative and ensure human needs in the health sector to be fulfilled. Based on this statement, it could be seen that the fulfillment of public health requires complex steps. A part of the services is curative and rehabilitative treatment at hospitals.

To achieve optimal health, it is necessary to exploring the will, awareness, and ability of people to live healthily. Hospitals have an important role in health development and becomes an integral part of international development (Health Promotion Center of the Indonesian Ministry of Health, 2010). Hospitals function as a resource center to develop public health, and they must be integrated

into a health system (Indonesian Ministry of Health, 2009). However, it is unfortunate that most hospitals in Indonesia still emphasize their services on curative and rehabilitative aspects. Therefore, it causes inconsistency in hospital functions making it shift into an elite facility that is independent from the reference to the health system in an area.

The World Health Organization (WHO) is aware of the importance of implementing health promotion at hospitals; thus, immediate actions for implementing it are required. The absence of world standards regarding hospital health promotion was an issue in the last years. As a result, the WHO held the 9th Hospital Health Promotion Conference in Copenhagen in May 2001, which resulted in the formation of work group for designing global hospital health promotion standards.

After the conference took place, the working group (assisted by several

countries of the WHO's working network) sparked hospital health promotion standards, with 5 core standard points applied to hospitals around the world. The five standards included (1) the existence of management policy related to hospital health promotion prior to implementation; (2) health promotion assessment prior to implementation; (3) home interventions of health promotion; (4) environmental health promotion for all hospital employees; and (5) partnership building with related stakeholders (WHO, 2004).

As stated in the Decree of the Indonesian Minister of Health Number 1114 of 2005 on the Implementation Guidelines for Hospital Health Promotion, one of the efforts to improve patient health is hospital health promotion program. This program aims to enable patients, families, and community groups to prevent health problems, improve healthy measures more independently, and be active in the healing process, of course with supporting policy regulations. The implementation of hospital health promotion aims to make patients and families active in the healing process, disease prevention, and development of community-based health measures with supporting public policy regulations (Indonesian Ministry of Health, 2018). To achieve a balanced life, individuals must pay attention to various supporting aspects. One of the most important is the fulfillment of health needs. Various efforts i.e., promotive, preventive, curative, and rehabilitative ones are fairly needed to meet community health needs. However, curative and rehabilitative treatment is more dominant and followed by a healing process at public health facilities (hospitals or primary healthcare centers).

The second amendment of the 1945 Constitution Amendment in Article 28H of the Indonesian Constitution states that everyone has the right to live with physical and mental prosperity, to have a good and healthy living environment, and to obtain health services. In the the third amendment of the 1945 Constitution, Article 34

paragraph (3) states that the State is responsible for providing proper health services and public facilities. In accordance with the mandate of the 1945 Constitution, the government obligates to fulfill health facilities and services according to the community needs or public good. The fulfillment process requires support and actions from all aspects, especially health facilities, including hospitals that implement hospital health promotion (Olivia, 2010).

Health is a part of politics as the degree of health or health problems is determined by policies that could be directed or amenable by policy interventions. The hospital health promotion policy is also a political product. The program achievements are sensitive to the conditions of the existing political environment. Making a policy requires power and authority to foster cooperation and to resolve conflicts that might arise in the process of achieving the goals.

## **METHODS**

The research method was literature review. Data were collected by literature study from various literature sources (books, theses, journals and others) concerning health politics and hospital health promotion both on an international and national scale; then, a qualitative analysis was carried out using thinking methods starting from general data to specific ones (Priasmoro, 2019). The results were analyzed systematically from March to May to facilitate reading about hospital roles in health promotion in the perspective of health politics.

## **DISCUSSION**

### **Hospitals as Health Promoters**

One important element that supports the implementation of the National Health System (NHS) is health promotion approach. Optimal health development, according to the NHS, requires all society to participate to their best. Community



empowerment is the effort possibly made for individuals, groups, and communities in the health sector in an integrated manner; integrated support in achieving the highest public health status by means of advocacy and monitoring can ensure its effective and targeted success (Indonesian Ministry of Health, 2018). The community empowerment may be in the form of health promotion aimed at encouraging people to make themselves and their environment healthy (Health Promotion Center of the Indonesian Ministry of Health, 2011).

