# Kes*m*as

## Jurnal Kesehatan Masyarakat Nasional
## (National Public Health Journal)

**Quarterly Journal**

# Kesmas

Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)

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Even though the COVID-19 pandemic is still not going anywhere, the great works behind the publication of **Kesmas**: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal) Volume 16 Issue 1 deserve an appreciation. Moreover, it became a beginning of a new journey of the COVID-19 pandemic in 2021. Great job, everyone!

The article I want to highlight is "Analysis of Measles Vaccination Refusal on Social Media (Facebook) among Anti-Vaccine Communities in Indonesia". We all know that in this hard time because of the COVID-19 pandemic, the vaccination program, moreover in Indonesia, is still become a contradictive discourse, even though the government has already made it free and accessible for everyone. I hope that the world, moreover Indonesia, will get better soon, and we can go back to our daily routines without practicing the health protocol anymore. **(Haikal, Surabaya)**

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# The Essence of Telemedicine for Bridging the Gap in Health Services

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**Abstract**

This study aimed to review the essence of telemedicine in this modern era of technology and innovation, especially in developing countries. It also investigated the regulation aspect as the main component for healthcare services. There were five main categories of telemedicine: revenue stream and technology literacy, health facilities, human resources, data authorization and security, and health protocol. Furthermore, when combined with wearable devices, it enhanced healthcare delivery opportunities. There were two major components of global electronic health, namely telehealth and health informatics, based on e-commerce and e-learning systems. The World Health Organization (WHO) has been able to describe the roles of telehealth services in developing countries. However, some related issues were needed to be well managed, such as the patient data security. It was found that the regular training and evaluation of people with poor educational background, low income, and stress were the main reasons most communities attend healthcare services despite mild sickness. Therefore, those need to be enlightened on the roles and importance of telehealth services.

**Keywords:** medical development, technology disruption, telemedicine

## Introduction

Information and technology have played an important role in transforming the way people live especially in the healthcare sector. Furthermore, it has contributed to improving the knowledge of healthcare providers and the behaviors of some communities. Based on National Health Services, people tend to use telemedicine in a long-term span in order to easily get connected with healthcare services. This includes using a smartphone application, wearable devices, remote monitoring, and reading the genome. Furthermore, it is known for reducing costs, energy, time limitation, and distance.[1] Telemedicine has been widely used since the 1990s, when healthcare providers used telephones whenever a patient felt sick, and later on, the development became accelerated in this modern era.[2] It is divided into three activities: teleconsultation involving telemonitoring, teleexpertise, and teleassistance. A further technological enhancement that also needs to be implemented in the health sector includes virtual and augmented reality, artificial intelligence, robotics, and gene writing. However, these developments have resulted in some arguments concerning ethical considerations and people's percep-

tions.[1]

Telehealth comes from the word "tele" meaning distant and "health" which means the well-being status of an individual. It is commonly referred to as telemedicine and has also been used to define of health services in various communities. Furthermore, according to World Health Organization (WHO), telehealth and telemedicine are classified as two different terms. Telehealth covers almost the whole aspects of health services communication, especially in promotive and preventive medicine. In contrast, telemedicine is one of the main roots enclosing the activity of curative medicine. Based on these findings, it was concluded that this currative medicine is the part of telehealth which provided health services in various communities.[2]

Primary physicians and nurses or midwives are the main people that mostly interact with patients. They either recommend patients to an expert or administer temporary medicine and observe the condition. Furthermore, each activity would be recorded in the patient's medical record which becomes an important criterion for the telematics and informatics approach.[3]

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**Method**

This study aimed to review telemedicine in this modern era of technology and innovation, especially in developing countries. It also investigated the regulation aspect as the main component for healthcare services. Furthermore, some sub-topics were evaluated, namely telemedicine regulation and evaluation, health data portal, and medical technology-related issues.

**Results and Discussion**

*Telemedicine regulation and evaluation*

Global electronic health has two crucial components; telehealth, based on the e-commerce system, and health informatics, which is based on the e-learning system. These components are both synergized to make up the global system of e-health. Some aspects needed to be improved in health informatics, including decision support systems and surveillance systems, electronic health records, and health portals as the comprehensive evaluation of system health management. Furthermore, the maturity of telehealth needs to be encouraged in each medical specialties, especially for emerging diseases.[5]

There are five main categories used in managing telemedicine: revenue stream and technology literacy, health facilities, human resources, data authorization and security, and health protocol. This was stated on the Circular Letter from the Ministry of Health of the Republic of Indonesia No. 303 of 2020 and the Regulation of Indonesian Medical Council No. 74 of 2020.[6,7] Furthermore, these regulations were used during the pandemic where non-emergency cases and health services were available. This country also needs improvement in regulations associated with virtual healthcare services when transferring patients and emergency cases.

National Health Services made the regulation of telemedicine based on the capitation system. It stated that healthcare providers need to be certified by Membership of the Royal College of General Practitioners (MRCGP) and National Health Services (NHS).[8] Furthermore, other countries' systems, such as the American College of Obstetrics and Gynecology was used as a model in this study. This involved reviewing their insurance regulations concerning telemedicine in overcoming the impact of Coronavirus disease 2019 (COVID-19), such as coding diagnosis remote-patient monitoring, treatment and consultation, and patient-cost sharing.[4,9] In addition, several international health organizations, such as WHO have described telehealth services in developing countries using teleconsultation and telemonitoring between healthcare facilities.[10,11]

*Health data portal*

Precision medicine foundation is divided into three main categories: the big-data of the medical field; clinical, genomics, and research. Genomics is one of the major pillars in promoting health management and can also be used as a guide in accelerating the development of healthcare delivery. Furthermore, sequencing genomics has resulted in genome mapping which has a great potential benefit associated with health and nutrition. Large biodiversity and microorganism were also used for genome mapping to know the importance of metabolic, physiological, and degenerative processes of a human being. Furthermore, knowledge sharing of genomics is also valuable in supporting biobank and in the development of drug materials.[12]

The second important category is research, and it involves the expansion and evolution of health knowledge. Furthermore, laboratory facilities, collaboration, funding, and the biobank integration are areas that need improvement for individuals to carry out a successful study.[12] The last important category is clinics which involves a clinician, clinical procedure, and patient's communication. In addition, clinical and study data used in teleme-
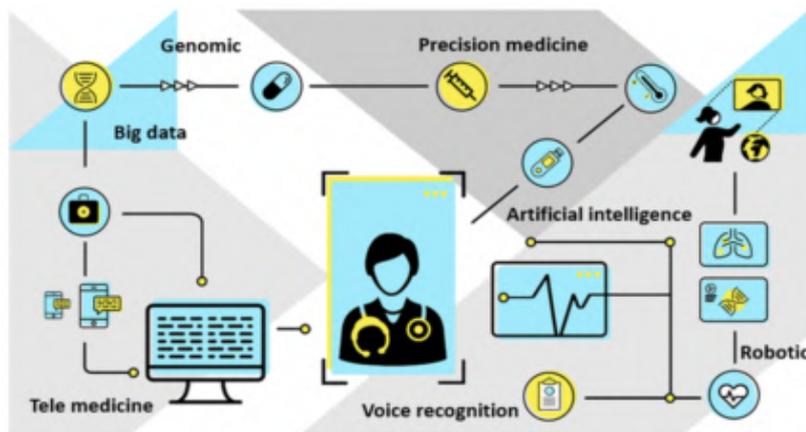


**Figure 1. Revolutionize Care Delivery**
(Source: https://www.gensler.com/blog/the-pandemics-lasting-effect-on-our-healthcare-system)

dicine and artificial intelligence are normally processed in the cloud data system (Figure 1).

Some components were expected to support the development of telemedicine. However, genomic and big data were the main pillars used in precision medicine. The use of modern technology in the medical sector such as carrying out a simple physical examination using wearable devices, teleradiology, or other static imaging, could be processed and transferred through artificial intelligence. At the same time, robotic technology could also aid in diagnostic or treatment procedures. For easy recording, these data were reported to healthcare providers and recorded into electronic medical records.

*Medical technology-related issues*

Various medical technology is used in the health evaluation of patients in remote areas (Figure 2). Tele-ultrasonography (USG) is an example of a medical instrument used in monitoring fetal development and needs empowerment from the government to promote a good fetal mortality rate. It is helpful in communities where there are people with cardiovascular disease, advanced age, decreased mobility, and living in a remote area. Since the cardiovascular system is one of the highest contributors to global mortality, it is important to educate patients and companions to increase their knowledge in using telehealth to supervise their health status.[13,14]

Various future medical developments are categorized based on their impact on various communities and the innovation progression. According to Figure 2, telemedicine, regenerative, and precision medicine reached the best progression. According to Smith from Queensland University,[15] many telehealth services were provided to citizens in Australia. This was carried out by establishing telepediatric and teleradiology, used as a distance health system for children and when performing x-rays. The protocol was well-organized via videoconference to monitor a patient's clinical condition. The broadband connection provided a higher capacity of connectivity at a relatively low cost to evaluate the patients in a real-time manner, such as skin, appearance, and chest or abdomen movement. The family expense was stated lower than usual as well as psychological stress and unnecessary visits during an emergency service.[15]

More advanced innovation came from the Electronics Division of Bhabha Atomic Research Centre Mumbai, when Lakhe and his team found a digital stethoscope that could differentiate between heart sound and others. This technology could detect heart sounds using an electron condenser microphone placed on the chest, before being processed and amplified. Furthermore, the background noise was reduced using the adaptive line enhancement technique. The heart sound could be stored, replayed, and sent to medical experts for analysis and evaluation.[16] A low-cost kit for diagnosing lung diseases was also developed by Chamberlain, *et al.*,[17] from the Massachusetts Institute of Technology. Furthermore, an electronic stethoscope along with a peak flow meter was created and recorded using an android smartphone. Before these instruments were invented, heart sounds were heard only by direct physical examination.[17]

The National University of Singapore was the first institution to use telemedicine for rehabilitated patients. This was carried out to reduce the physical barrier and stress experienced by healthcare workers. Their Heart Center also delivered telehealth systems for patients with conditions, such as diabetes, hypertension, and heart failure. The system was monitoring daily blood pressure, blood sugar, and weight transferred to the healthcare provider.[18,19]



**Figure 2. Innovation Traction and Impact Scheme**
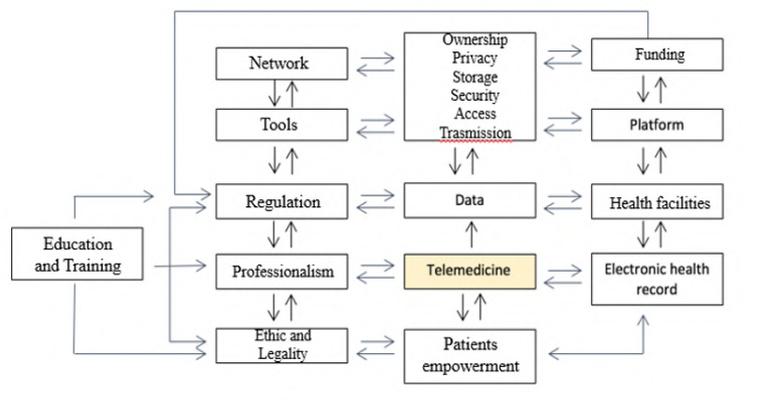
**Figure 3. Telemedicine Framework**

The telemedicine system requires further development, especially in situations whereby emergency cases and homecare needs urgent attention before being transferred to advanced healthcare facilities. Some examples were shown in the pilot study conducted by Finkelstein, *et al.,*[20], which involved managing more than twenty patients with chronic diseases such as heart failure, chronic obstructive pulmonary disease, and chronic wound successfully. Pre-hospital telecardiology was also reported in reducing the time of segment elevation myocardial infarction (STEMI) diagnosis and management. Moreover, live-remote monitoring and diagnosis of stroke increased the time management of drug administration followed by the quality of treatment and prognosis.[20]

Nevertheless, some issues relating to telehealth need to be managed, such as patient data security of health services. Regular training and evaluation for people with poor educational background, low income, and stress were the main reasons most communities attended healthcare services despite mild sickness. For example, a mother rushed to the hospital because the child had a fever solved through a telehealth platform. The other aspect that also needed improvement was the presence of a physician. Direct communication, gesture, and contact could not be denied as many patients came to doctors just to seek some health tips. Sometimes, some situations led to misunderstandings between the healthcare provider and patients, but this was resolved through effective communication using video call conferences.[10,12,21]

Telemedicine is also an approach to increase the precision of medical care in which patients could be monitored continuously. Patients can reach physicians even if they were limited by the distance, by communicating through telemedicine in a real-time manner or a live-video conversation. A combination of telemedicine and wearable devices improves healthcare. Furthermore, a combination of both telemedicine and wearable devices improved healthcare delivery opportunities by enhancing remote patient monitoring. Imaging and ultrasound recording could also be improved using teleradiology (Figure 1,[22]). Currently, many health platforms were utilized to empowering patients about essential self-care for optimal treatment, such as using mobile health applications, which were normally used as a predictive, preventive, participatory, and personalized tool.[4]

Based on Telemedicine Framework in Figure 3, there were five important areas of telemedicine development, namely (1) patient empowerment, (2) data storage (3) electronic health records (4) professionalism, and (5) capacity development. Capacity development involves providing education and training for a group of people which encompass the settings for data and equipment regulation, professionalism, ethic, and legality.

## Conclusion

Telemedicine is an effective way of reducing the limitations of having good healthcare services. Various communities need to be encouraged and empowered with good medical facilities to reduce morbidity and healthcare costs. In addition, long-term evaluation and data securities need to be well-managed to create a good health service system.

**Abbreviations**

WHO: World Health Organization; MRCGP: Membership of the Royal College of General Practitioners; NHS: National Health Services; COVID-19: Coronavirus Disease 2019; USG: Ultrasonography; STEMI: Segment Elevation Myocardial Infarction.

**Ethics Approval and Consent to Participate**

Not applicable

**Competing Interest**

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the per-

formance or presentation of the work described in this manuscript.

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# The Determinants of Stunting for Children Aged 24-59 Months in Kulon Progo District 2019

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**Abstract**

This study pertains to stunting in children in Indonesian with z-scores of less than -2 Standard Deviation (SD) and less than -3 SD. The preliminary study results showed the highest prevalence of stunting to be 22.6%, at the Temon II Primary Health Care in Kulon Progo District. The study aimed to assess the determinants of stunting children aged 24–59 months. This study was conducted from September 2018–May 2019. The design of this study was analytical observational with study design case-control. The sample was 60 children aged 24–59 months. The method utilized proportional sampling, whereas the data analysis applied chi-square and logistic regression.The analysis of statistical tests showed a significant correlation between the stunting children and energy intake factor (p-value = 0.030; α = 0.05; CI = 95%). Risk factors were energy intake, protein intake, suffering from acute respiratory tract infections, and suffering diarrhea. A non-risk factor was immunization status. Protective factors were access to clean water and the history of exclusive breastfeeding. The most influential factor for stunting children aged 24–59 months was energy intake.

**Keywords**: determinant, energy intake, stunting

## Introduction

Stunting is a nutrient issue that concerns developing countries, especially.[1] Stunting, or being too short for one's age, is defined as a height of more than two standard deviations (SD) below the World Health Organization (WHO) Child Growth Standards median.[2] Malnutrition occurs during pregnancy and the newborn period.

Children are considered stunted and severely stunted if the body length and the height based on the age range are less than the WHO-Multicentre Growth Reference Study (MGRS) median standard.[3] The Indonesia Ministry of Health considers the value of the z-score of stunted children is less than -2 SD and severely stunted children is less than -3 SD.[4] Wasting in children is a symptom of acute undernutrition, usually due to insufficient food intake or a high incidence of infectious disease, as indicated by a weight-to-height ratio less than -2 SD of the WHO Child Growth Standards median.[5]

Children who suffer from growth retardation due to low diets or recurrent infections tend to be at greater risk for illness and death. Stunting is the result of long-term nutritional deprivation and often results in delayed mental development, poor school performance, and reduced intellectual capacity. These, in turn, affect economic productivity at the national level. Women of short stature are at greater risk for obstetric complications due to smaller pelvis. Small women are at greater risk of delivering infants with low birth weights, contributing to the intergenerational cycle of malnutrition. As infants of low birth weight or retarded intrauterine growth, they tend to be smaller as adults.[5]

According to the National Basic Health Research (*Riset Kesehatan Dasar*/Riskesdas) by the National Institute of Health Research and Development, Ministry of Health, the prevalence of stunting in Indonesia as a whole fell from 37.2% in 2013 to 30.8% in 2018.[6] Annual stunting percentage, according to the Nutritional Monitoring Status (*Pemantauan Status Gizi*/PSG) was 28.9% in 2014, 29% in 2015, 27.5% in 2016, and 29.6% in 2017. In the province of Yogyakarta, the prevalence of stunting was quite a bit lower–13.86% in 2017, dropping to 12.37 in 2018.[6]

Based on Rahmayana's study,[7] children aged 24–59 months from Bangladesh, India, and Pakistan were at greater risk of obstruction. The causative factors must

be known to control the incidence of stunting. Those are insufficient food intake, infectious diseases, lack of mother's knowledge, bad parenting, unsanitary conditions, and low health services.[1,8] Of those, according to the United Nations Children's Fund (UNICEF), direct and indirect factors most influence the nutritional status of children and the causes of malnutrition. Food intake and disease could directly cause low nutrients, while there are three indirect causes of malnutrition–food security, child care patterns, and health and environmental services. Based on those problems and the continuing high prevalence of stunting in children, further investigation is needed to determine its causes.[9] The study aimed to determine the determinants of stunting children aged 24–59 months.

**Method**

This study was an observational analytic study with a case-controlled design. The study was conducted between September 2018–May 2019 in Temon II Primary Health Care, Kulon Progo District. The population was all children aged 24–59 months. The case sample was 30 stunted children; the control sample was 30, not stunted children. Respondents were the mothers of the cases and the control sample children. Sampling in this study was proportional sampling, taken from seven villages in Temon II Primary Health Care (PHC). Examinations of children in each village were performed according to inclusion and exclusion criteria. The inclusion criteria were children aged 24–59 months residing in the study area, with z-score limits of $\geq$-2 SD to 2 SD. The mothers were willing to follow the study by signing informed consent. They were randomly chosen following a proportional distribution determined by each village to be equally represented.

The histories of exclusive breastfeeding variable is obtained from the respondent's acknowledgment of breastfeeding for 0–6 months. Energy intake pertained to the total energy sourced from respondents' food and beverages, as inputted in the NutriSurvey 2007. "Low" was <80%, sufficient was $\geq$80%. Protein intake was drawn from total protein sourced from animal and vegetable proteins and inputted in the Nutrisurvey 2007, again with a low category of <80% and sufficient $\geq$80%. Immunization status was based on the Mother and Child Health/MCH (*Kesehatan Ibu dan Anak/KIA*) book following the basic immunization requirements, as obtained according to age and the Immunization Development Program's government policy. Suffering from acute respiratory infections (ARIs) was obtained from the respondent's recognition of the frequency of sick children affected by ARIs (tuberculosis (TB), cough, colds, and other respiratory diseases) in the past year with categories of frequent ($\geq$6 times a year) and rare (<6 times a year).