The development of health promotion paradigm began in 1994, and it was firstly known as the Hospital Public Health Promotion (PKMRS). The term was changed to Hospital Health Promotion in 2003 (Department of Health, 2010). Hospital health promotion targets patients, families, and community groups in the surrounding environment. It is one of five PHBS as the flagship programs of health promotion. (Ayuningtyas, 2008). Hospital health promotion aims to enable patients, families, and community groups to prevent health problems, improve health more independently, and be active in the healing process. The hospital health promotion program is also considered very beneficial for hospitals if implemented optimally; it can improve the quality and image of hospital services.

In the process, hospitals should provide basic hospital health promotion guidelines on preparation, advocacy and socialization to stakeholders, training program for executors, monitoring as input for program development and improvement, and media broadcast (Nurdianna, 2017). There are strategic issues explaining why hospital health promotion has not run optimally. Firstly, it does not become a priority of health service policy at most hospitals. Secondly, the delivery of information regarding disease prevention and treatment is not clearly and continuously disseminated by health personnel to patients. Thirdly, a clean, healthy, and safe workplace has not been

established by most hospitals. Finally, partnerships in promotive and preventive health services are still lacking.

The hospital health promotion program enables patients and families to understand types of diseases they suffer and their causes; this could allow them to understand its prevention (avoiding re-infection) and be active in the healing process. This promotional step is inseparable from the hospital health services (Nurdianna, 2017).

Hospital health promotion at some hospitals have been implemented for quite a long time, but the system and organization are not yet targeted in that the implementation is just based on interests and opportunities of certain health workers. The conditions are not fully supportive, and thus the pros and cons of various parties arise. On one hand, certain parties feel that the hospital health promotion can make things i.e., time and cost complicated. On the other hand, some people argue the optimal hospital health promotion may exist as long as managers and administrators have the will and understanding of the benefits. To run hospital health promotion accordingly, relevant parties must agree with concepts, have supporting policies, and have sufficient resources i.e., humans, funding, and technology (Hakim, 2012). Program implementation is closely related to policy and planning, both of which are an enabling factor for achieving objectives (Burke, 2012).

In general, there are many opportunities for hospitals to promote health, both indoors and outdoors. The Regulation of Indonesian Ministry of Health Number 11 of 2006 states that successful implementation of hospital health promotion (in terms of objectives, strategies, resources, and media) needs at least 1 person whose degree is Bachelor of Public Health. This person should be assigned to assist in the process and design strategies for implementing hospital health promotion. Additionally, personnel with

Associate Degree who are interested and talented in health promotion is required to assist in empowerment, building the atmosphere, and advocacy (Purba, 2016).

Based on the strategic framework of "Health for All" in the Ottawa Charter on Health Promotion, the Ljubjana Charter on health service reform, and the Budapest Declaration on hospital health promotion, the role of hospitals as health promoters is first to promote human dignity, equality, solidarity, and professional ethics. They should be aware of the differences in needs, values, and cultures of different population groups. Second, they should be orienting to quality improvement, patient welfare, patient, employee relatives, and environmental protection, and potential development to become a learning organization. Third, they focus on health with a holistic approach that does not only emphasize curative efforts. Fourth, they should prioritize people who provide health services for patients and their relatives, facilitate the healing process, and contribute to patient empowerment. Fifth, they should use existing resources efficiently and effectively and allocate resources on the basis of contributing to health improvement. Sixth, they should build good rapport with stakeholders in the health service system and community (Jancey, 2017).

### **Health Politics**

Health politics is a development effort of public health. Among the people, there are many fundamental questions, for example, 'why health is political?' because of disparities in the degree of public health which is not evenly distributed. As a result, efforts to achieve justice must be strived for and fulfilled (Bambra, 2005). Health is a part of politics because health policies determine the degree of health and may be directed or amenable by political policy interventions. Besides, health is a human right. Health politics is the science and art of striving for the degree of public health through a constitutional system adopted by

a region or country in creating a healthy society (Sade, 2012). Power is needed in policymaking and guarantees the degree of public health.