Incidence of diarrhea was obtained from the respondents' recognition of the frequency of sick children affected by diarrhea in the past year, with "frequent" being $\geq$3 times a year and "rare" <3 times a year. Testimony regarding access to clean water was obtained from the respondent's acknowledgment and inspection of the respondent's house.

Data were obtained from interviews with the questionnaire. Data of respondents' food intake were obtained from interviews based on a 24-hour food recall questionnaire. Those were then analyzed by NutriSurvey 2007 software to obtain the percentage of energy intake and protein intake, compared with the nutritional adequacy rate. Data on infectious diseases (incidence of diarrhea and ARI, September 2018 to May 2019) were collected from respondent testimonies and the PHC register book from the previous year (2018). Primary immunization data is collected from the MCH handbook and the register of Temon II Primary Health Care immunizations. Environmental sanitation was based on toilet use and access to clean water.

This study data retrieval is done by an enumerator, with a nutrition team consisting of two nutrition experts and three applied nutrition students. Initial preparation was data collection at the PHC, then the inclusion and exclusion criteria from select respondents. If the respondent matches the inclusion, then an interview is conducted using a questionnaire. The immunization status in the questionnaire is secondary data from the MCH book. Then the nutrition team conducted a direct interview to fill in 24-hour food recall. Interviews with the 24-hour food recall method were conducted twice in one week with an interval of two days.

Data analysis included univariate, bivariate, and multivariate. Univariate involved a frequency distribution test. The bivariate analysis used a chi-square test with a significance level (p-value = 0.05) and 95%CI. Interpretation of odd ratio (OR) values was used to determine the risk of each factor and the most influential factors. A multivariate logistic regression analysis was performed on the variable results of the bivariate analysis with values of p-value < 0.25 to see the most dominant factors. This study has been approved by the Health Research Ethics Committee (KEPK) of the Health Ministry of Health Polytechnic, Yogyakarta No.LB.01.01/KE-01/VII/249/2019.

**Results**

Table 1 showed that gender could affect the level of children stunting. Male children experience stunting (53.3%) more than female children, while those who were not stunted were found to be more in the female by (46.7%) than male children. The mother's work can also affect the level of children stunting. It is known that

stunted and non-stunted children have unemployed mothers higher (66.7%) than employed mothers (63.3%). Maternal education can also influence the level of children stunting. It is known that children who are stunting and not stunting have mothers with secondary education (80%) higher than mothers who have low education (83.3%).

Based on Table 2, the history of exclusive breastfeeding, according to the statistical test results, showed no relationship between exclusive breastfeeding history and stunted children (p-value = 0.588, 95%CI). Children who are not given exclusive breastfeeding have 0.64 times greater risk of stunting than those who are given exclusive breastfeeding, meaning exclusive breastfeeding is a protection factor, although it is not statistically significant.

The factor of energy intake from the statistical test results showed differences in the incidence of stunted children (p-value = 0.017, 95%CI). Children with low energy intake have six times the chance of experiencing stunting compared to children with sufficient energy intake. According to these results, low energy intake is a risk factor for stunting children. In the factor of protein intake from the results of the statistical test, there is no correlation between protein intake and stunting children (p-value = 0.605, 95%CI). Children who have low protein intake have a chance of 3.22 times to experience stunting than children who have enough protein intake. It means that low protein intake is a risk factor for stunting children.

Immunization factors have no significant relationship with stunting children (p-value = 1.00, 95%CI). However children who do not have complete basic immunizations have a chance of 1.00 stunting compared to children who have complete basic immunizations.

According to a statistical test analysis, complete basic immunizations are not a risk factor for stunting.

Based on the statistical tests, no relationship was found between stunted children who often suffer from ARIs and children who rarely suffer from them (p-value = 0.210, 95%CI). Children who often suffer from ARI have a 2.78 times greater chance of stunting than children who rarely suffer from ARI. This result means that children who suffer from ARIs have a high-risk factor for the occurrence of stunting. Children who often –or rarely–suffer from diarrhea showed no difference between children who were stunting or not stunting (p-value = 1.00, 95%CI). However, children who often suffer from diarrhea have a slightly higher 1.38 times chance of experiencing stunting than children who rarely suffer from diarrhea. This finding means that children who suffer from frequent diarrhea carry risk factors for stunting.

Based on the results of statistical tests, access to clean water factor found that there was no significant relationship between access to clean water and stunted children (p-value = 0.422, 95%CI). Children who consume un-

**Table 1. Characteristics of Stunted Children Aged 24-59 Months in the Work Area of Temon II Public Health Care in Kulon Progo District**

| Variable | Category | Stunting | | Not Stunting | |
|---|---|---|---|---|---|
| | | n | % | n | % |
| Gender | Male | 16 | 53.3 | 14 | 46.7 |
| | Female | 14 | 46.7 | 16 | 53.3 |
| Mother's work status | Employed | 10 | 33.3 | 11 | 36.7 |
| | Unemployed | 20 | 66.7 | 19 | 63.3 |
| Mother's education level* | Lower | 4 | 13.3 | 3 | 10 |
| | Secondary | 24 | 80 | 25 | 83.3 |
| | Tertiary | 2 | 6.7 | 2 | 6.7 |

Note: *Education level: Lower = Less than junior high school; Secondary = Senior high school; Tertiary = College or higher.

**Table 2. Relation of Risk Factors of Stunted Children Aged 24–59 Months in Temon II Primary Health Care in Kulon Progo District**

| Variable | Category | Stunting | | Not Stunting | | p-value | OR | 95%CI |
|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | | | |
| Exclusive breastfeeding history | Exclusive breastfeeding | 9 | 30 | 12 | 40 | 0.588 | 0.643 | 0.221–1.873 |
| | Not exclusive breastfeeding | 21 | 70 | 18 | 60 | | | |
| Energy intake | Low | 12 | 40 | 3 | 10 | 0.017 | 6.000 | 0.047–0.782 |
| | Sufficient | 18 | 60 | 27 | 90 | | | |
| Protein intake | Low | 3 | 10 | 1 | 3.3 | 0.605 | 3.222 | 0.030–3.168 |
| | Sufficient | 27 | 90 | 29 | 96.7 | | | |
| Immunization status | Complete | 29 | 96.7 | 29 | 96.7 | 1.000 | 1.000 | 0.060–16.763 |
| | Incomplete | 1 | 3.3 | 1 | 3.3 | | | |
| Suffer from diarrhea | Often | 4 | 13.3 | 3 | 10 | 1.000 | 1.385 | 0.282–6.796 |
| | Rare | 26 | 86.7 | 27 | 90 | | | |
| Suffer from ARI | Often | 9 | 30 | 4 | 13.3 | 0.210 | 2.786 | 0.751–10.331 |
| | Rare | 21 | 70 | 26 | 86.7 | | | |
| Access to clean water | Yes | 17 | 56.7 | 21 | 70 | 0.422 | 0.560 | 0.193–1.623 |
| | No | 13 | 43.3 | 9 | 30 | | | |
| Toilet | Yes | 29 | 96.7 | 29 | 96.7 | 1.000 | 1.000 | 0.060–16.763 |
| | No | 1 | 3.3 | 1 | 3.3 | | | |

Notes: *means p-value < 0.05; OR = Odd Ratio; CI = Confidence Interval; ARI = Acute Respiratory Infection

Table 3. Factors that Most Affect Stunting Toddler Aged 24–59 Months in the Temon II Primary Health Care Working Area of Kulon Progo District

| Variable | β | Wald | df | Sig. | Exp (β) | 95%CI for Exp (β) | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | | | Lower | Upper |
| Energy intake | -1.637 | 0.740 | 1 | 0.027 | 0.195 | 0.046 | 0.830 |
| Suffered from ARI | -0.537 | 0.534 | 1 | 0.465 | 0.584 | 0.138 | 2.467 |

Notes: *p-value < 0.25; CI = Confidence Interval; ARI = Acute Respiratory Infection; df = degree of freedom

sanitized water have a 0.56 times greater chance of experiencing stunting than those who consume sanitized water. It means that access to clean water is a protective, or preventive, factor for stunting.

Based on Table 2, the toilet factor found no difference in stunting between children who had good toilets and those who did not (p-value = 1.00, 95%CI). Children who do not use good toilets have a 1.00 time chance of stunting than those who use good toilets. Judging from the odds ratio, the toilet is not a risk factor for stunting.

Based on Table 3, the variable energy intake (p-value = 0.027) is a factor that is significantly associated with stunting in children aged 24–59 months after being controlled with a history of exclusive breastfeeding, energy intake, protein intake, immunization status, the incidence of diarrhea, and ARI, and toilet conditions. That means that energy intake factors are protective or preventive factors to stunting in 24–59–months olds.

## Discussion

The factors examined in this study were feeding factors, including exclusive breastfeeding, energy intake, and protein intake. Health care factors include immunization status and infectious diseases, ARI, and diarrhea. Environmental sanitation factors consist of access to clean water and toilets.

The results of the study showed that children who did not receive exclusive breastfeeding during the first six months were at greater risk for stunting. Based on Table 2, the results of this study found no association between exclusive breastfeeding history and stunting children aged 24–59 months in the working area of Temon II Primary Health Care in Kulon Progo District. Exclusive breastfeeding factors are determined to be protective factors or preventive factors for stunting children. This study is in line with that of Tariku, *et al.*,[9] in Ethiopia that exclusive breastfeeding is not related to stunting. This may be caused by the condition of stunting not being determined solely by factors of exclusive breastfeeding status and other factors such as complementary food quality, adequate daily nutritional intake, and the health status of the baby.[11]

The results of this study indicate that there is a relationship between energy intake and stunting. Inadequate nutritional intake, especially from total energy, is directly related to physical growth deficits in children. Low energy consumption is a significant cause of children stunting in Indonesia.[12]

This study revealed that there was no relationship between protein intake for stunting children aged 24–59 months in the working area of Temon II Primary Health Care in Kulon Progo District. However, statistically, protein intake was still a risk factor for stunting. These results indicate that there is a significant relationship between protein consumption and the incidence of stunting in infants. The present study shows that most children had sufficient protein intake levels, but statistically, no association was found between the level of protein intake and stunting children aged 24–59 months. There are several possible reasons for not finding a relationship. Stunting occurs over a long time, so the protein intake level cannot be considered one of the causes. Also, protein intake is not the only factor that affects stunting.

Immunization is an attempt to raise or enhance one's immunity against a disease actively. If those are exposed to the disease one day, they will not get sick or only experience mild symptoms.[13] Immunization status in children is one indicator of contact with health services. It is hoped that contact with health services will help improve nutritional problems over the long term. Immunization status is also expected to have a positive effect on long term nutritional status.

The immunization status is in line with the results of this study. Statistical analysis does not show a relationship between immunization status and stunting in children aged 24–59 months. According to statistical tests, immunization factors are not a risk factor for stunting. Sutriyawan's study,[14] states that there is no meaningful immunization status with the incidence of stunting. Even though the child is given complete immunization, it does not mean that the child is protected from stunting. Some of the factors that can cause stunting are knowledge, exclusive breastfeeding, poor sanitation due to the absence of latrines, stagnant waterways, open trash cans, an unclean environment, parental education, parental work, parents' income, the sex of children under five, low birth

weight, the length of birth of children, and mothers who rarely wash their hands using clean water and soap.[15]

In contrast to this study, however, one of the study conducted by Neldawati in Mugianti, *et al.*,[21] showed that immunization status had a significant relationship to the nutritional status index. Children who were not given complete primary immunization did not immediately suffer from infectious diseases. Children immunity is influenced by other factors such as nutritional status and the presence of pathogens. There are forms of herd immunity or immunity in immunization, where individuals who are not immunized are still protected because most of the other individuals in the group are immune to the disease after receiving immunization.[11]

Infection is a factor that directly affects nutritional status in addition to adequate nutrition. Infection decreases food intake, interferes with nutrient absorption, causes direct loss of nutrients, increases metabolic requirements or catabolic loss of nutrients, and interferes with nutrient transport to target tissues, including food intake. One infectious disease, including diarrhea, is a symptom of gastrointestinal disease or other diseases outside the digestive tract.

The study was not in line with the results of this study that there was no association between diarrheal infections in stunting children aged 24–59 months. However, in Table 3, children who suffered from frequent diarrhea have a 1.38 times greater risk of stunting, meaning diarrheal infections are a risk factor for stunting. The absence of a meaningful relationship in this study was due to the direct impact of diarrhea, that is weight loss compared to stunting. Children who experience diarrhea are usually also found with anorexia and dehydration. If not properly treated, diarrhea impact on weight loss, which is a sign of acute malnutrition, while stunting signifies repeated chronic malnutrition. The other factor is the duration of the infection experienced.[11]

Acute Respiratory Infections (ARI) and diarrhea are among the infectious diseases to which children under the age of five are especially prone. The children period is a vulnerable age for health problems, especially ARI, because of their undeveloped immune systems. Acute respiratory infections are acute inflammation of the upper and lower respiratory tracts caused by bacterial, viral, or rickets infections, both with or without inflammation of pulmonary parenchyma.[16]

The results of this study do not indicate a significant relationship between ARI infectious disease and stunting in children aged 24–59 months. Nonetheless, infectious disease is a risk factor for stunting. The results of this study are following study conducted by Nasikhah in East Semarang Subdistrict,[16] which shows that a history of infectious diseases, in this case, acute upper respiratory tract infection, is a non-significant risk factor for stunt-

ing. Unlike the Agrina and Ameliwati's study,[13] there is a significant influence between the nutritional status of toddlers with ARI. This is due to stunting being affected by the frequency of infectious diseases and the duration of the and nutrient intake during infectious disease episode.[17] Access to clean water and sanitation is the sixth target of SDGs. Without clean water and adequate sanitation, a decrease in the prevalence of stunting will not be achieved.[18] Exposure to the environment and poor hygiene can result in stunting due to inadequate nutrition absorption and the intestines' inability to function as a disease barrier.[19] It is not in line with this study that there is no relationship between access to clean water and stunting in children aged 24–59 months in the Temon II Primary Health Care work area. However, it is a protective or preventive factor for the occurrence of stunting.

In Kusumawati, *et al.*,[11] Van der Hoek's study finds that children from families with clean water facilities have a lower prevalence of diarrhea and stunting than those from families without clean water and toilet facilities. The indicators for the short-term number of children are due to the lack of availability of clean, decent drinking water. As many as 47% of the population of Indonesia drink water containing germs, even though the water has been boiled and 340 children die from diarrhea every week in Indonesia.[12] There is no relationship between stunting and access to clean water as a source of drink.

Exposure to the environment and cleanliness are in line with primary sanitation factors. According to Yulestari's study,[20] children with stunting were more prevalent in families with poor basic sanitation. Households with poor sanitation are 1.3 times more likely to have children with stunting than households with adequate basic sanitation. In this study, there was no relationship between toilet ownership and stunted children aged 24–59 months, meaning that this toilet factor was not a risk factor for stunting. According to this study, the proportion of respondents with good toilets and clean water sources (sanitation) was more significant than poor sanitation.

The logistic regression test results in Table 3 show that energy intake is the dominant factor associated with stunting in children aged 24–59 months in the Temon II Primary Health Care work area. In Yensasnidar's study,[18] there is a significant relationship between energy intake and the incidence of stunting in these students. Study by Tessema, *et al.*,[15] shows that inadequate protein and energy intake may be a predictor of childhood linear growth failure in rural Ethiopia. Most children's energy intake in stunted and non-stunted children was below the estimated average requirement. All children with protein deficiency were also energy deficient. The median energy density of the child's complementary foods was 1.4 kcal/g, with no significant difference between stunted

and non-stunted children. Nova and Afriyanti's study,[19] showed that the incidence of stunting in children is mostly in children whose energy intake is less than children with sufficient intake energy. Children with energy intake less than 1.2 times that of children with sufficient energy intake, experienced stunting.[11] Based on the theoretical and factual results, authors assume that low energy intake is the factor with the highest percentage as a factor in stunting because total energy is directly related to physical growth deficits in children.

The efforts to increase energy intake in children are by making foods that make children interested in consuming them. Infectious diseases that occur in stunting children result in a loss of appetite, such that children's food consumption decreases.[12] Contrarily, coaching families to improve the nutritional status of children is critical. Development of health promotion media related to children nutrition and counseling to families with malnutrition problems in children needs to be adjusted to the characteristics of the family. Extension media and material must be adjusted to the level of family education so that the effectiveness of the information delivery runs optimally. For example, a flip sheet with sentence selection is easy to understand. Besides that, refreshment for cadres providing health education, especially nutrition for children, is critically important.

## Conclusion

Respondent characteristics in Temon II Primary Health Care, Kulon Progo, according to gender, stunted children were more likely to be male while those who were not stunted were female. Employed mothers contributed to stunting rather than unemployed mothers with secondary education. Energy intake factor has a significant relationship to stunting children aged 24–59 months, while feeding factors (exclusive breastfeeding history and protein intake), immunization status, infectious diseases (suffered from diarrhea and ARI), and toilets are not associated with stunting children aged 24–59 months.

Risk factors in stunting children aged 24–59 months in the Temon II Primary Health Care working area in Kulon Progo District are feeding factors (energy and protein intake), infectious diseases (suffered from diar- rhea and ARI). Non-risk factors are immunization and toilet status, while the protective factor is the history of exclusive breastfeeding and access to clean water. The most influential stunting factor in Temon II Primary Health Care working area in Kulon Progo District is energy intake.

## Recommendation

Increase revitalization efforts for nutrition-conscious families on the importance of increasing the balanced nu-

tritional needs of children to prevent stunting. Increase information dissemination to the community regarding stunting, through media booklets or counseling and make policies for the first one thousand days of a child's life to improve the nutritional status of pregnant women, nursing mothers, and children under five. Provide information and education counseling for practitioners about providing balanced, dietary needs for children under five to prevent stunting. Then give education for mothers with children under five, including prevention following pregnancy, which in turn encourages them to actively participate in Maternal and Child Health Services. This way, children's growth and development can be monitored to support stunting prevention efforts. Improve the ability of Maternal and Child Health Services cadres through guidance and training on monitoring the growth and development of children under five, so that they are not overly dependent on Maternal and Child Health Services officers.

### Abbreviations

WHO: World Health Organization; SD: Standard Deviation; UNICEF: United Nations Children's Fund; ARI: Acute Respiratory Infection; SDG: Sustainable Development Goals; WHO-MGRS: World Health Organization Multicentre Growth Reference Study; MCH: Mother Child Health; OR: Odd Ratio; CI: Confidence Interval.

### Ethics Approval and Consent to Participate

This study has been approved by the Health Research Ethics Committee (KEPK) of the Health Ministry of Health Polytechnic Yogyakarta No.LB.01.01/KE-01/VII/249/2019.

### Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

### Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### Authors' Contribution

CAH, YEP, TM, and YW were involved in the design study, analyze data, compile, and revise the script. SH was involved in preparing the publication journal. All authors read and approved the final manuscript.

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# A Path Analysis Model for Explaining the Factors Influencing Wearing a Mask among Commuting Workers Using Commuter Line Bogor-Jakarta

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**Abstract**

Jakarta is one of the most air-polluted cities in the world, which can increase the health risk of commuting workers exposed to pollutants. This study aimed to determine the factors that directly and indirectly affect healthy behavior (wearing a mask) for commuters using the Bogor-Jakarta Commuter Line. Furthermore, a total of 155 respondents participated and the data collected were analyzed using descriptive and path analysis. The commuters aware of the hazard potential related to air pollution during commuting were 137 people (88.4%). While 104 people (67.1%) were aware of the good perception of pollution and 125 uses masks during commuting (80.6%). The healthy behavior in commuting workers using Commuter Line was affected by some factors, both directly and indirectly. The knowledge and commuting experience toward healthy behavior were two variables that significantly influenced on healthy behavior. The knowledge was also the only mediated variable with a significant indirect effect of education on healthy behavior.

**Keywords:** commuting workers, healthy behavior, Commuter Line, mask, path analysis

## Introduction

Numerous studies have shown that workplace accidents have occurred due to commuting and health risks from pollution.[1] Air pollution is a major environmental risk to health. The government can reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma, acute lower respiratory, chronic obstructive pulmonary disease, stroke, ischemic heart disease, and lung cancer by reducing air pollution.[1] Meanwhile, a student's exposure to air pollution can increase the health risk associated with neurodegenerative aging processes.[2]

Jakarta is one of the most air-polluted cities in the world, which can increase the health risk of its commuting workers exposed to pollutants. In Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) City, the number of commuters continued to increase from 6 to 7 million in 2014, and they are at risk of being exposed to particulate matter (PM). The level of exposure was influenced by the mode of transportation used as reported in the study conducted by Gilliland, *et al.*[3] Another dangerous pollutant exposure is ultrafine particles (UFPs),[4,5] with an increased level of urinary 1-Hydroxypyrene (1-

OHP), which is a biomarker of polycyclic aromatic hydrocarbons (PAHs) exposure in urine,[6] pleural anthracosis,[7] a respiratory disorder due to air pollution,[4] and ischemic heart disease due to transportation noise exposure.[8]

According to the theory of the Health Belief Model developed by Rosenstock with assumptions of an individual suffering from a disease, they become more aware of prevention and protection or healthy behavior, such as wearing personal protective equipment (PPE) and mask in the workplace and when commuting to work. Furthermore, healthy behavior at work is needed to reduce the risk of accidents and health. The lack of hazardous knowledge in the workplace can increase the workers' accidents and health risks.[9] The previous study related to commuters using Commuter Line Bogor-Jakarta reported the perception of inconvenience when commuting to work. About 67.1% of respondents stated that they felt uncomfortable with the air pollution while commuting to work.[10]

Previous study has been conducted on healthy behavior in working with various workplace settings.[9] However, the information related to the factors influenc-

ing healthy behavior, especially for commuter workers wearing a mask when commuting to work, has not been clear until now. This study aimed to determine the influencing factors of health behavior in commuting activities, especially wearing a mask for commuter workers using the Commuter Line to work from Bogor to Jakarta, directly and indirectly. Furthermore, this study used descriptive and path analysis.

## Method

The first model to explain the factors that influenced the wearing of a mask is based on several hypothesis, $(H_1)$ knowledge of the risk of contamination which directly affects the wearing of a mask, $(H_2)$ experience of using Commuter Line, which has a direct impact on wearing mask, $(H_3)$ the level of income has a direct impact on wearing mask, $(H_4)$ knowledge has an indirect effect on wearing mask mediated by inconveniences perception with pollution, $(H_5)$ the experience of using Commuter Line has an indirect effect on wearing mask mediated by the pollution inconveniences perception, $(H_6)$ the level of education has an indirect effect on wearing of mask, mediated by the pollution inconveniences perception, $(H_7)$ the experience of using Commuter Line has an indirect effect on wearing mask, mediated by the knowledge and pollution inconveniences perception, $(H_8)$ the education has an indirect effect on wearing of mask, mediated by the knowledge and pollution inconveniences perception, $(H_9)$ the education has an indirect effect on wearing mask mediated by the knowledge.

This preliminary study was part of the study on the quality of life (QOL) of commuting workers using the Commuter Line and Busway (Transjakarta) from Bogor to Jakarta in 2018 with the WHO QOL BREF questionnaire and some additional questions about knowledge in pollutant risk. Furthermore, an applied cross-sectional design was applied with a total of 155 respondents of commuting workers using Commuter Line Bogor-Jakarta in 2018. A pilot survey involving 30 pre-test subjects was carried out to check the validity and reliability of the questionnaire and later on, was distributed via Google Form. A brief assessment was carried out and the incompletely answered questionnaire was not excluded from the study. Finally, 155 completed questionnaires were qualified to be used in the analysis. The questionnaire consists of questions in demographic characteristics (name, sex, education, job characteristics, salary, marital status), the experience of using Commuter Line, knowledge of pollutants risk exposure. The knowledge of pollutants risks exposure measured by mentioning what kinds of contaminants respondents know (vehicle emission, PAHs, PM), using a mask when going to work or not). In this study, six variables were used following hypothesis.

The dependent variable was wearing a mask and the independent variables were knowledge, commuting experience, education, income, and discomfort perception with pollution. The knowledge arises from knowing a potential hazard related to air pollution when using Commuter Line. Commuting experience is defined as traveling for less and more than two years. Furthermore, education was the highest formal education attained by the commuter, less than or equal to senior high school (SHS) and higher.[10] Income is a total income per month of the commuter, using provincial minimum wage (less than equal 3 million/low and above 3 million/high). Discomfort perception with pollution is defined commuters feel discomfort with pollution during commuting (measured of 1-10 scale, good is more than median score and vice versa).

Descriptive analysis was used to explain the demographic characteristics of the respondents (name, sex, education, job characteristics, salary, marital status). Then a path analysis was carried out by using proprietary statistical software package, which is a tool for assessing the direct and indirect effects of some variables on a specific target variables that was healthy behavior. The direct effect meant that it would be affected without an intermediate dependent variable $(H_1, H_2, H_3)$ while indirect effect had intermediary variable to dependent variable $(H_4, H_5, H_6, H_7, H_8, H_9)$. The strength of a path was represented by a coefficient conceptually equal to the standardized partial regression coefficients. A coefficient had a range from $-1$ to $+1$. The higher the coefficient, the greater the effect of one variable on another. The t-value, which is the ratio of the unstandardized estimate to standard error, was used to assess the significance of a path in a path analysis model: if t-value >1.96, the path was significant at 0.05.

In addition to each path, the suitability of a path analysis model can also be determined using indices available for such evaluations. These indices can be categorized into two main groups, absolute fit indices and comparative fit indices. Furthermore, absolute fit indicated outline how well the hypothesized model fits the data.[11] The model $\chi^2$ value, Root Mean Square Error of Approximation (RMSEA), suitability of Goodness Fit Index (GFI), and Root Mean Square Residual (RMR) were some indices categorized in the group.[11]

The model $\chi^2$ value was very sensitive to the sample size and typically its value increases as the sample size increases. To solve this problem, it is proposed to use the ratio of the value $\chi^2$ to the degree of freedom (df) in such a way that a ratio of less than two indicates of a satisfactory adaptation of the model.[11] An RMSEA was another absolute fit index, popular because of its informative and easy to interpret nature. This index was calculated using the model $\chi^2$ value, df, and sample size (N)

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

**Formula 1. Root Mean Square Error of Approximation**

(Formula 1).[12] An RMSEA value lower than 0.07 indicates a good fit, values lower than 0.1 were indicative of mediocre fit, and values higher than 0.1 represent unacceptable model fit,[11] as potrayed in the Formula 1. Where the RMSEA, root mean square error of approximation, $\chi^2$ is the chi-square value of the model, N is a sample size.

In contrast, comparative fit indices, e.g., Normal Fit Index (NFI) and Comparative Fit Index (CFI), explain how close the hypothesized model is to a baseline ideal model. Moreover, comparative fit indices with values higher than 0.95 indicate that a model is of good fit.[11]

## Results

The data obtained from the questionnaire regarding the characteristics of participants are summarized in Table 1. Based on the hypothesis, a model path analysis was constructed. Table 2 presents the fit indices of the path model in the present study. From the table, the ratio of the $\chi^2$ value to the degree of freedom (df) is lower than two (2.24/3 = 0.746), RMSEA<0.07 (0.00), Incremental Fit Index (IFI)>0.95 (1.015), GFI>0.95 (0.995), and CFI>0.95 (1.000). It can be concluded that the overall fit indices are acceptable on the model.

From the model (Figure 1), the factors affected wearing a mask is presented in different ways: (1) direct path from knowledge; (2) direct path from commuting experience (using Commuter Line); (3) direct path from in-come; (4) indirect path from knowledge, which was mediated by discomfort perception with pollution; (5) indirect path from commuting experience, which was mediated by discomfort perception with pollution; (6) indirect path from education, which was mediated by discomfort perception with pollution; (7) indirect path from commuting experience, which was mediated by knowledge and discomfort perception with pollution; (8) indirect

**Table 1. Characteristic of Commuting Worker Using Commuter Line Bogor-Jakarta 2018**

| Variable | Category | N | % |
|---|---|---|---|
| Knowledge | Good | 137 | 88.4 |
| | Bad | 18 | 11.6 |
| Commuting experience (using Commuter Line) | <2 years | 23 | 14.8 |
| | ≥2 years | 132 | 85.2 |
| Education | ≤SHS | 12 | 7.7 |
| | >SHS | 143 | 92.3 |
| Income | Low | 56 | 36.1 |
| | High | 99 | 63.9 |
| Discomfort perception with pollution | Good | 51 | 32.9 |
| | Bad | 104 | 67.1 |
| Healthy behavior (wearing mask) | Good | 125 | 80.6 |
| | Bad | 30 | 19.4 |

**Note**: SHS = Senior High School

**Table 2. Various Fit Indices of the Model**

| Model Fit Index | Estimation Result | Acceptable Level | Conclusion |
|---|---|---|---|
| | df = 3 | | |
| $\chi^2$/df | $\chi^2$ = 2.24 | <2.00 | Fit |
| RMSEA | 0.00 | <0.07 | Fit |
| IFI | 1.015 | >0.95 | Fit |
| GFI | 0.995 | >0.95 | Fit |
| CFI | 1.000 | >0.95 | Fit |

**Notes**: df = degree of freedom, RMSEA = Root Mean Square Error Approximation, IFI = Incremental Fit Index, CFI = Comparative Fit Index, GFI = Goodness of Fit Index
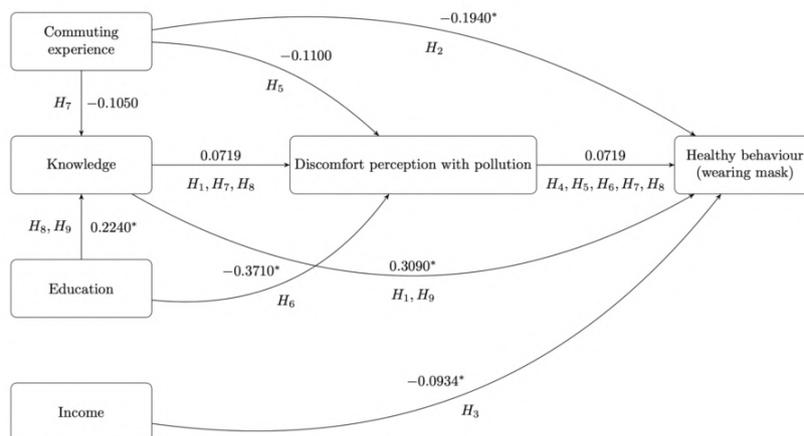


Noted: *Significant effect

**Figure 1. The Path Model for Explaining Factors to Wear a Mask among Commuting Workers using Commuter Line Bogor-Jakarta**

path from education, which was mediated by knowledge and discomfort perception with pollution; and (9) indirect path from education, mediated by knowledge.

The variables that affected wearing a mask are presented in four different ways; (1) direct effect ($H_1$, $H_2$, $H_3$); (2) the effect mediated by knowledge ($H_9$); (4) the effect mediated by discomfort perception ($H_4$, $H_5$, $H_6$); and (3) the effect mediated by knowledge and discomfort perception ($H_7$, $H_8$). As shown in the path model (Figure1), it is evident from the data, which concludes as follows: (1) knowledge and commuting experience towards wearing a mask are two variables with a significant direct effect (t value on $H_1$ and $H_2$ were more than 1.96), while income was not a significant direct effect (p-value on $H_3$ was less than 1.96); (2) knowledge was also the only mediated variable with a significant indirect effect of education on wearing a mask (t-value on $H_9$ wasmore than 1.96). Therefore education has an indirect effect on wearing a mask; (3) discomfort perception is not an intervening variable on the effect of knowledge, commuting experience, and education on wearing a mask where the path on $H_4$, $H_5$, and $H_6$ was not significant (t-value < 1.96). Interestingly, it was demonstrated that the influence of knowledge, commuting experience, and education towards wearing a mask was not mediated by inconveniences perception with pollution. Knowledge and discomfort perception were not intervening variables on the effect of commuting experience and education on wearing a mask where the path on $H_7$ and $H_8$ were less than 1.96. From this path, it was concluded that the commuting experience and education has no indirect effect on wearing a mask mediated by knowledge and discomfort perception.

Table 3 presents all statistics on each path. This, along with the model shown in Figure 1, provides the lead of the variable that has the most significant direct effect on wearing a mask, which is the knowledge of the importance of wearing a mask related to the hazard of the pollutant. Furthermore, it is followed by commuting experience using Commuter Line Bogor-Jakarta. Moreover, education has an indirect effect on wearing a mask mediated by knowledge. From the significant path coefficient, it can be concluded that (1) The direct effect of knowledge on wearing a mask has a positive path coefficient of 0.309 (odds ratio (OR) = $e^{0.309}$ = 1.36); (2) the indirect effect of commuting experience on wearing a mask has a negative path coefficient of -0.194 (OR= $e^{-0.194}$ = 0.82); and (3) the indirect effect of education on wearing a mask mediated by knowledge (education*knowledge*wearing a mask) has the coefficient effect of 0.224*0.309 = 0.069 (OR= $e^{0.069}$= 1.07).

Using a path analysis model, not only to quantify the direct effect but also able to quantify the indirect effects that variables have on each other. Table 4 presents these quantities for each variable in the path coefficient column. As shown on the table, knowledge was the variable with the highest direct effect on wearing a mask (0.309).

## Discussion

Currently, wearing a mask is very important during the Coronavirus disease 2019 (COVID-19) pandemic. Using a mask both in public transport and workplace is the key recommended practices for health protocol. This study produced three important findings related to wear-

**Table 3. The Significance Level of Each Path in the Models**

| Path | | Standardized Path Coefficient | SE | t |
|---|---|---|---|---|
| **From** | **To** | | | |
| Commuting experience | Knowledge | 0.105 | 0.071 | 1.465 |
| Education | Knowledge | 0.224* | 0.095 | 2.349 |
| Knowledge | Discomfort perception with pollution | 0.071 | 0.119 | 0.603 |
| Commuting experience | Discomfort perception with pollution | −0.110 | 0.106 | −0.104 |
| Education | Discomfort perception with pollution | −0.371* | 0.142 | −2.605 |
| Knowledge | Wearing a mask | 0.309* | 0.095 | 3.245 |
| Commuting experience | Wearing a mask | −0.194* | 0.088 | −2.184 |
| Income | Wearing a mask | −0.093 | 0.065 | −1.436 |
| Discomfort perception with pollution | Wearing a mask | −0.103 | 0.065 | −1.600 |

**Note**: *(Significant) if t > 1.96; SE = Standard Error

**Table 4. Direct, Indirect, and Total Effects of the Variables on Wearing Mask**

| Variable | Direct Effect | Indirect Effect | Total Effect |
|---|---|---|---|
| Knowledge | −0.309 | 0.0005 | 0.3038 |
| Commuting experience with Commuter Line | −0.0194 | −0.0084518 | −0.0278 |
| Education | - | -0.0255 | −0.0255 |
| Discomfort perception with pollution | 0.0719 | - | 0.0719 |
| Income | −.0934 | - | −0.0934 |

ing a mask of commuter workers using Commuter Line transportation.

The factors that directly and indirectly influenced wearing a mask were factors of knowledge, education and risk perception. This finding was in line with the factors affecting workers/community that influence wearing a mask during the COVID-19 pandemic.[20] The direct effect of knowledge on wearing a mask had a positive path coefficient of 0.309 (odds ratio (OR) = $e^{0.309}$ = 1.36). As a result, the commuter that knew about the potential hazard of air pollution had OR to wear masks by 1.36 units higher than commuters that do not know.

The direct effect of commuting experience on wearing a mask has a negative path coefficient of -0.194 (OR= $e^{-0.194}$= 0.82). Therefore, the commuter with experience using the Commuter Line Bogor-Jakarta for more than equal two years had OR to wear a mask by 0.82 units lower than the commuter with experience less than two years using Commuter Line Bogor-Jakarta. In other words, commuters with experience in using the Commuter Line Bogor-Jakarta for less than two years have OR to wear mask 1.22 units higher than commuters with an experience of more than equal two years.

The indirect effect of education on wearing a mask mediated by knowledge (education to knowledge to wearing a mask) has a coefficient effect of 0.224*0.309 = 0.069 (OR= $e^{0.069}$= 1.07). Therefore, the commuter with higher education than SHS had OR to wear a mask by 1.07 units, higher than the commuters with lower educational level than SHS.

Healthy behavior is required during labor. Most study related to healthy and safe behavior are being carried out in the workplace.[9,13,14] However, a study has also shown that safe behavior is important in commuting activities, especially in the transportation industry.[14] In this study, the assessment of healthy behavior related to wearing a mask was carried out for commuters using Commuter Line Bogor-Jakarta. Furthermore, wearing a mask is one of the indicators studied concerning healthy behavior because it reduces the risk of exposure to various pollutants.[15,16] This study reported that knowledge of the risk of contaminants was the greatest significant effect directly on safety or healthy behavior (wearing a mask). This result is in line with the findings of the previous study, according to Ghasemi, *et al.*[17]

Previous study showed that the perception of risk was directly significant to healthy or safe behavior.[18] However, this study also demonstrated that the discomfort perception about pollution (bad and good) did not significantly affect the commuter wearing a mask both as a direct and indirect effect (intermediary factor) through knowledge, commuter experience, and education. Furthermore, the perception of pollution was only measured by bad and good. The perception of risk of hazard

(pollution) could affect commuters in healthy behavior; therefore, the bad perception of inconvenience feeling about pollution is not dangerous for them, especially from an occupational health and safety perspective. There was a positive effect between perceived severity and preventive behavior, and people with a high perceived severity increased preventive behavior compared to people with low perceived severity. In summary, the model presented provides important findings on how the effects of wearing a mask on healthy behavior are not mediated by other variables such as perceived complaints about pollution.