Health Politics, based on fundamental rights, is a state policy in the health sector that stands for citizen's rights. As a result, political decision-making will greatly affect public health, which affects the community welfare (Siswanto, 2004). Currently, the mindset of political stakeholders is significantly different from the concept of public health experts. To achieve optimal implementation of targeted health development, it is necessary to align the concepts.

According to the mindset of public health experts, health is the major component that must be improved. They think sources of health problems come from neglecting maternal and child health, having disparities in the rich and poor populations, and poverty. Health politicians must have evidence-based policies which prioritize disease prevention handling. However, the political elites do not have the same mindset of health development. A popularity survey mentioned the basis for political decision-making is what appears fast in the eyes of constituents as a development priority. This could become a problem if both public health experts and political elites reluctantly understand each other, especially community welfare development. The illustration makes health a political problem (Olivia, 2009).

Medical technicality is no longer the only reason for the emergence of health problems since economic, social, and political conditions also contribute to it. Political commitment is needed to solve health problems although the problem-solving is never easy; political actors in health cannot convince other political elites about long-term health investment that is productive, not consumptive. Health practitioners cannot convey the benefits of health investment in supporting the nation's development to the political elite (Siswanto, 2004).

Being a health political actor is indeed not easy because what moves is not only the hands and feet, but also the heart and mind; however, fighting for the welfare and health is everyone's right and obligation. In health politics application, all political actors unnecessarily become health workers or have a health education background. Politics is a complex system of its own; it starts from the process of determining to implementing goals with various activities across many sectors. The decision-making on the objectives of the political system involves the selection of several alternatives and setting of priority objectives. However, public policies should be made concerning the regulation and distribution (or allocation) of existing resources (Palutturi, 2013).

Fostering cooperation may resolve conflicts during this process. Networking as well as participation in decision-making require authority and power. Therefore, stakeholders must convince the target either with coercion or not. A little coercion will make a strong impetus allowing policy issuance (Palutturi, 2013). Political practices often appear in everyday life, such as in economic, social, cultural, or other aspects. Politics does not only include individual interests but also prioritizes common interests (Palutturi, 2015).

### **The Role of Hospital Health Promotion in Health Politics**

Hospitals as health promoters can participate in implementing health promotion supported by a preventive paradigm. Currently, the ingrained paradigm of society is still oriented towards disease treatment, which may trigger the society to think about the importance of health. Different preventive paradigm from an early age may increase the life expectancy. A strategy taken to achieve a better quality of life is improving a healthy lifestyle, consuming healthy food sources, relaxing physically and spiritually, increasing the body's ability to be more independent, as well as having capacities to

fight for chronic diseases and even deaths. In short, all of these strategies may increase the quality of life (O. Greoene, 2006). The Indonesian Law No. 44 of 2009 concerning Hospitals states that a hospital is a health service institution that provides complete health services, including preventive, promotive, curative, and rehabilitative services. Therefore, each hospital must put efforts to improve health through various hospital health promotion activities as stated in the Regulation of the Indonesian Ministry of Health No. 4 of 2012.

Promotional and preventive strategies are carried out to achieve equality of affordable health services but still prioritizing quality, justice, and evidence-based work; moreover, fostering national and global partnerships is required to increasing community empowerment. The strategies consider the National Priorities in the Health Sector (PNBK) (Indonesian Ministry of Health, 2015). The WHO stated that an applicable health system must be integrated with existing health facilities i.e., hospitals through hospital health promotion program (WHO-Europe, 2004).

The hospital health promotion as preventive services for patients requires policy with its implementation accordingly. For example, hospitals may need to recruit more health workers or personnel in implementing preventive and curative programs. It supports to achieve public welfare thoroughly without exception. In addition to that aspect, hospitals need to increase the level of health status for all parties (Pramesti, 2015).

Health development policies include (1) fostering partnerships and a cross-sectoral atmosphere; (2) increasing community independence and cooperation with the private sector; (3) improving the level of environmental health; (4) increasing resources in the health sector; (5) improving health efforts, (6) health development policy and management, (7) community protection from the illegal use of pharmaceutical goods, food, and medical

devices, and (8) health science and technology (Ayuningtyas, 2008).

Evidence showed that the strongest health determinants in the modern era are social, cultural, and economic factors. These factors are considered by governments and international bodies. However, health inequality continues to exist in a country; for example, there are differences in socio-economic class, gender, and ethnic groups. There are still disparities in prosperity, welfare, and resources (Donkn et al, 2002).

The government obligates to improve the community welfare by fulfilling the socio-economic needs. Besides, the government is responsible for creating an environment that is physically and spiritually healthy; the need for community welfare holds the same importance as social and economic factors in health determinants (Marmot and Wilkinson, 2001). By empowering the community to willingly create a healthy and ideal environment, their productivity may increase and, in turn, raise the quality of life. The government has done efforts to make the community prosperous as evidenced by various regulations and laws that spark diverse systems of community life, regarding physical, mental, and social aspects. Many burdens borne by the government may hinder execution and achievement. One example is health care costs. Encouraging the government to partner with the private sector, for both non-profit and profit organizations, in decision-making will share the burden.

Policy implementation is influenced by the extent to which the interests of the target group(s) are put into the policy (Razak, 2012). It could be illustrated that the implementation of health promotion may be carried out properly if supported by the government policies and hospital management. It is recommended that hospital health promotion standards should be included in hospital accreditation indicators. Due to increasing numbers of hospitals implementing hospital health

promotion, more people are expected to change their health paradigm. In relation to the massive participation, health promotion policy is required immediately to improve service quality (Nurdianna, 2017). Support from all parties contributes to changes in attitudes, behavior, and a healthy environment everywhere. That way, the community can become independent and improve the degree of health by preventing and developing health businesses. To achieve a prosperous society, it is necessary to cooperate with each other in support of government healthcare policies.

Any types of policies carry the risk of failure. Likewise, implementing health development poses challenges that are not easy. Many undesirable things may occur; one example is struggling to fight for the respective interests. At the level of organizational units, there must be different perspectives between researchers and divisions in research-focused organizations. Second, the agency and other directorates general for resources may also have different interests. Third, between sectors, each party hold power to legitimize their interests (Firdaus, 2018).

Likewise, advocacy strategies in hospital health promotion aim to produce policies and regulations related to various aspects of the predetermined standards. In this case, how to interpret determinants of resources in the area of national development matters. Stakeholders who have the ability to convince decision-makers will get what they want and vice versa. Parties who are unable to convince decision-makers must accept defeat in the struggle for meanings and resources.

Causes and predisposing factors for health and diseases that are better understood greatly affect the degree of public health (Bambra *et al.*, 2005). Hospital health promotion is prominent in overcoming this issue. Giving care at its best allow hospitals to help patient recovery and improve the quality of patient life. To maintain it, patients and relatives must be prepared and educated more intensively

through hospital rules and policies that have long-term impacts on improving the quality of life. Organizations produce, collect, and disseminate a great deal of knowledge which may impact local health structures and professional practice elsewhere.

Building collaboration in the planning and development stages determines what information is needed and ensures the final product relevancy and usefulness. Despite providing information, hospitals need to build cooperation and provide accurate information for actions. Knowledge should be viewed as an output of collaborative and problem-solving work between researchers and decision makers. It may produce reciprocal learning through planning, production, and dissemination. Hospital health promotion is considered relatively successful in this process when receiving recognition from the health bureaucracy and politicians. There are many opportunities for hospitals to further address health promotion process and its other aspects.

## CONCLUSION

Hospital health promotion holds a big role in health politics mainly to improve the quality of life. It can be developed by preparing guidelines, advocacy and socialization to patients, clients, and community. Hospitals are expected to enable patients, families, and community to prevent health problems, improve health more independently, and be active in the healing process, supported by policy regulations. Advocating strategies of hospital health promotion is done by formulating policies and regulations related to various aspects of hospital health promotion in accordance to predetermined standards. The program also may overcome various prevention issues, for example, helping patient recovery and improving the quality of patient life.

Future research is expected to further analyze this topic more specifically

and study the impact of the hospital health promotion on health politics.

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