Path analysis is a powerful method for assessing direct and indirect impacts, but it has limitations. Some of these limitations are discussed by Jeon. For example, path analysis can only be used for explanation and not for prediction.[18,19] This study also needs a qualitative method to investigate further and validate healthy and safe behavior. The bias may arise from the distributed questionnaires. However, this problem has been minimized by conducting the validity and reliability test of the questionnaire.

Despite the limitations of this study, the findings contributes to the literature with important information on healthy behavior related to wearing a mask for commuting workers

## Conclusion

The healthy behavior (wearing a mask) for commuting workers using Commuter Line Bogor-Jakarta is influenced by some factors, both directly and indirectly. The knowledge and commuting experience towards healthy behavior were two variables with a significant direct influence on healthy behavior. Knowledge was also the only mediated variable with a significant indirect effect of education on healthy behavior.

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

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# Empowering Health Cadres to Support Drug-Resistant Tuberculosis (DR-TB) Patient to Enroll in Treatment

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## Abstract

Tuberculosis (TB) remains a big challenge globally, while the involvement of health cadres' constitutes one of the key strategies for the TB program in Indonesia. These roles were further expanded to providing support to DR-TB patients. This study was a qualitative study, conducted in 2015 to explore the various factors which influence the performance of health cadres' in supporting DR-TB patients to enroll in treatment. A total of 39 informants consisting of 24 health cadres, three nurses, four DR-TB patients, and three family members, two peer support, a head of primary health care, and two TB staffs from the District Health Office were recruited for this study. Meanwhile, a refresher training for health cadres was conducted regarding knowledge on TB, community support, effective communication, as well as patient tracing. There was no significant difference in the pre and post-test results; however the health cadres showed great capability in communicating and assessing the condition of patients. In addition, the health cadres assisted in carrying out patient tracing process, an important initial step to better understand patients's overall condition and identify problems faced while seeking treatment. Health cadres need to work with various parties such as family members, close relative to the patient, peer support groups, and nurses to encourage patients to enroll in treatment.

**Keywords:** default patient, drug resistant-*tuberculosis*, health cadres, patient tracing

## Introduction

Tuberculosis (TB) remains a big challenge globally, the World Health Organization (WHO) reported the estimated TB incidence rate to be 9.6 million and 13% co-infected with HIV, 1.5 million died of TB where 1.1 was HIV negative and 400,000 positive. Besides, there was also a challenge where 480,000 Drug-Resistant Tuberculosis (DR-TB) occurred in 2014, but only 123,000 cases were detected and reported.[1] Untreated TB cases continued to transmit disease rapidly; hence it was important that all case needed to be placed under evidence-based treatment and to ensure that each patient complete the treatment successfully. Moreover, when patients failed in DR-TB treatment, it potentially results in Extensively Drug-Resistant (XDR-TB). The average proportion of DR-TB cases that became XDR-TB was 9%.[1] In 2018, WHO reported that the estimated number of DR-TB in Indonesia was 2.4% new cases, 13% and previously treated cases, 24,000.[2]

In 2013, the Minister of Health of the Republic of Indonesia No. 13 of 2013 was launched. It explained that DR-TB is a man-made phenomenon, while the three main components that contributed towards the occurrence of DR-TB include health workers, patients, and the TB control program. The main factor causing resistance towards TB drugs was the human factor which failed to carry out TB treatment management properly. This factor is concerned with health workers' skills and performance, non-adherent patients, and a weak TB control program.[3-5] Based on previous studies, the determinants of DR-TB include side effect during first-line treatment, negligence by health care worker, interruption of treatment, previous default, and duration of treatment between 2-6 months.[6-8]

Matebesi and Timmerman,[9] concluded that lack of knowledge about TB, unsustainable TB education, side effects of drugs, hunger, lack of family support, stigma, and various factors were all related to health services. Similar situation was also reported in Persahabatan Hospital, Jakarta, Indonesia. Based on data collected from 2009 to 2013, of 595 confirmed cases for DR-TB,

only 402 (67%) enrolled in the treatment. The most stated reason for the failure in follow-up was transportation cost and living expenses (57%), followed by side effects (22%), psychosocial problems (6%), work reasons (6%), while 5% were unknown, and 4% were due to other reasons.[10]

Overall, the DR-TB enrollment rate was not improved and even worse. Based on the global TB report and the results of the joint evaluation monitoring mission,[11] the situation has not changed. The treatment outcome of DR-TB patients in Indonesia has not changed and even tends to decline at 50%.[2,11]

According to the National Tuberculosis Control Guidelines, the Direct Observer Treatment (DOT) officer is responsible for tracking default TB patients. Whereas, based on the Technical Guidelines for Integrated Program Management of Drug-Resistant Tuberculosis Control (PMDT), health workers in hospitals or Primary Health Care are responsible for preventing and minimizing loss to follow-up cases including tracking default patients. However, this procedure has not always been carried out in reality. Limitations in time among health workers as well as incomplete patient information failed to track patients that did not enrol for treatment.[4,12]

As an effort to control various public health problem, community involvement has been applied in providing support to TB patients. Involvement of health cadres in improving case tracking and supporting drug-sensitive TB patients has long been applied in Indonesia, although this role is yet fully implemented. In other countries, the community-based approach tends to improve the cure rates for DR-TB patients. A psycho-social support group (PSSG) consisting of psychologists, social workers, and TB nurses jointly improved treatment adherence from 47% to 97% in Kazakhstan.[13] In Bangladesh, the involvement of community health worker (CHW) in supporting DR-TB treatment reduced follow-up loss from 27% in 2008 to 14% in 2011.[14]

Since June 2014, there were 30-72 health cadres in North Jakarta and Central Jakarta. This community intervention was to increase the enrollment rate of DR-TB patients. Based on the pre-study, the health cadres successfully encouraged five out of 21 DR-TB patients that delayed treatment, three out of the default patients continued the treatment. Hence, it was concluded that the role of health cadres in encouraging patients to increase the enrollment rate of TB patients is not yet effective. This was an exploratory study conducted to evaluate the main roles of cadres and the various factors influencing the performance in supporting DR-TB patients' enrollment for treatment.

The logic model developed by Naimoli, *et al.*,[15] and was used to explore various factors influencing the performance of health cadres in supporting DR-TB patient. It is a pathway or theoretical flow about the causal performance of CHW as well as mapping the relationship between program planning and goals to be achieved. Using this model, it was concluded that when various activities at the program and system-level are well performed, there is improvement in CHW performance and the program goals are achieved.[15]

**Method**

The explanatory study conducted using qualitative methods from April to July 2015. It aimed to explore the main roles of health cadres in encouraging patients to enrolled for treatment and explore various factors influencing the health cadres' performance. The study results were expected to provide basis for the development of more appropriate strategies to increase the enrollment rate of DR-TB patients.

Data collection was carried out with focused group discussion, in-depth interview with key informants, communication skill observation, and review of routine data monitoring. There were two Focus Group Discussions (FGDs) with health cadres from Central and North Jakarta. In-depth interview conducted with six health cadres, three nurses, two DR-TB patients that complied with treatment, one defaulter patient, a DR-TB patient with experience as a defaulter and three family members, two TB staffs at North and Central Jakarta Regional Health Office staff, and the head of primary health care. A self-administered questionnaire was used to describe the characteristic of the 24 health cadres, including variables, such as socio-demographic data, history TB experience, motivation and perspective about the training material, non-material incentive, and work satisfaction.

Data were analyzed through several stages namely codification based on interview transcript and FGD, grouping theme, data validation using the triangulation method and conclusions. The result was used to identify the key topics that expected to be covered in the refresher training. In September 2015, a three-day refresher training was conducted to improve the capacity of 24 health cadres. The topics covered in training include TB knowledge, improving effective communication and conducting patient assessment skill, collaborating with former patient groups, and carrying out report recording.

A pretest was performed to measure the knowledge of respondents while the posttest was done three months after the training. In addition, communication skills observations were conducted to observe the capability of the health cadres while conducting home visits. The routine monitoring data were reviewed to analyze the progress of health cadres in providing support to DR-TB patients in three months.

The study fulfilled the standards set by *Komisi Ahli*

*Riset dan Etik Riset*—Research Committee and Research Ethics—Faculty of Public Health, Universitas Indonesia, for explanatory study using qualitative methods under 195/H2.F10/PPM.00.02/2015.

**Results**

Table 1 shows the characteristic of health cadres. This was needed to explore more appropriate criteria for cadre selection. Forty-two (42%) of the health cadres were aged between 40-45 years, 54% have 0-5 years experience while 25% had more than 10 years of experience. Furthermore, 87.5% completed Senior High School education. In comparison, 50% were also active as cadres for other health programs such as Community Based Vehicle to Improve Child Survival and Development—*Pos Pelayanan Terpadu (Posyandu)*, community support for dengue—*Juru Pemantau Jentik (Jumantik)*, Family Welfare Program—*Pembinaan Kesejahteraan Keluarga (PKK)*, people with HIV/AIDS (PLWHA), data collection in children with disabilities by the Social Service and Family Planning Assistance—*Penyuluh Keluarga Berencana (PPKB)* of the division of regions in Indonesia under the Neighborhood Council. Two respondents worked as a kindergarten teacher; one was a security guard and another is even currently active as Neighborhood Ward in the resident area. The analysis was carried out to determine the relationship between cadre characteristics and the motivation to be active as cadres, based on FGD and interview results. The cadres with TB experience or had infected family members showed high motivation to support to the patient.

"*If you see this one, it feels like you want to help even though we don't know it, but surely it feels like to help.*" KP-3 (56 years)

"*I am not a rich person. I can't give money. I can only*

help him if he can recover.*" KP-1 (43 years)

The main roles of health cadres in supporting DR-TB patient was identified based on FGD and in-depth interviews with health cadres. Based on the results, the roles include accompanying patients to the health facility for diagnosis and treatment, educate and motivate the patient and family, and be the first person to be contacted by the health provider when the patient fails to visit the health facility to get regular medication, in turn, the health cadres is to conduct patient's tracing.

"*... then she/he also helped me often to contact with family as well..when the patient did not come to Puskesmas, then I call health cadres. I had no time.. huh..to do a home visit. She/he could do it three times a week ... I just could not do it (home visit)…maybe.. sometimes could be once in a month*", the Nurse (52 years) explained the roles of the cadre in tracing patient.

The health cadres also play important role in carrying out patient tracing. This role is to monitor the patient's condition by conducting a home assessment. Certain steps are to be followed during the home assessment, namely, inquire whether the patient and family are available for the meeting, or the patients often feel reluctant to be open at the beginning. When this happens, the arrangement is to be made for another visit. When possible, health cadres are expected to conduct the assessment to identify the actual condition, support the patient, and

**Table 1. Characteristic of Health Cadres, September 2015**

| Characteristic | Category | n = 24 | % |
|---|---|---|---|
| Age | <40 years | 3 | 13 |
| | 40–45 year | 10 | 42 |
| | >45–50 years | 6 | 25 |
| | >50–55 years | 2 | 8 |
| | >55–60 years | 3 | 13 |
| Gender | Male | 1 | 4 |
| | Female | 23 | 96 |
| Marital status | Married | 22 | 92 |
| | Divorce | 2 | 8 |
| Education | Junior high school | 3 | 12.5 |
| | Senior high school | 21 | 87.5 |
| Work status | Health community cadres | 17 | 71 |
| | Work (e.g., kindergarten teacher) | 7 | 29 |
| Experience as cadres | 0–5 years | 13 | 54 |
| | >5–10 years | 2 | 8 |
| | >10–15 years | 6 | 25 |
| | >15 years | 3 | 13 |
| Experience on TB | No experience | 17 | 71 |
| | Has family member infected by TB | 6 | 25 |
| | As TB patient | 1 | 4 |
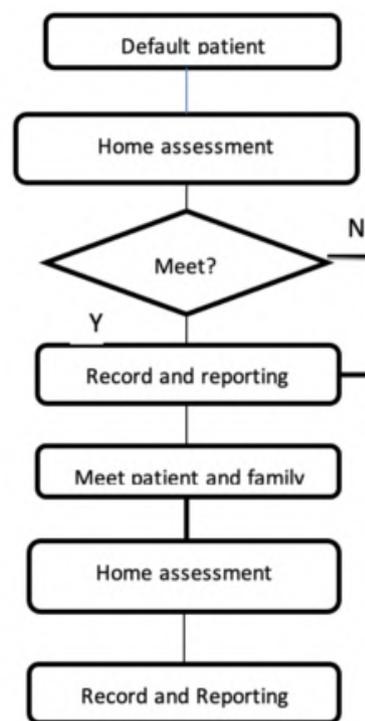


Figure 1. The Flow of Patient's Tracing for Home Assessment

Table 2. The Result for Pre-test and Post-tests

| Topic | Pre-test (n = 17) | | Post-test (n = 20) | | Remarks |
|---|---|---|---|---|---|
| | n | % | n | % | |
| About DR-TB | 13 | 76 | 5 | 25 | The pre and post-test were not the same. |
| Treatment duration | 11 | 65 | 18 | 90 | In post-test, one topic consisted of more than |
| The causes of default patient | 5 | 29 | 1 | 5 | one question and there were some questions |
| Patient' tracing | 10 | 59 | 9 | 45 | with multi answers. |
| TB Prevention | 16 | 94 | 12 | 60 | |

**Note:** DR-TB = Drug-Resistant Tuberculosis

Table 3. The Communication Skills of Health Cadres*

| Health Cadre | Communication Skill (Observed by the Researchers) | Self-Assessment (by Health Cadres) |
|---|---|---|
| 1 | Health cadres have done well in; showing empathy, understanding patient's explanation, did not urge the patient to answer, appreciating the patient at the end of the assessment.<br>Health cadres need to improve communication skills especially in terms of making sure the patient understand the posed question, making eye contact, providing opportunity for questions. | Health cadres were able to provide a clear explanation to the patient, did not urge the patients to answer, appreciate the patients at the end of the asessment.<br>Health cadres need to improve the process of exploring the patient's experience. |
| 2 | Health cadres have done well in; greetings, using simple language that the patient understands making eye contact, showing empathy, listening to explanations, did not urge the patient, asked aout patient's plans for treatment, appreciating the patient at the end of the assessment.<br>Health cadres need to improve communication skills, especially in terms of providing an opportunity for questions. | Health cadres were able to use simple language that the patient understand, made eye contact, showed empathy, listened to the patient's explanation, did not urge the patient to answer, asked about patient's plans for treatment, appreciate the patient at the end of the assessment.<br><br>Health cadres need to improve in providing complete explanations on drug-resistant TB, showing empathy, thinking about other things and sometimes interrupting when patients were explaining. |
| 3 | Health cadres have done well in; showing empathy, listening to patient's explanation, appreciating patient at the end of the assessment.<br>Health cadres need to improve communication skills, especially in terms of ensuring that patient understand the question posed, providing opportunity for questions. | Health cadres were able to communicate without stigma, listened to the patient's explanation, appreciate the patient at the end of the assessment.<br><br>Health cadres need to improve showing empathy when listening to patient explanations, thinking about other things and sometimes interrupting while the patient was explaining. |

**Note:** *The communication skills observation just carried out only with limited number of interaction between health cadres and DR-TB patients since only most of patients did not allow the researcher to conduct the observation.

identify the barriers to accessing the treatment. The flow of patient tracing is shown in Figure 1.

Patient tracing activities are conducted not only for DR-TB patients that have not enrolled for treatment or default patients but also for new patients that are yet to begin the treatment. There was no significant difference in encouraging default patients or new patients to enroll for treatment. Instead, the challenge in making default patients return for treatment was greater compared to new patients. This step is important since the loss of follow-up on DR-TB patients was one of the main challenges in the DR-TB program.

Based on the in-depth interviews with four DR-TB patients, several factors were found concerning to patients that enroll and complete the treatment. These factors include personal motivation, family support, side-effect management, knowledge of patient and family, health workers' empathy, peer support, health cadres, and friends support.

The information collected from all informants was used to develop the refresher training modules. Furthermore, the pretest was carried out to determine the topic that needs to be emphasized during the training, whereas the post-test was carried out three months after the training. The results are presented in Table 2.

Aside from the pre-test, the authors observed the capacity of some health cadres to communicate with patients and family during patient tracing. Although the health cadres showed the capability to communicate effectively, however, certain skills still needs to be improved, like ensuring the patient understands the question, exploring the patients' experience conrening to DR-TB, eye contacting, and showing empathy (Table 3).

The authors also reviewed the process by which patient's tracing was performed. Three months after the training, 36 patients have been traced by the health cadres. The result of the patient's tracing from September to December 2019 is presented in Table 4. In total, 36 patients were traced, while eight had already moved to another place and refused to meet the health cadres.

**Table 4. The Result of the Patient's Tracing by Health Cadres**

| Region | Category | n | % |
|---|---|---|---|
| Jakarta Pusat | | 20 | 56 |
| | Patient's defaulter | 3 | 15 |
| | Have not started treatment | 0 | 0 |
| | On treatment | 8 | 40 |
| | Died | 4 | 20 |
| | Move to other places or could not meet | 5 | 25 |
| Jakarta Utara | | 16 | 44 |
| | Patient's defaulter | 5 | 38 |
| | Have not started treatment | 3 | 19 |
| | On treatment | 3 | 19 |
| | Died | 2 | 13 |
| | Move to other places or could not meet | 3 | 19 |

Table 4 shows the result of patient tracing activities by health cadres. It was extracted from routine data monitoring. Based on the results, the information obtained by cadres was not accurate. Four of the patients visited in Central Jakarta had died; meanwhile, based on data from the hospital, these individuals were lost in the follow-up process. The major difficulties faced while conducting patient tracing was incomplete or inaccurate address information.

"*...I got the name of the patient, but…when I traced the address..it was fake..then I searched with Pak RT, RW data,*" health cadres (46 years).

Besides, some patients have moved to another place and did not know the new address; also, the status of some default patient was not right for instance, the patients that have died, non DR-TB patient, or the patient was still enrolling for the treatment. The role of health cadres in tracing patients was noticed and assisted by the nurses in health facility to understand the updated situation of the patients.

"*... Anyway, it really helped to keep update the condition of the patient in the reports ... like xx (mentioned the patient's name), he didn't want to meet me, because he didn't take medicine anymore. So..the health cadre came to visit the patient and assessed the lastest condition of the patient... ",* Nurse (52 years).

## Discussion

The health cadres' retention or activeness percentage after 1.5 years was 63% or declined at + 37%. This percentage was based on the number of health cadres that actively provided support to DR-TB patients compared to the newly recruited. Similar results were obtained for community health workers in several countries, where the decline rate of total cadres varied each year between 3.2% to 77% per year.[16]

The DR-TB is predominately a disease of socially vulnerable groups, making long-term adherence to treatment a major challenges. The lost to follow-up constitute one of the major programmatic challenge for many countries.[2,5,7] The role of health cadres as part of the community was expanded also to support DR-TB patients. There is no ideal prescription for CHW. Certain criteria are needed to identify and select candidates. The personal characteristics of CHWs play an important role in the relationship with the community and motivation.[17] In this study, it was discovered that health cadres with experience in relation to TB tend to show high motivation to support the patient.

The expanding role of health cadres in providing support to DR-TB patients is a relatively new approach. In addition, the knowledge about TB obtained from continuous training is also required. During patient's tracing, the health cadres show effective communication skills in showing empathy, active listening, motivating and encouraging patients to be open.

Haaq and Hafeez,[18] reported that CHWs might seem elementary in high-resource settings; however, these individuals play a valuable in developing countries. Some basic steps were required to facilitate efficacy and effectiveness. A continued process is needed in the primary health care programs where opportunities are provided to community health workers to update knowledge, sharpen communication skills and gain credibility as personal health educators. The USAID reported that additional tasks were assigned to CHWs after the initial training—coupled with corresponding training. In addition, training is expected to go beyond technical skills, that include "soft" skills, such as time management, problem-solving, and communication.[19]

The complexity of the guidelines, including inappropriate training, weak supervision, lack of support, and weak relations with the community, were some of the factors that culminated in the low performance of cadres. Other alternative methods may be applied like providing information with simpler methods such as pictures or giving quizzes at meetings. The regular monthly meeting is an avenue to increase understanding of topics that need to be mastered.

Naimoli, *et al.,*[15] emphasized that CHW needs to be integrated with the health system for health workforce development both in training and supervision. Supervision by nurses through direct skill observation can improve performance. The supporting role played by health cadres have no significant influence on the enrollment of DR-TB patients. Low enrollment rate remained one of the major challenge in the DR-TB program at North and Central Jakarta. These patients are also well know to usually drop out of treatment.

Maeve, *et al.,*[6] reported that most DR-TB patients usually fail to enroll for TB treatment. The patients that failed the treatment have a higher risk of further treatment failure; thereby leading to death. The process of bringing back default patients to return for treatment was
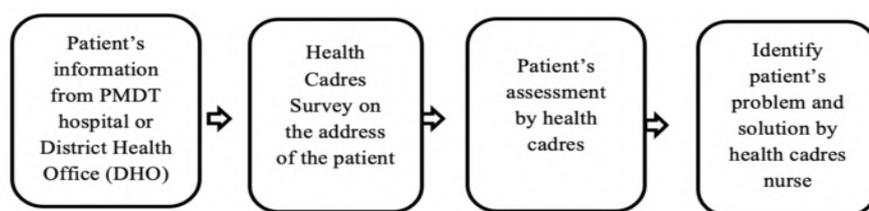
**Figure 2. The Initial Steps in Supporting the DR-TB Patient**

a major challenge. There were several factors that influence treatment adherence (1) health-services related such as unavailability of drugs, knowledge of staff about TB, limited access to health services, and waiting for long duration to get services; (2) socioeconomic factors; (3) patient knowledge about TB, as well as related factors such as family history, age, and gender; (4) patient's condition such as alcohol consumption, HIV, and history of treatment failure; (5) treatment-related factors including side effects and improvement, and; (6) lack of support.[8]

The role of health cadres has no direct influence on treatment adherence of DR-TB patients. Besides, the key role of health cadres is patient assessment, which is an essential step to identify the barriers in accessing treatment and solutions to overcome the problem. The health cadres also play a role in tracking the lost to follow-up patients.[20] These two roles are performed using a similar mechanism (see Figure 2). Accurate information concerning patient's condition and complete data regarding the patient's address are needed to trace patient easily.

## Conclusion

This study was conducted to explore the main roles of health cadres in providing support to DR-TB patients. It was beneficial to determine the challenges of patients in enrolling for treatment and solution, factors that influence health cadres' performance, programs to supports the health cadres such as training, supportive supervision, and rewards for motivation. This study also described a clear flow patient's assessment and the needed information to be prepared for this activity and how to synergize with other parties including peer support group or nurses in primary health care.

The limitation of this study is related to the limited number of health cadres involved. This affected the study as it failed to apply the methodology by which the results is statistically analyzed. Moreover, the authors were involved in developing procedures and training material for health cadres. Several study assistants were recruited to carried out data collection and avoided possible bias.

## Recommendation

Technical Guidelines for Integrated Management of Drug Resistance Tuberculosis Control (PMDT) stated that health workers are responsible for carrying out patient tracing; however, this was not applied in the reality. Therefore, there is a need for revision to accommodate the clear roles of health cadres. The selection of health cadre's needs to be in line with several criteria, namely 56 years as the maximum age limit, high school education, minimal workload. Also, selected cadres are expected to work well with other health parties and not give up easily. The training is highly expected to improve the knowledge and skill of health cadres. Capacity building through continuous training is needed with appropriate methods which focus on a specific topic such as patient' tracing and communication.

The roles of health cadres failed to increase the enrollment rate of DR-TB patients. Collaboration with various parties is needed by developing a comprehensive community-based approach. Specific support such as psycho-emotional patient assistance by psychologists is needed for some patients. Optimizing patient decentralization to primary health care needs to be intensified to reduce hospital burden. There is a need to develop a community database for monitoring patients to provide community support and a strong link system to provide complete and accurate patient information for easy and immediate follow-up.

The National TB program is recommended to refine the policy and regulation to clarify the community, especially health cadres under a legal framework. Further, comprehensive studies are needed to understand the effectiveness of health cadres in patient tracing as well as the role of various community components in reducing the number of default patients to increase the enrollment rate of DR-TB patients.

**Abbreviations**

TB: Tuberculosis; WHO: World Health Organization; XDR-TB: Extensively Drug-Resistant; DR-TB: Drug-Resistant Tuberculosis; DOT: Direct Observer Treatment; CHW: Community Health Worker; FGD: Focus Group Discussion; Jumantik: *Juru Pemantau Jentik*; PKK: *Pembinaan Kesejahteraan Keluarga*; PLWHA: People Living with HIV/AIDs; PPKB: *Penyuluh Keluarga Berencana*; PMDT: Program Management of Drug-Resistant Tuberculosis; USAID: US Agency for International Development.

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# National Health Insurance Scheme: Internal and External Barriers in the Use of Reproductive Health Services among Women

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**Abstract**

Lack of familiarity among the community, medical workers, and administrative staff regarding reproductive health services covered by *Badan Penyelenggara Jaminan Sosial (BPJS)* or the National Health Insurance (NHI) in Indonesia remained a problem. Therefore, this resulted in sub-optimal use of the medical services, as shown by surveys from the Women's Health Foundation for three consecutive years (2015-2017). This qualitative study was conducted with a Rapid Assessment Procedure design in three cities within Indonesia: Padang Pariaman, Manado, and Kupang. Data were collected through IDIs (n = 47 informants) and 6 FGDs (7 persons/group). Participants also consisted of NHI RHS users (mothers and young women), administrative officers at health facilities, medical services providers, and officials related to the NHI assistance. Data were managed using NVivo version 2.0 software, accompanied by thematic analysis. The internal barriers in NHI use included inadequate knowledge of RHS covered by NHI, and a culture of shame in informants. External barriers included additional costs for medicines not covered by NHI, the dissatisfaction of health services provided by medical workers, busy work and household activities, and lack of women's role in decision-making within families, which related to reproductive wellness.

**Keywords:** National Health Insurance, reproductive health, the Social Security Administrative Body for Health, women

## Introduction

The International Conference on Population and Development (ICPD) in Cairo (1994), which set out a bold call-to-action on Sexual and Reproductive Health and Rights (SRHR), affirmed that choice and self-determination, gender equality, and human rights constitute the keystone of population policies.[1-3] The goals of Sustainable Development Goals (SDGs) are to ensure healthy lives and promote the well-being of all at all ages (SDG 3), in order to achieve gender equality and women's empowerment (SDG 5), which signifies the increased access toward SRH services, ensure their affordability, and advance sex evenness.[4]

Health is one of the basic needs of every individual regardless of their gender. Access to complete sexual and reproductive health services (RHSs) was crucial to the well-being of individuals, families, and communities.[5] Global efforts to improve women's health are largely focused on improving their reproductive wellness.[6,7] Since 2014, the Government of the Republic of Indonesia had organized a National Health Insurance (NHI)

program, administered by the Social Security Administrative Body for Health, to ensure the fulfillment of basic medical needs, including RHSs. Expectations were that by 2019, all Indonesian citizens are likely to become NHI participants.

Reproductive health services in primary health care had numerous benefits.[8] A study conducted on 39 women in India demonstrated that participants were receptive to the availability of RHSs in primary care and the benefits of streamlining it, provided clinicians approach these services in a manner that respects patient autonomy and reproductive desires.[8] In other study, RHSs at private hospitals that enrolled in the NHI scheme of India were 2%. Over 75% of respondents were unaware of RHSs availability, through NHI. It was possible for respondents with some education to have this knowledge, while poorer families were less likely to be aware.[9] Improvements in using existing public resources were also important for efficiency, quality, and equity gains.[4]

Based on a survey by the Women's Health Foundation

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in 15 provinces within Indonesia in 2015 - 2017, the use of RHSs by the community was not optimal. The utilization of services was mostly carried out for antenatal care (24.5%) and normal delivery (31.7%). Moreover, with clinical and administrative officers, the community was not fully aware about the types of women's RHSs being covered by the NHI. The Women's Health Foundation study also showed that most respondents knew that RHSs were limited to antenatal care, normal delivery, complications, and family planning services.[6] However, there were numerous reproductive services provided by NHI, such as general screening, post-natal service, breast and cervical cancer analysis, and more.

This qualitative study aimed to explore the in-depth reasons for the low utilization of the NHI scheme for women's RHSs, in three regions of Indonesia. The results were expected to be used as advocacy material to the relevant government, to make policies and increase RHSs usage covered by NHI.

**Method**

This study was conducted after ethical approval was obtained from the Institutional Review Board at the University of Indonesia, with the numbers LB.02.01/2/KE.296/2018. Study participants were required to sign the informed consent form. Before seeking their consent, participants were also assured that their personal information was to be kept confidential when the study results are published. This qualitative study was conducted in three areas, represented by specific regions within Indonesia. The Western, Central, and Eastern Indonesia regions were represented by Padang Pariaman District, Manado City, and Kupang City. The design used in this study was the Rapid Assessment Procedure (RAP), a qualitative approach that was likely to be carried out quickly (around 1-2 months) regarding health-related behavior.[10]

In this study, the validity and reliability were examined through the triangulation of sources and methods. Triangulation was carried out to check the validity of the data.[11] To establish credibility, the authors had well-established cooperation with the participants. The external key informant's reviews of the information were carried out, with additional comments also being used.

Data collection was carried out in two ways, namely focus group discussions (FGD) and in-depth interviews (IDI), through a semi-structured interview approach. The study instrument in the qualitative study was the author. The study instrument in the qualitative study was the author. Interviewers were equipped with semi- structured guidelines for the questions to be identified properly, both in FGDs and IDIs. These guidelines were used as a benchmark for interviewers to gather information from the informants. Despite the guidelines had been arranged in such a pattern, the interviewer was still provided with the freedom to explore and develop deep questions for the informants, as the objectives were achieved.

The total informants for IDI were 47 for the three locations (Padang Pariaman, Kupang, and Manado). The number of informants in Padang Pariaman was 20 for IDI, with two groups each consisting seven of respondents for FGD. However, in Kupang and Manado City, the total informants that participated for IDI were 12 and 13, with two groups each for FGD, respectively. Informants of the IDI were users of NHI-RHSs, particularly mothers and families (including young women), NHI administrative staffs at health facilities, clinical officers (midwives and doctors) as medical care providers, and officials related to the program (NHI) services. The program officials included the head of primary health care at the region medical office level and units related to NHI and their staffs.

All IDIs and FGDs were conducted, recorded, and transcribed verbatim. Furthermore, the data transcripts were cleaned initially by re-checking the suitability with the contents of the recordings on the audio recorder and field notes for data accuracy purposes. Afterwards the data were processed using NVivo version 2.0 software (license of the software is available). The purpose of using this software was to minimize subjectivity from the authors by looking at the data obtained in detail.[12]

Moreover, data analysis was carried out using thematic assessment to discover "patterns" that other parties were unable to observe clearly.[13] Patterns or themes occurred randomly in the pile of available information. After finding a pattern, classification was conducted, by providing labels, definitions, or descriptions.[14,15]

**Results**

The participants of this study are summarized in Table 1. According to Table 1, the informants in this research based on RHSs utilization in health care facilities in the three provinces were both married women and the adolescent groups. For the stakeholders, the informants consisted of midwives, health care doctors, NHI administrators at clinical centers and hospitals, with the heads of medical district offices and National Health Insurance at the areas.

The two themes developed from eight sub-themes discovered in the study were briefly summarized in Table 2. The description of all the observations of knowledge was divided into four sub-themes.

Informant knowledge about RHSs covered by NHI had not been evenly distributed, especially among those from the community having inadequate awareness, compared to the health workers and administrative staff

**Table 1. Informants Groups Characteristics for In-Depth Interview and Focus Group Discussion**

| Informants Group | Position | Information Gather Method |
|---|---|---|
| Married women | Ever use NHI | FGD |
| Married women | Never use NHI | FGD |
| Adolescent (<18 years old) | Ever use NHI | FGD |
| Adolescent (<18 years old) | Never use NHI | FGD |
| Family of woman/NHI user | Ever use NHI | IDI |
| Head of a health care center | NHI provider | IDI |
| NHI administration staff | NHI provider | IDI |
| Midwives/doctors at a health care center | NHI provider | IDI |
| Midwives/doctors at hospitals | NHI provider | IDI |
| Head of health office | NHI provider | IDI |
| Head of NHI at regent | NHI provider | IDI |
| NHI staff | NHI administration staff at hospitals | IDI |

**Notes:** NHI = National Health Insurance, IDI = in-depth interviews, FGD = Focus Group Discussion

**Table 2 Theme, Sub-theme, and Relevant Quotations of In-Depth Interview and Focus Group Discussion**

| Theme | Sub-theme | Quotations |
|---|---|---|
| Knowledge | RHSs that are covered by NHI | "... *(I) do not know and have never heard about it...*" (IDI, Adolescent - Kupang).<br>"… *I do not know…*" (IDI, Adolescent – Padang Pariaman) |
| | Types of HCSs that are covered by NHI | "… *pregnancy, childbirth, postpartum, contraception, STI, HIV & AIDS, detection of cervical cancer, adolescent reproductive health...*" (IDI, Woman - Padang Pariaman).<br>"... *pregnant women, childbirth, family planning, adolescent reproductive health, STIs, early detection of cancer...*" (IDI, Midwife at primary health care-Kupang) |
| | Types of HCS that are not covered by NHI | "... *Abnormalities due to pathology. I don't think that procedure for transgender is covered...*" (Doctor at a hospital - Padang Pariaman).<br>"... *all diseases, IVA and pap smear. Safe abortion need to be considered for NHI responsibility...*" (IDI, adolescent - Manado) |
| | Sources of information on RHSs covered by NHI | "...*colleagues. NHI prepares posters for us to post...*" (Doctor at primary health care - Kupang) |
| Attitude | Towards improving the quality of reproductive health | "... *Yes, I feel much better, Everything has been provided by NHI...*" (Mother - Padang Pariaman)<br>"…*Agree. Because as a teenager, we can have MCU for reproductive health issue earlier…* " (IDI, adolescent - Kupang)<br>"... *both RHSs and surgery is very good, and it needs to be maintained...* " (IDI, Adolescent - Manado) |
| | Towards access to NHI services | "... *it was easier when using in hospitals, clinics, and primary health care.*" (IDI, Family used NHI - Manado).<br>"… *disagree. It is not complicated…*" (IDI, Adolescent – Kupang)<br>"…*no complicated at all.…*" (IDI, adolescent NHI user – Padang Pariaman)<br>"… *not really… as long as follow the procedure ...*" (IDI, Housewive – Kupang) |
| | Toward the fulfill of women's interests | "... *for reproductive health checkups, STIs, IVA, and rooms for adolescents are separate ...*" (IDI, Primary health care administrative staff - Kupang) |
| | Towards NHI attention to RHSs | "…*I don't think so.. The services have paid attention to gender, only the information that has not been widely spread, yet.*" (IDI, Mother - Kupang)<br>"…*Disagree. For example, for women that continues sterilization contraceptives after delivery, the insurance is likely to still be claimed after 40 days....*" (IDI, Doctor's Hospital - Kupang)<br>"... *if the patient is admitted as an NHI patient, then the service seems slow...* " (FGD- Kupang) |

**Notes:** RHSs = Reproductive Health Services, HCS = Health Care Service, NHI = National Health Insurance, IDI = in-depth interviews, FGD = Focus Group Discussion, MCU = Medical Check Up, *IVA = Inspeksi Visual Asetat*, STIs = Sexually Transmitted Infections

of NHI.

"... *(I) do not know and have never heard about it... (IDI, Adolescent - Kupang).*

Most informants knew the types of health care covered by NHI, as they mentioned them more. However, there were also respondents with limited knowledge of the treatment of severe diseases, such as cancer and cesarean section. Also, health worker informants were able to explain medical care covered by NHI.

According to informants, NHI types that are not covered by NHI were fertility issues (IVF), costs for transgender, and safe abortion surgeries. Health worker informants believed that safe abortion should be considered and covered by the NHI.

Most information about RHSs covered by NHI were known from family and relatives that work in health institutions. Medical informants made it known that there was an involvement of various parties in the dissemination of information, which was related to RHSs for women included in the NHI scheme.

"*... colleagues that deliver. NHI prepares posters for us to post to the public. ...* " (IDI, Doctor at primary health care - Kupang)

The Attitude's sub-theme was viewed from several aspects, including Quality of RHSs, Access to NHI Services, Health Services that Fulfill Women's Interests, and NHI Attention to RHSs. Some informants agreed with the statement that the quality of RHSs covered by NHI was improved. A housewife respondent in Padang Pariaman that had used NHI, provided information about never buying drugs because all was provided, and the flow had been regulated through the NHI scheme.

"*... Yes, I feel much better; everything has been provided by NHI...* "(IDI, Mother - Padang Pariaman)

One adolescent informant in Kupang City also provided information that the inclusion of RHSs in the NHI scheme had led to an increase in the quality of HCSs, through the access of obtaining it (RHSs) for women.

"*...Agree. Because as a teenager we can have MCU for reproductive health issue earlier...*" (Adolescent - Kupang)

Although there were relatively many informants that agreed that the quality of health care services (HCSs) covered by NHI was getting better, some also expressed their need to improve the efficiency of the services.

Informants' attitudes were explored through the statement, "*Access to get NHI services is complicated and 'convoluted'* ". Some expressed their disagreement with the statement, as they believed that NHI participants obtain priority, through the experience of using the services.

"*... Based on my experience while using NHI, it is very easy and hassle-free, especially when using it in hospitals and clinics, with primary health care...*" (IDI, Family used NHI - Manado)

The informants' attitude to the statement, "*the services provided by NHI still apply in general, and do not pay attention to the specific interests of women or men*", was not fully agreed upon by the health officer respondents. According to them, in terms of facilities, there were already separate rooms for female and male patients to conduct reproductive health checkups and other actions, such as sexually transmitted infection (STI) management and *inspeksi visual asetat* (IVA).

"*... for reproductive health checkups, for STIs and IVA, rooms for adolescents, all are separate ...* " (IDI, primary health care administrative staff - Kupang)

This statement was in line with the opinion of adolescent informants in Kupang, which stated that there were separate rooms designated for adolescents, which functioned as a zone for counseling on reproductive health. However, this condition was not observed in all regions. In Padang Pariaman, for example, due to the limitations of existing facilities, the separation between examination rooms or inspection procedures according to gender was sometimes not yet fulfilled. This situation was also acknowledged by a doctor informant at a hospital in Kupang City.

"*...Agree. For 3rd class, it is unavailable, because there are around 6 to 7 people in one ward. Even though there are curtains between the beds, it is not really closed to ensure privacy...*" (IDI, Doctor at a hospital - Kupang)

One informant from Kupang further stated that the problem was the lack of dissemination of information on RHSs, for women and adolescents. This was the reason many people still thought there was no separation of RHSs, which was general in nature.

"*I think no, the service has paid attention to the interests of women or men, only the information has not been widely spread.*" (Mother- Kupang)

Regarding the attitude to the statement "*Woman-related RHSs has become the concern of the NHI*", several service users and health workers as informants from both Manado and Kupang Cities, believed that the NHI had provided more attention to services related to reproductive health. One of them was the promotive roles in communication or counseling regarding both the functional and procedural management of NHI and HCS, which was included in the National Health Insurance financing scheme. In this promotive activity, NHI was usually accompanied by the local health services, through the availability of RHSs for early examinations, which were related to the reproductive organs and management, or care associated to ANC and post-partum. It was evidenced that the NHI had provided attention to women-specific reproductive health.

"*... Right, it's not that... there are already services for mothers giving birth... Abnormal menstruation can be served by NHI...*" (IDI, Adolescent -Padang Pariaman)

Although many informants had stated their agreement, some did not agree that woman-related RHSs had become the concern of the NHI. The respondents that disagreed were health workers in Kupang and Padang Pariaman.

"*... Disagree because, for example, for women that deliver and immediately take sterilization contraceptives, the insurance is likely to be still claimed but if after two weeks (heading to) sterile unclaimed. Except after 40 days it can only be claimed...*" (IDI, Doctor's Hospital - Kupang)

The types of RHSs utilized by informants were relatively varied. These services included examining the reproductive organs, pregnancy checkups, and assistance in the form of medical interventions, such as normal delivery, cesarean section, and removal of the myoma.

"*... more than five years I have been using NHI cards. It was often used for regular medical treatment and*

*most recently for cesarean delivery ...*" (FGD - Kupang)

Practically, the community had barriers in using NHI membership to obtain RHSs. The barriers were divided into two, namely internal and external barriers, originating from within and outside the individual.

Aspects from within the informant that hindered the use of RHSs, was a culture of shame and fear of reproductive health checkups. In some areas, discussing reproductive-related problems was still considered a taboo. Therefore, there was a reluctance to have a reproductive health checkup.

"*...From women themselves, for example, a culture of shame and fear. Don't let it be examined by a male doctor, embarrassed about revealing personal matter, embarrassed when you have to take off your clothes while checking up, getting scared to know if there is an illness...*" (IDI, Doctor at primary health care - Kupang)

Lack of knowledge about RHSs was also one of the barriers to the use of RHSs. External barriers included the costs incurred despite using NHI cards to get services. Some medicines were not covered by the insurance program, therefore ensuring patients pay out-of-pocket.

"*…Medicines above IDR 30,000 are paid by NHI, but patients themselves redeem the medicines above IDR 50,000 ...*" (FGD - Kupang)

The slow handling of NHI participant patients also made the informants reluctant to use cards for treatment. Conversely, general patients that pay out-of-pocket tended to get services and treatment immediately. Furthermore, one of the heads of primary health care in Manado City stated that being busy with work and household activities that could not be left behind, caused the loss of time to have reproductive health checkups.

"*...What hampers women's access to the NHI was more to themselves, due to being busy with work and other activities ...*" (IDI, Head of primary health care - Manado)

The family also played a role in women's access to RHSs. In some cases, the husband had a role in deciding on contraceptives for the wife. The husband and family also played an important role in determining where pregnant women were to deliver.

"*... Lack of sex education. However, some women also came, but for contraception, it is still the husband that plays an important role even though we have explained it, or they already have many children...*" (IDI, Doctor at a hospital - Kupang)

## Discussion

Health insurance played a role in healthcare access and service utilization.[16] Information, education, and communication campaigns were necessary to enhance the utilization of health insurance coverage.[17] Based on the results obtained from a study conducted by Kurfi,[18] general knowledge of the NHI scheme had a positive and significant relationship with client's satisfaction. The results of this study indicated that informants' knowledge of RHSs covered by NHI, had not been evenly distributed. Knowledges of the health workers and administrative officers were better than the community respondents. Some community informants knew that the RHSs covered by NHI were pregnancy checkups, postpartum examinations, early detection of cancer, family planning services, and other diseases related to reproductive organs. Health services that were not covered by NHI included treatment for infertility, sex reassignment procedure for transgender, and safe abortion (medical abortion), in cases of pregnancy complications. A study by Oyenike, *et al.*,[19] showed a significant influence of knowledge ($R^2 = 0.683$, p-value = 0.000) on the utilization of the NHI scheme.[19] Effective strategies should be implemented towards increasing awareness and knowledge about health insurance.[20]

The information on RHSs covered by NHI, was generally obtained from the closest people, health workers, and medical insurance officers. Furthermore, visual media such as posters were also displayed at health facilities. One of the factors associated with low access to RHSs with the NHI scheme was the low knowledge and awareness about the availability of the program.[9,21] Lack of knowledge on health insurance, particularly about coverage on preventive care, also led consumers to avoid assistance due to perceived costs.[22] In conveying the information, visual media had to be accompanied by direct information from the person concerned, for data to be comprehensively received in more detail. In a study by Yakong, *et al.*,[23] the community needs for family planning information were not met. Though the Family Planning posters were displayed at health facilities, they did not significantly impact due to the lack of education or illiteracy.

Lack of knowledge about HCS also led to the underutilization of health services. A study among Thai immigrants by Akerman, *et al.*,[24] showed that 52% of respondents were not aware of the location to seek RHSs, due to the lack of information. To increase knowledge, applications through various platforms and technologies should be available to the community, such as mass or social media. In a previous study, expanding understanding of RHSs, especially among adolescents, showed a significant relationship between knowledge and exposure to the mass media.[25]

The attitude is a psychological tendency expressed by evaluating certain entities with several levels, for example, agree or disagree.[26] Attitude was useful in predicting behavior, when it is not considered a problem by the per-

son. This was accompanied by social acceptance of actions, which were in line with the person's attitude.[27] Some informants had positive attitudes, which improved the quality of health services for NHI participants. Generally, the explanations cited for considering the improved quality were the ease of locating medicines because they had been determined. Furthermore, the involvement of reproductive health in the services covered by NHI, also made it easier for the public to access RHSs.

Although RHSs were available in the community, the utilization remained low due to the perceived negative attitude from the health workers, lack of privacy, and social norms.[28] A study conducted by Adjei,[29] in Ghana, showed that health insurance beneficiaries had high trust in their primary care provider by giving them quality assistance. However, in this study, the negative attitude shown by the informants was due to dissatisfaction with the services from health workers that seemed to discriminate between patients that pay out-of-pocket and NHI participants. Also, a negative attitude was shown in the statement on access to obtain NHI services, which were complicated and 'convoluted'. This meant that informants considered that the pathway to be followed by NHI participants to receive health services was not complicated. Complicating matters were when the administrative requirements were incomplete. A study by Campbell, *et al.*,[30] among the artisans, showed that an insufficient level of knowledge and awareness of health insurance translated to a negative attitude towards the scheme. There was a need for a substantial stakeholders' enlightenment campaign to increase coverage.

Additionally, some informants disagreed with the statement that the services provided under NHI did not pay attention to the specific interests of women or men. According to the health worker informants, there was already room partitioning to perform actions, such as STIs management and IVA. Even when there were barriers, it was due to the inequality of facilities and infrastructure at health structures. Lack of attention to patients' privacy, especially in RHSs, played a role in using health facilities.[21,31] A study by Adetona, *et al.*,[19] showed a significant influence of attitude ($R^2 = 0.872$, p-value = 0.000) on the utilization of the NHI scheme. Informants in this study agreed to the women's RHSs had become the concern of the NHI. This utilization was indicated the counseling on the functions and procedures for managing NHI, including RHS as one of the services covered by the insurance scheme. In the Regulation of BPJS No. 1 of 2014, the scope of NHI services included promotive services and preventive care.[32] However, informants that disagreed expressed that they still felt the facilities and infrastructure for RHSs had not been optimal.

The types of RHSs used by informants were relatively varied. These services included examining reproductive organs, pregnancy examinations, and services in the form of medical interventions, such as normal delivery, cesarean section, and removal of myoma. The factor that encouraged informants to use RHSs using NHI, was the cost relief (free of charge) offered to register participants.

The barriers shown by the informants were divided into internal and external barriers. The internal barriers included lack of knowledge about RHSs covered by NHI, therefore allowing informants feel uncertain about using health services covered by the insurance scheme. Also, there was still a culture of shame for informants, as they were reluctant to have checkups at the health facility. Shyness was influenced by the values prevailing in the society, for example, religion. The norms and characteristics of some religious groups encouraged negative attitudes to medical matters. These facts are shown by the studies of Gyimah,[33] Tlaye,[25] Ansha,[31], and Negash,[21] which stated that shame and fear of some social values made respondents reluctant to access RHSs, unlike those that were already sexually active.

Conversely, external barriers that made people reluctant to use NHI for health checkups included the additional costs incurred because some medicines were not covered by the insurance scheme. This observation indicated that affordability was still an obstacle, even for the insured informants, to utilize health services and join the NHI scheme. This was in line with the results from studies by Gobah,[34] and Mensah,[35] which showed that difficulties in affording the cost of health care, were one of the major obstacles to the enrollment of the NHI scheme.

Besides that, dissatisfaction with health services provided by health workers also made informants reluctant to use NHI. Informants argued that non-NHI patients were prioritized and treated faster than those insured. Similar to existing studies, most of the insured patients perceived and experienced long waiting times, verbal abuse, not being physically examined, and discrimination in favor of the affluent and uninsured.[36] Patient satisfaction influenced the decision in selecting a health facility as a place of treatment. A study by Gan-Yadam, *et al.*,[37] in Mongolia, showed that patients that were satisfied with the services at the health facilities were more likely to select the same medical infrastructure repetitively. The study by Yakong, *et al.*,[23] also showed that dissatisfaction with the services by health workers had a role in the choice of treatment. In this study, patients were not only wanted to be treated, they were also accompanied by clear information to address the health problems being encountered. The government should further adjust NHI schemes and optimize the allocation of health resources to alleviate the inequality across policies and enhance the effective utilization of medical care services.[38]

In this study, busy work and household chores also made informants lose time for a reproductive health

checkups. Inconvenient service hours remained a considerable reason for respondents not utilizing reproductive health services.[21] Concerning health insurance, encouragement by friends and family was observed to motivate subscription to health insurance.[39] For example, the husband had a role in determining contraceptives for the wife, or in determining the location for pregnant women to deliver. In reproductive health, women's autonomy was an important socio-cultural factor, which played a role in using of health facilities.[40] This study, consistent with other results, showed that the husband had a role in making decisions in the family, and that women's autonomy in decision-making was very limited, including the basis of the female reproductive health.[41,42] Husbands as the head of households should be motivated by health practitioners on the utilization of the National Health Insurance scheme, as this ensured the achievement of universal medical coverage.[19] These results further indicated the need for demand-side intervention among enrolled families to maximize the government's efforts in increasing access to health services.

The researchers observed some weaknesses in this study, such as locating informants, which was in line with the inclusion criterion. Thematic analysis in this study had limited the formation of themes based on information provided by informants. Another weakness was the different interviewers for every three locations, which in turn became an obstacle in data analysis. However, the researchers discovered numerous information that should be investigated further, through quantitative research for a huge population, such as knowledge about types of RHSs covered by NHI or about the health insurance itself. Alongside good coordination with the counterpart in three different provinces, this study had a pattern of reproductive health services by NHI, which should be shared as a recommendation to the government, as a continuous improvement.

## Conclusion

Informants' knowledge towards reproductive health and RHSs covered by NHI varied. Some informants have the knowledge about the type of services covered by the NHI, as others from the youth and maternal groups were still unaware. Albeit the dissemination of NHI information and what RHSs covered was all about, more equitable distribution was needed by health workers or NHI staff, as information was to be delivered accurately to the community.

Generally, informants had a good assessment of NHI and RHSs, and also a positive attitude to improve the programs. Community informants and health workers also had a positive attitude toward women RHSs by NHI. However, most informants disagreed with the statement that access to get NHI services is complicated. Also, most informants agreed with NHI services nowadays in terms of considering gender.

Internal barriers in the use of NHI for RHSs also showed a culture of shame and fear of being examined, with lack of information. External barriers felt by informants included works and household activities, with inadequacy of women's participation in family decision-making, including reproductive health issues. Other barriers were dissatisfaction with the services provided by health workers, and additional costs for medicines not covered by NHI.

### Abbreviations

BPJS: Badan Penyelenggara Jaminan Sosial; NHI: National Health Insurance; IDI: In-Depth Interview; RHS: Reproductive Health Services; FGD: Focus Group Discussion; ICPD: The International Conference on Population and Development; HCS: Health Care Service; SRHR: Sexual and Reproductive Health and Rights; SDG: Sustainable Development Goal; STI: Sexually Transmitted Infection; IVA: *Inspeksi Visual Asetat.*

### Ethics Approval and Consent to Participate

This study was conducted after ethical approval was obtained from Institutional Review Board at the University of Indonesia, with numbers LB.02.01/2/KE.296/2018. Moreover, before data collection, informed consent had been provided by all the informants and key respondents in the three provinces.

### Competing Interest

The authors declare declared that there are no significant competing financial, professional, or personal interests that was likely to have affected the performance or presentation of the work described in this manuscript.

### Availability of Data and Materials

Data was available from the corresponding author on request.

### Authors' Contribution

EM and HL conceived the proposal of the study, data collection, and analysis. EM also wrote the initial draft of the manuscript. RSZ studied literature, data analysis, and wrote the initial draft of the manuscript. YS re-analyzed data, updated the literature, and made the improvement of the final manuscript.

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# Prevalence and Determinants of Pre-lacteal Feeding: Insights from the 2017 Indonesia Demographic and Health Survey

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**Abstract**

Pre-lacteal feeding is widely known as a distraction to exclusive breastfeeding, and the malpractice continues to be prevalent in Indonesia. Therefore, this study aimed to explore the potential determinants of pre-lacteal feeding among mothers of infants below 24 months. A sample of 6,455 mother-infant pairs from the 2017 Indonesia Demographic and Health Survey (IDHS) was used. Also, multivariate logistic regression was employed to identify factors associated with pre-lacteal feeding practice. In Indonesia, 44% of infants were introduced to solid/liquid feeds in their first three days of life. Infant formula was the most common pre-lacteal feed given, followed by any other milk, plain and sugar water, and honey. Early initiation of breastfeeding and living in an urban area was protective method against pre-lacteal feeding (AOR: 0.24; 95%CI: 0.21-0.28; AOR: 0.76; 95%CI: 0.65-0.90, respectively), while cesarean delivery acted as a risk factor (AOR: 1.36; 95%CI: 1.14-1.63). Meanwhile, gender role attitude, parity, perceived birth size, and household wealth index was also associated with pre-lacteal feeding. Overall, the percentage of mothers introducing pre-lacteal feeds was still high. The modifiable covariates associated with pre-lacteal feedings, such as early initiation of breastfeeding, parity, and birth size, were the major factors discouraging this practice.

**Keywords**: breastfeeding, determinants, early initiation of breastfeeding, Indonesia, pre-lacteal feeding

## Introduction

Breastfeeding has a wide range of benefits for infants throughout their life cycle.[1] It protects from illnesses or infections, contributing to the reduction of morbidity and mortality.[2] Besides the short-term benefits, this practice is also associated with a lower risk of several diseases, such as type 2 diabetes, leukemia, celiac, atopic, and inflammatory bowel diseases.[3] From an economic standpoint, breastfeeding save costs associated with several illnesses, in addition to the costs of using other substitutes.[4]

Generally, pre-lacteal feeding is defined as introducing any solid or liquid feed besides breastmilk in the first three days of life. This has been proven as one of the barriers towards the recommended breastfeeding practices, as well as other factors, such as delaying initiation, shortening the duration, and disrupting exclusive breastfeeding.[5] The common pre-lacteal feeds given to infants differ across regions and parts of the world, such as in the Maldives, where honey and dates were parts of ritual food given in the first three days of life. Meanwhile, in Ethiopia, raw butter, plain water, and

milk (besides breastmilk) were among the most commonly found pre-lacteal feeds.[6,7] In Indonesia, most mothers, preferred infant formula, which is similar in South Africa, Bangladesh, and Nepal.[8-11]

Pre-lacteal feeding is practiced in many regions, even where the breastfeeding rate is high, such as Uganda and Indonesia. In both countries, breastfeeding and given a substitute feed in the first three days of life are believed to be norms.[12] A study also found that for almost all women, introducing pre-lacteal feeding is not based on health or nutritional concerns. However, it is determined by cultural beliefs or family influence.[13] Infants given pre-lacteal feeding are not exclusively breastfed by definition. Therefore, encouragements on the avoidance of this practice are crucial for improvement. Also, information about the factors associated with it needs to be obtained. Studies on the determinants of pre-lacteal feeding are found in this literature, while for the Indonesian context, this topic has not been extensively explored. This study aimed to identify factors associated with pre-lacteal feeding among infants under two years of age using the data from the Indonesia Demographic

and Health Survey (IDHS) 2017.

## Method

This study employed the Indonesia Demographic and Health Survey (IDHS) data conducted in 2017.[14] A total of 6,455 mother-infant pairs were included in this assay. At the same time, the data used for the analysis of pre-lacteal feeding practice were restricted to the last birth in the past two years. A full explanation of the methodology, design, and sampling of the IDHS was found in previous studies.[14] Furthermore, the sampling frame used the 2010 population census data, which was updated specifically for the selected blocks (clusters). The design used a two-stage stratified sampling. Several clusters were selected from 1,970 in 34 provinces, with systematic selection proportional to the size (size: the number of households) in stage one. Then, in stage two, 25 households were selected systematically. Questionnaires—that was the source of the dataset used in this paper—were administered to women aged 15-19 years. The information collected included data on family planning, HIV/AIDS, maternal and child health, in which the latter encompass the data on infant feeding practices, as the main topic of this analysis.

Pre-lacteal feeding, which is defined as the practice of introducing any liquid or solid feed, except breast milk in the first three days after delivery, was the dependent variable. The independent covariates included the infant, maternal, and household characteristics based on the conceptual framework for breastfeeding, which was adapted from previous publications.[1,15] Infant characteristics included sex (male and female), age in months (0-5, 6-11, 12-23), perceived birth size (smaller-than-average, average, larger-than-average), and birth type (single and multiple). Maternal factors included age in years (<18, 18-34, >34), education (primary/no formal education, secondary/post-secondary), occupation (employed and unemployed), parity or the number of children born (≤2, >2), place of delivery (home or health facility), birth attendant (health professional and traditional birth attendant), and type of delivery (non-cesarean and cesarean). Variables related to women empowerment, such as decisions on health spending (respondent alone, none, or others), and gender role attitudes ('conforming' or 'non-conforming') were also included. Respondents who agreed with at least one reason for wife-beating were categorized as 'conforming' because they complied with the husband's decision or society's norms. While those that did not agree with all reasons for wife-beating were included in the 'non-conforming' category. There were three household-level variables included in the analysis, namely residence (urban or rural), wealth quintile, and household size (≤5, >5).

All statistical analysis were performed using Stata 15.1 (StataCorp, College Station, Texas, USA—license of the software is available), by taking into account the study design of cluster survey and sample weights. Descriptive statistics were presented in proportions. Analysis of pre-lacteal feeding determinants was conducted using a logistic regression model, where the final model was determined through a backward logistic regression with a significance of p-value < 0.05. The second step was to run the model while excluding covariates with the highest p-value in the full design, then the changes were observed. When the exclusion of this variable did not change the odds ratio(s) by at least 10%, it is left out forever. This second step was repeated until the final model containing independent variables with p-values less than 0.05 fitted in.

## Results

More than two-thirds of the respondents were at the age of 20-35 years, and almost 25% of them only attended primary schools or no formal education (Table 2). The proportion of not working mothers was 3.4% higher than those employed in any sector. The percentage of infants introduced to pre-lacteal feed was 44.0% and almost equally distributed in all age groups (Table 1). More than half of mothers, or 24.7% of all respondents chose the infant formula followed by any milk, plain and sugar water, and honey when asked about what type of pre-lacteal feed preferred.

The majority of the respondents had one or two children, and 18.8% of respondents underwent cesarean section for their last child. More than 80% of women delivered in a health facility and had health professionals as their birth attendants. There were 88.9% of infants which birth sizes were perceived as average or larger by their mothers. Table 2 also shows that almost 70% of the respondents agreed with wife-beating. As for health spending decisions, 44.9% of women decided it by themselves. Early initiation of breastfeeding was practiced by almost 60% of respondents. Both the place of residence and the wealth index distribution were almost equally distributed in each category. More respondents were living in a smaller household with five or fewer family members.

**Table 1. Distribution of Pre-lacteal Feeding Practice by Infant Age**

| Age of Infant (Months) | N | Given Pre-lacteal Feeds | |
|---|---|---|---|
| | | n | % |
| 0-5 | 1,616 | 737 | 45.0 |
| 6-11 | 1,597 | 693 | 42.8 |
| 12-23 | 3,242 | 1,486 | 44.1 |
| 0-23 | 6,455 | 2,916 | 44.0 |

**Table 2. Respondents' Characteristics of Pre-lacteal Feeding Practice**

| Variable | Category | N | % |
|---|---|---|---|
| Infant characteristic | | | |
| Infant sex | Male | 3,344 | 51.4 |
| | Female | 3,111 | 48.6 |
| Birth type | Single | 6,416 | 99.4 |
| | Multiple | 39 | 0.6 |
| Perceived birth size | Small | 801 | 11.1 |
| | Average | 3,460 | 57.7 |
| | Large | 2,104 | 31.2 |
| Maternal characteristic | | | |
| Maternal age (years) | <20 | 309 | 4.4 |
| | 20-35 | 4,950 | 76.8 |
| | ≥35 | 1,196 | 18.8 |
| Maternal education | College or higher | 1,270 | 16.9 |
| | Secondary | 3,657 | 58.9 |
| | Primary/no formal education | 1,528 | 24.2 |
| Occupation | Not working | 3,511 | 56.7 |
| | Working | 2,938 | 43.3 |
| Parity | ≤2 | 4,159 | 68.3 |
| | >2 | 2,296 | 31.7 |
| Antenatal care visits (times) | ≥4 | 5,700 | 90.8 |
| | <4 | 731 | 9.2 |
| Type of delivery | Non-caesarean | 5,281 | 81.2 |
| | Caesarean | 1,170 | 18.8 |
| Birth attendants | Health professional | 5,895 | 93.0 |
| | Non-health professional | 558 | 7.0 |
| Place of delivery | Health facility | 5,057 | 83.5 |
| | Non-health facility | 1,397 | 16.5 |
| Gender role attitude | Conforming | 4,088 | 69.0 |
| | Non-conforming | 2,171 | 31.0 |
| A decision on health spending | Respondent alone | 2,747 | 44.9 |
| | Not respondent alone or other | 3,565 | 55.1 |
| Early initiation of breastfeeding | Yes | 3,732 | 59.5 |
| | No | 2,723 | 40.5 |
| Household characteristics | | | |
| Wealth index | Poorest | 1,747 | 20.2 |
| | Poor | 1,285 | 20.2 |
| | Middle | 1,172 | 19.8 |
| | Rich | 1,161 | 20.8 |
| | Richest | 1,090 | 19.0 |
| Place of residence | Urban | 3,145 | 48.3 |
| | Rural | 3,310 | 51.7 |
| Household size | ≤5 | 3,531 | 60.0 |
| | >5 | 2,924 | 40.0 |

Table 3 shows the bivariate analysis results in which early initiation and type of delivery were strongly associated with pre-lacteal feeding (p-value < 0.0001). Cesarean delivery almost doubled the odds of pre-lacteal feeding (OR = 1.82, 95%CI = 1.55-2.15). However, infants with no early breastfeeding initiation had around four times higher odds of given pre-lacteal feeds (OR = 4.37, 95%CI = 3.81-5.01). Other variables showing association with pre-lacteal feeding in this unadjusted analysis were parity, wealth index, and place of residence.

Results of the multivariate logistic regression were presented in Table 4. In the initial model (results not shown), there were nine independent covariates were included as the p-value in the bivariate analysis (Table 3), which was less than 0.25. In the end, two variables were excluded, which resulted in only seven covariates

kept in the final model. Early initiation of breastfeeding and type of delivery remained the strongest predictors. Then, the adjustment for other variables only changed the odds ratios at around 8% for early initiation of breastfeeding and 25% for the type of delivery with no change in their p-values. Respondents with more than two children were less in introducing pre-lacteal feeds (AOR = 0.83, 95%CI = 0.71-0.96). Mothers who perceived that their infant was smaller than average had 1.43 (95%CI = 1.15-1.79) times the odds of introducing pre-lacteal feeding. Living in rural areas was associated with the higher practice of pre-lacteal feeding, increasing the odds by 31%. Gender role attitudes and wealth index were also found to be associated with this practice.

**Discussion**

This study found that almost half of the mothers introduced pre-lacteal feeds, and the infant formula was the most common feed given. Analysis of the determinants of pre-lacteal feeding showed that perceived birth size, type of delivery, parity, early initiation of breastfeeding, gender role attitude, household wealth index, and place of residence were associated with pre-lacteal feeding. Not all variables that were initially assumed to be correlated with the result showed evidence of association. Variables reported to be predictors of pre-lacteal feeding in previous reports were maternal education, employment status, antenatal care visit, and place of birth. However, these variables showed no correlation in this study.[16,17]

Pre-lacteal feeding was practiced by 44% of mothers, whose ages were less than 24 months in 2017. This figure was lower than that of previous surveys, which was 60% in 2012 and 65% in 2007.[14] Compared to other ASEAN countries, pre-lacteal feeding in Indonesia was lower than Vietnam (73.3%) and higher than Laos (35%).[18,19] Some countries, such as Nepal and Ethiopia have lower figures with 29% and 8%.[20,21] Differences in geographical characteristics, exposure to modern lifestyle, and policies regarding breastfeeding might be the reasons for these differences.

Pre-lacteal feeding is associated with early initiation and exclusive breastfeeding. Infants with delayed breastfeeding initiation are more likely to receive the pre-lacteal feed. Introducing pre-lacteal feeding is negatively associated with the exclusive type as well.[22] The downward trend of pre-lacteal feeding in the last decade was followed by the increasing prevalence of early initiation or exclusive breastfeeding.[14,23] However, there were still more than half of the children not exclusively breastfeed. Therefore, more effort to improve the exclusive type or infant feeding practices should be prioritized.

Observing the pre-lacteal feeds given, infant formula

**Table 3. Bivariate Analysis for the Determinants of Pre-lacteal Feeding**

| Variable | Category | Pre-lacteal Feeding | | OR | 95%CI | p-value |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| Infants age (months) | 0-5 | 737 (54.0%) | 879 (55.0%) | 1 | | |
| | 6-11 | 693 (42.8%) | 904 (57.2%) | 0.91 | 0.77-1.09 | 0.32 |
| | 12-23 | 1,486 (44.0%) | 1,756 (56.0%) | 0.96 | 0.83-1.12 | 0.63 |
| Infants sex | Male | 1,513 (43.8%) | 1,831 (56.2%) | 1 | | |
| | Female | 1,403 (44.1%) | 1,708 (55.9%) | 1.01 | 0.89-1.15 | 0.82 |
| Birth type | Single | 2,892 (43.9%) | 3,524 (56.1%) | 1 | | |
| | Multiple | 24 (50.7%) | 15 (49.1%) | 1.31 | 0.59-2.90 | 0.5 |
| Perceived birth size | Small | 415 (53.3%) | 386 (46.7%) | 1.57 | 1.30-1.91 | <0.001 |
| | Average | 1,529 (42.0%) | 1,931 (58.0%) | 1 | | |
| | Large | 935 (44.2%) | 1,169 (55.8%) | 1.09 | 0.95-1.26 | 0.21 |
| Maternal age | Not at risk | 2,203 (44.2%) | 2,687 (55.8%) | 1 | | |
| | At risk | 713 (43.3%) | 852 (56.7%) | 0.97 | 0.84-1.11 | 0.63 |
| Maternal education | College or higher | 624 (45.9%) | 646 (54.1%) | 1 | | |
| | Secondary | 1,650 (44.3%) | 2,007 (55.7%) | 0.94 | 0.79-1.11 | 0.46 |
| | Primary or no formal education | 642 (41.7%) | 886 (58.3%) | 0.84 | 0.69-1.03 | 0.1 |
| Occupation | No | 1,582 (43.8%) | 1,929 (56.2%) | 1 | | |
| | Yes | 1,332 (44.2%) | 1,606 (55.8%) | 1.01 | 0.90-1.15 | 0.8 |
| Parity | ≤2 | 1,960 (45.8%) | 2,199 (54.2%) | 1 | | |
| | >2 | 956 (40.0%) | 1,340 (60.0%) | 0.79 | 0.69-0.90 | 0.001 |
| Antenatal care visits | ≥4 | 2,584 (43.9%) | 3,116 (56.1%) | 1 | | |
| | <4 | 322 (44.2%) | 409 (55.8%) | 1.01 | 0.82 1.25 | 0.92 |
| Type of delivery | Non-caesarean | 2,215 (41.2%) | 3,066 (58.8%) | 1 | | |
| | Caesarean | 700 (56.1%) | 470 (43.9%) | 1.82 | 1.55-2.15 | <0.001 |
| Birth attendant | Health professional | 2,689 (44.2%) | 3,206 (55.8%) | 1 | | |
| | Non-health professional | 226 (40.1%) | 332 (59.9%) | 0.84 | 0.63-1.12 | 0.25 |
| Place of delivery | Health facility | 2,296 (43.7%) | 2,761 (56.2%) | 1 | | |
| | Non-health facility | 620 (45.0%) | 777 (55.0%) | 1.05 | 0.89-1.25 | 0.55 |
| Gender role attitude | Conforming | 1,802 (43.2%) | 2,284 (56.8%) | 1 | | |
| | Non-conforming | 1,017 (45.7%) | 1,154 (54.3%) | 1.11 | 0.97-1.27 | 0.13 |
| Decision on health spending | Respondent alone | 1,222 (43.2%) | 1,525 (56.8%) | 1 | | |
| | Not respondent alone or other | 1,632 (44.8%) | 1,933 (55.2%) | 1.06 | 0.94-1.21 | 0.33 |
| Early initiation of breastfeeding | Yes | 1,153 (29.7%) | 2,579 (70.3%) | 1 | | |
| | No | 1,763 (64.8%) | 960 (35.1%) | 4.37 | 3.81-5.01 | <0.001 |
| Wealth index | Poorest | 701 (40.3%) | 1,046 (59.7%) | 0.8 | 0.65-0.98 | 0.03 |
| | Poor | 609 (44.4%) | 676 (55.6%) | 0.94 | 0.77-1.15 | 0.56 |
| | Middle | 553 (45.9%) | 619 (54.4%) | 1 | | |
| | Rich | 557 (46.6%) | 604 (53.4%) | 1.03 | 0.84-1.25 | 0.77 |
| | Richest | 496 (42.5%) | 594 (57.5%) | 0.87 | 0.70-1.08 | 0.2 |
| Place of residence | Urban | 1,405 (41.7%) | 1,740 (58.3%) | 1 | | |
| | Rural | 1,511 (46.1%) | 1,799 (56.0%) | 1.19 | 1.02-1.37 | 0.01 |
| Household size | ≤5 | 1,623 (44.1%) | 1,908 (55.9%) | 1 | | |
| | >5 | 1,293 (43.8%) | 1,631 (56.2%) | 0.99 | 0.87-1.12 | 0.85 |

**Notes:** OR = Odd Ratio, CI = Confidence Interval

was the most prevalent choice, as also shown in previously conducted IDHS and another national survey, namely Basic Health Surveys (*Riskesdas*).[8] Although the overall percentage of pre-lacteal feeding decreased over time, proportions of infant formula feeding in the first three days of life saw an upward trend.[8] Massive promotions of infant formula contributed to this condition. In Vietnam, infant formula was also the most popular pre-lacteal feed chosen.[13,18]

This study added the literature on factors associated with the pre-lacteal feeding practice in the Indonesian context. The only infant level characteristic showed an association between pre-lacteal feeding and perceived birth size: mothers perceiving their newborns were

smaller than average, to be given pre-lacteal feeds. This independent covariate acted as a strong predictor for pre-lacteal feeding either in bivariate or multivariate analysis. Previous studies in South Asia using DHS data also showed similar conclusions regarding this variable.[15] However, a meta-analysis on Ethiopian studies did not include birth size among their determinants.[17] Small size newborns often have difficulties when breastfeeding, normally due to problems with their ability to suck the breastmilk. This problem causes frustration for the infants, making them end up crying. Mothers often interpret infant crying as hunger and think of it that the breastmilk alone was not enough, therefore, their newborns should be given food/liquid besides breastmilk.

**Table 4. The Final Model for the Determinants of Pre-lacteal Feeding in Indonesia**

| Variable | Category | AOR | 95%CI | p-value |
|---|---|---|---|---|
| Perceived birth size | Smaller than average | 1.43 | 1.15 - 1.79 | 0.001 |
| | Average | 1 | 1 | |
| | Bigger than average | 1.08 | 0.92 - 1.26 | 0.35 |
| Type of delivery | Non-caesarean | 1 | 1 | |
| | Caesarean | 1.36 | 1.14 - 1.63 | 0.001 |
| Parity | ≤2 | 1 | 1 | |
| | >2 | 0.83 | 0.71 - 0.96 | 0.01 |
| Early initiation of breastfeeding | Yes | 1 | 1 | |
| | No | 4.13 | 3.58 - 4.75 | <0.001 |
| Gender role attitude | Conforming | 1 | 1 | |
| | Nonconforming | 1.15 | 1.00 - 1.32 | 0.05 |
| Wealth index | Poorest | 0.72 | 0.57 - 0.91 | 0.005 |
| | Poor | 0.90 | 0.72 - 1.12 | 0.36 |
| | Middle | 1 | 1 | |
| | Rich | 0.97 | 0.79 - 1.20 | 0.81 |
| | Richest | 0.90 | 0.70 - 1.14 | 0.38 |
| Place of residence | Urban | 1 | 1 | |
| | Rural | 1.31 | 1.11 - 1.54 | 0.001 |

**Notes:** AOR = Adjusted Odd Ratio, CI = Confidence Interval

Mothers delivering small-size infants also think that given pre-lacteal feeds help their newborns to gain weight faster.

Cesarean delivery was consistently reported as a factor discouraging recommended breastfeeding practices in developing countries.[13,24] This study also had the same conclusion, in which mothers with cesarean delivery had around 50% higher likelihood to introduce pre-lacteal feeding. Mothers delivered by c-section, either as an emergency or planned c-section, were reported to have difficulties with breastfeeding due to the inability to produce enough milk, inverted or flat nipples, and feeling of discomfort due to swollen or painful breasts, and soreness nipples.[25] These conditions drive mothers to introduce pre-lacteal feeding, and this chance was higher when there was no assistance or lactation support available. Besides, women undergoing c-sections were less likely to plan to breastfeed compared to those with vaginal deliveries.[25]

Women with higher parity had a lower likelihood to introduce pre-lacteal feeding.[13] In Asia, first-time mothers were more likely to give pre-lacteal feeds. They had a lower chance to adopt other recommended infant feeding practices, such as early initiation and exclusive breastfeeding, and appropriate complementary feeding.[13,26,27] A possible explanation for this result was that women with higher parity have more experience in dealing with infant feeding. They learned what they had done for their previous children, what worked, and those that did not.

Compared to other covariates in this analysis, early initiation of breastfeeding was not only the most solid predictor. However, it also had the biggest effect size. This result was in line with existing literature stating that early initiation acts as protective toward pre-lacteal feeding.[17] The period between delivery and late breastfeeding might increase the probability of mothers that gives pre-lacteal feed. Meanwhile, advice from family members might influence mothers' decisions, whether to give pre-lacteal feed or not. A study in southern Ethiopia showed that grandparents were the most common external source of information to introduce pre-lacteal feeding.[5]

Findings on women empowerment-related variables (gender role attitude) showed that the factor of 'nonconforming', women, predict pre-lacteal feeding. This finding was similar to that of the analysis on Afghanistan population surveys, which showed that women empowerment was associated with the introduction of pre-lacteal feeding.[15] In the latter study, another variable, namely women's decision-making autonomy, also predicted that autonomous women were more likely to give pre-lacteal feed. This variable was not included in the present study; however, a variable representing decision on health spending was analyzed and showed that health spending was not associated with pre-lacteal feeding.

Analysis showed some evidence of the association between socioeconomic variables, which were wealth index and pre-lacteal feeding. However, this correlation was only significant in the poorest group. Mothers from the lowest wealth-quintile were less likely to introduce pre-lacteal feeds than those from the middle. Studies in Vietnam and Laos also found similar results that a high socioeconomic status was a risk factor for pre-lacteal feeding.[19] A possible explanation for this finding is because breastmilk substitutes, such as infant formula, were highly regarded and perceived as a symbol of a

modern lifestyle. Women of higher socioeconomic status were able to afford it, unlike the underprivileged. A similar finding was also reported on the association between breastfeeding and socioeconomic factors that, breastfeeding was more common in lower socioeconomic women.[2]

Living in rural areas increased the odds of introducing pre-lacteal feeding, as shown in this analysis, was also reported by several studies on African populations.[17,28] Cultural beliefs and local norms are more commonly practiced by rural communities. The lack of access to information related to optimal infant feeding practices was among the reasons behind the higher proportion of rural women introducing pre-lacteal feeding. Besides, variables related to cultural practices and information about Infant and Young Child Feeding (IYCF) were not included in this study.

This study used a nationally representative dataset on a large scale which provides reliable results for the analysis. The variables also used international definitions to be compared with previous studies. Analysis conducted in this report also took into account a complex survey design. Some limitations were unavoidable, while data on pre-lacteal feeding were obtained using the recall method, resulting in memory bias as respondents were asked, what happened in 0-22 months before the interview. Secondly, analyzing data from a cross-sectional design, reflected the association between variables, while causal inference was restricted. There was also one variable with several missing values that were not excluded in the multivariate analysis due to its very strong association with the results. However, this potential bias caused by missing data should not be significant since the data missing did not differ between clusters.

## Conclusion

Perceived birth size, type of delivery, parity, early initiation of breastfeeding, and place of residence were found to strongly associate with pre-lacteal feeding. Infants born with smaller-size than average, such as those delivered by cesarean section, are more likely to receive a pre-lacteal feed. Mothers with one or two children have higher odds of introducing and engaging in this practice. By contrast, respondents that initiated breastfeeding within the first hour after delivery have lower odds of giving a pre-lacteal feed. In contrast, urban women have a higher likelihood of giving this feed. Household wealth index and gender role attitude showed some evidence of association with pre-lacteal feeding. The poorest respondents had a higher risk of introducing solid/ liquid feeds in the first three days after delivery. The 'non-conforming women' were more likely to engage in this practice. Therefore, interventions are needed to discourage mothers from introducing pre-lacteal feeding.

Efforts should also be made by directly targeting modifiable covariates, such as early initiation of breastfeeding and specific measures on cesarean delivery. Health facilities need to ensure that early initiation of breastfeeding is part of the procedure either for normal or cesarean delivery. This was also found in previous studies which showed that early initiation of breastfeeding rate was lower in women with cesarean compared to those with normal delivery. Health staffs also need sufficient skills and knowledge to educate women and their families about the recommended infant feeding practices. This effort is effective when the procedures in the health facilities include this activity. Further studies explaining the associations between early initiation of breastfeeding, cesarean delivery, and pre-lacteal feeding are needed to formulate more effective interventions.

Women with more than two children were chosen to be part of the community-based interventions related to infant feeding and targeting pregnant women as they already have experience dealing with this practice. The analysis also showed that they were less likely to introduce pre-lacteal feeding. Moreover, it is important to address this issue, as the smaller-size-born infants are more prone to receive pre-lacteal feeds, and the education from health staff on how to prevent low-birth-weight is also crucial. Special attention should be given to women from the lowest socioeconomic background and those with non-conforming gender role attitudes, as they have a higher chance of giving pre-lacteal feeds.

In Indonesia, all these efforts should be integrated into community health centers with more massive education and counseling, targeting the pregnant women and the family. In delivery, health facilities play a crucial role in counseling and education on infant feeding, and it is to support all breastfeeding-friendly policies.

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

**Availability of Data and Materials**

The materials and dataset used in this study were accessed at https://dhsprogram.com/data/available-datasets.cfm.

**Authors' Contribution**

SN was responsible for the overall concept of the study, analysis, and writing the manuscript. SM helped the concept and statistical analysis, while KEW contributed to the writing. All authors discussed the content of this manuscript and approved the final version.

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# The Effect of Smoking on Carbon Monoxide Respiration among Active Smokers in Palembang City, Indonesia

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**Abstract**

Smoking leads to disease and disability as well as harms nearly every organ of the body. Furthermore, tobacco-smoking is known to cause pulmonary dysfunction and lead to complications, pain, or even death. This study aimed to measure the risk factors for the respiration of carbon monoxide among smokers. A cross-sectional design was implemented by involving 156 smokers in Karyajaya Subdistrict, Palembang City. The dependent variable was carbon monoxide levels (ppm), while the independent variables were smoking frequency, duration, and the last period of smoking. The carbon monoxide levels (ppm) measured with a PiCO + Smokerlyzer® device from Bedfont Scientific Limited were the study tool and the independent variables of the questionnaire. The Pearson Correlation and multiple linear regression were used for the analysis. The multiple linear regression analysis results revealed that smoking duration assessment is related to carbon monoxide respiration after controlling smoking frequency, the last period of smoking, and the distance of residence to sources of exposure. The smoker's respiration of carbon monoxide level was 72.5% influenced by the duration, frequency, last period of smoking, and distance of residence to sources of exposure. Reducing the frequency of smoking and stopping may prevent and control carbon monoxide respiration.

**Keywords**: carbon monoxide level, smoking duration, swamp, tobacco smoke

## Introduction

Smoking is a risk factor for several diseases, including cardiovascular disease, chronic obstructive pulmonary disease, and lung cancer. However, the specific role of the smoke of cigarette in the disease remained unclear. Furthermore, it is a complex aerosol made up of thousands of chemicals compounds identified as carcinogens.[1]

One of the more toxic substances in the tobacco gas phase is Carbon monoxide (CO), which can cause tissue hypoxia toxicity because it can bind 200 to 240 times the amount of oxygen to hemoglobin that can decrease oxygen transport capacity and inhibit the release of oxygen in cells.[2] Furthermore, CO can also cause cardiovascular dysfunctions such as angina, myocardial infarction, arrhythmias, left ventricular dysfunction, myocardial transient fainting, cardiogenic shock, and sudden death.[3]

The acute effects of cigarette smoke containing CO influenced the biochemical conditions of the lungs, which can lead to lung disease.[1,4] The CO content exhaled by the body is influenced by physiological factors and disease in which endogenous and exogenous factors influ-

ence the amount of carbon monoxide stored in the body.[5] Furthermore, its poisoning occurred in different populations and was influenced by the type of work, and the jobs at risk were workers exposed to the gas.[6]

The CO monitoring each individual can identify populations at high risk for respiratory diseases related to air pollution. Exposure to CO has been shown to correlate with concentrations of particles that can cause respiratory problems, lung disease, increase the risk of asthma, and even death.[7-9] Lung disease and respiratory disorders can cause disability and poor quality of life.[10,11] People that survive severe CO poisoning may suffer long-term health problems. Furthermore, the CO is quick to connect with the red blood cells but slow to exit the body.[12] The average CO level of smokers was higher than that of non-smokers, proving that exposure to cigarettes affects biological conditions in the body.[13]

The acute effects of smoking influence the biochemical conditions in the lungs.[14] This study played an important role to determine the levels of CO in the lungs of active smokers, which accumulates over a long period of time. The main objective of this study was to measure ac-

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tive smokers' CO levels in the respiratory cavity and to find out the factors associated with high levels of CO.

## Method

In this study, a cross-sectional design was created in which the duration of smoking and the CO levels of the respiratory tract were measured simultaneously. The population was all households in the Karyajaya Primary Health Care working area, consisting of 40 neighborhood groups with a total population of 2,631 residents and is located near the river bank with house-like features.

The Probability Proportionate to Size (PPS) sampling method and systematic random sampling were applied. The sampling frame consists of households in each neighborhood group, with the total sample of 156 respondents.

There were several inclusion criteria, such as household members that smoke at least for six months with two active smokers living in one house. This criteria involves the choosing of only one person—the oldest one, also family members that were not diagnosed with acute respiratory tract infections and pulmonary tuberculosis.

A questionnaire and a portable PiCO + Smokerlyzer® device from Bedfont Scientific Limited were used as a study instrument. The measurements of CO levels in the respiration were carried out by how the respondent breathed, as usual, inhaled, and held his breath for 20 seconds. After holding his breath, the respondent immediately exhaled on the measuring device until it was lifted. Within a few seconds, the measurement device would show CO levels on the screen and were calculated using part-per-million (ppm).

The analysis started with a data completion by editing, coding, and entering. The refined was further analyzed by using the univariate, bivariate, and multivariate methods. Furthermore, univariate analysis was conducted to describe the characteristics and distribution of each variable, gender, education, job status, income level, and cigarette types.

The gender variable was divided into two categories of men and women. The education variable was divided into no school education, graduated from elementary school, graduated from junior high school, and graduated from senior high school. The job-status variable was divided into unemployment, student, driver, parking attendant, factory worker, mechanic, merchant, labor, teacher, and employee. The income level variable was divided into less than Guaranteed Minimum Income (GMI), and $\geq$ GMI. The cigarette types variable was divided into Clove and White. The measurement results variable was divided into smoking duration, frequency, age, a distance of residence to sources of exposure, last period of smoking, age of the first period of smoking, and family income with numerical data. The bivariate statistical analysis using correlation test with the model selected candidates only

variable with significance < 0.25 to be continued into the multivariate analysis using multiple linear regressions test. This study passed the ethical review of the Faculty of Public Health Universitas Sriwijaya with the number of 124/UN9.1.10/KKE/2019.

## Results

Based on the data recorded in Table 1, the respondents were 156 people with the characteristics of the majority of men being 98.1%, the level of education graduating from elementary school was 41.7%, employed 41.7%, income level below the regional minimum wage at 71.8%, and smoking clove cigarettes at 83.3%. The average level of CO was 12.38 ppm with the highest level of 23 ppm, the average frequency of smoking was 13 cigarettes in the last three days, the average smoking period was 16 years, and the last period of smoking was 128 minutes ago, as recorded in Table 2.

The result of the correlation analysis showed a positive correlation between the duration of smoking, the age, and the CO values in the respiratory cavity of smokers with a moderate correlation strength. The correlation between smoking frequencies—the level of income with CO

**Table 1. Characteristics of Active Smoker Respondents in Palembang City (n = 156)**

| Variable | Category | n | % |
|---|---|---|---|
| Gender | Male | 153 | 98.1 |
| | Female | 3 | 1.9 |
| Education | Not having school | 4 | 2.6 |
| | Graduated from elementary school | 65 | 41.7 |
| | Graduated from junior high school | 45 | 28.8 |
| | Graduated from senior high school | 42 | 26.9 |
| Job status | Unemployment | 12 | 7.7 |
| | Student | 2 | 1.3 |
| | Driver | 16 | 10.3 |
| | Parking attendant | 4 | 2.6 |
| | Factory worker | 33 | 21.2 |
| | Mechanic | 2 | 1.3 |
| | Merchant | 7 | 4.5 |
| | Labor | 65 | 41.7 |
| | Teacher | 1 | 0.6 |
| | Employee | 14 | 9.0 |
| Income level | < Guaranteed Minimum Income (GMI) | 112 | 71.8 |
| | $\geq$ Guaranteed Minimum Income (GMI) | 44 | 28.2 |
| Cigarettes types | Clove | 130 | 83.3 |
| | White | 26 | 16.7 |

**Table 2. Distribution of Active Smokers Respondents in Palembang City (n = 156)**

| Variable | Mean | Median | 95%CI | |
|---|---|---|---|---|
| | | | Lower | Upper |
| Carbon monoxide levels (ppm) | 12.38 | 13 | 11.39 | 13.36 |
| Smoking frequency (last 3 days) | 13.12 | 12 | 11.87 | 14.37 |
| Smoking duration (year) | 16.49 | 16 | 15.26 | 17.72 |
| Last time of smoking (minute) | 128.69 | 127 | 101.37 | 156 |

**Note:** CI = Confidence Interval

levels showed a positive correlation with strong correlation strength. The correlation between the first period of smoking showed a significant negative correlation with medium correlation strength, while the distance where the respondent lived to the factory showed a negative correlation with the weak correlation strength. The last period of smoking showed a negative correlation with strong correlation strength, as shown in Table 3.

Multiple linear regression results showed that duration of smoking, smoking frequency, last hour of smoking, and distance from home to sources of exposure are variables that predict smoker monoxide carbon levels. The coefficient of determination R squared (Table 4) showed the value of 0.725, which means that the regression model obtained can explain 72.5% of the variation smoker monoxide concentration level. This regression equation model also fulfilled the assumptions such as existence with residual value (mean) 0.0001, linearity with ANOVA value obtained 0.0001 < 0.05. The homoscedasticity, which is a non-patterned scattering point and spreads evenly around the zero points in such a way that multivariate normality also fulfills assumptions. There was no VIF value for each variable in the model that exceeded 10. Therefore, there was no multicollinearity between the independent variables. Assumptions that meet the requirements stated that the regression model is fit (Table 4). Carbon Monoxide Levels of Smokers = 8.326 + 0.092 (Smoking Duration) + 0.453 (Smoking Frequency) + (-0.014) Last Time of Smoking + (- 0.014) Distance of Residence to Sources of Exposure.

## Discussion

This study showed that most of those on low incomes or below the district salary were 71.8% and had smoking habits, which increased the level of carbon monoxide in the respiratory cavity. The human respiratory tract would receive between 15,000 and 40,000 µg particulates matter with one cigarette. Long-term smoking habits affect the health of healthy people and those that are already sick, especially in the respiratory system. The carbon monoxide component in cigarette smoke contained 2-6%.[15] Exposure to cigarette smoke increased carbon monoxide levels in breathing activity in such a way that it can increase the risk of sleep apnea, asthma, and pulmonary tuberculosis.[16]

The results showed that the average level of CO was 12.38. Teenagers that smoked between the age of 13-17 years had carbon monoxide levels of 2.14 ppm and 8 ppm.[17] The average CO level was higher for smokers compared to non-smokers.[18] This study was in line with Sandberg, *et al.,*[19] study result, which revealed that the smokers smoking the last eight hours had higher CO levels than those smoking more than eight hours and non-smokers. The frequency of smoking correlates with the CO values. The frequency of the correlation of smoking with the CO values correlates with weaknesses.[19]

Increasing the levels of CO smokers also correlated with old smokers. The longer a person smokes, the higher the CO level. Furthermore, CO can be synthesized endogenously with several physiological effects resulting in significant morbidity and mortality.[20,21] Another study also stated that the smokers of 50 packs and 20 packs per year had higher levels of CO and had a higher risk for respiratory problems.[22]

The results showed that the average level of CO was 12.38. Teenagers that smoke between the age of 13 and 17 had carbon monoxide levels of 2.14 ppm and working totals of 8 ppm.[17] An individual that had been smoking for a long time would be positively correlated to the incidence of myocardial infarction because carbon monoxide was considered a pollutant and toxic that can bind to the heme-containing iron from hemoglobin.[2]

This study revealed that there was a positive correlation between the smoking duration and CO levels. Exhaled carbon monoxide (CO) levels were positively associated with smoking. Active smokers have higher CO levels for both men and women than those that never smoke.[23]

The results showed a positive correlation between the

**Table 3. Correlation Analysis of Independent Variables with Carbon Monoxide Level**

| Variable | p-value | Correlation Coefficient |
|---|---|---|
| Smoking duration | 0.0001 | 0.40 |
| Smoking frequency | 0.0001 | 0.77 |
| Age | 0.0001 | 0.28 |
| Distance of residence to sources of exposure | 0.029 | - 0.17 |
| Last time of smoking | 0.0001 | - 0.62 |
| Ages of the first time smoking | 0.001 | - 0.28 |
| Family income | 0.042 | 0.60 |

**Table 4. Final Model of Multiple Linear Regression**

| Variable | B-value | p-value | VIF | Residual (Mean) | R Square | ANOVA | Durbin-Watson | Constanta |
|---|---|---|---|---|---|---|---|---|
| Smoking duration | 0.092 | 0.02 | 1.291 | | | | | |
| Smoking frequency | 0.453 | 0.0001 | 1.418 | | | | | |
| Last time of smoking | - 0.014 | 0.0001 | 1.136 | 0.001 | 0.725 | 0.0001 | 2.066 | 8.326 |
| Distance of residence to sources of exposure | - 0.002 | 0.002 | 1.101 | | | | | |

**Notes:** VIF = Variance Inflating Factor; ANOVA = Analysis of Variance

smoking frequencies with carbon monoxide levels in the respiratory cavity. This research was in line with Zhang, *et al.*,[23] which stated that the average CO levels were higher in people who smoke cigarettes every day than non-smokers. The respondent's living near the industry (factory) and landfills are exposed to higher level of CO of about 23.1%. Furthermore, CO exposure can also increase due to environmental pollution and living close to the source of pollution. The last time of smoking was negatively correlated with CO levels in the respiratory cavity. The longer the CO level was measured in the lungs of a smoker, the lower the level of CO level. People that smoke had higher levels of CO than non-smokers.[23]

The strength of this study was to determine the levels of respiratory carbon monoxide in smokers. The measurements were made directly using a reliable measuring instrument with a valid result and the data can be used to control diseases in smokers. The weakness of the chosen design was the lack of strong causality between cigarette smoke exposure and respiratory CO levels among smokers.

## Conclusion

The duration of smoking influences the respiratory carbon monoxide content of 72.5% in smokers. Other factors influence the frequency of smoking, the last period of smoking, the distance of residence to sources of exposure, and 28.5%.

## Recommendation

Reducing the frequency of smoking and even stopping smoking may prevent and control the respiratory of carbon monoxide.

### Abbreviations

CO: Carbon monoxide; PPS: Probability Proportional to Size; PPM: Part-Per-Million; VIF: Variance Inflating Factor; GMI: Guaranteed Minimum Income; CI: Confidence Interval.

### Ethics Approval and Consent to Participate

This research has passed the ethical review in the Faculty of Public Health with the number of 124/UN9.1.10/KKE/2019.

### Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

### Availability of Data and Materials

Data and all related materials from this study are available by the first author.

### Authors' Contribution

RJS designed the study, developed data instrument for collecting the data, data analysis, and drafted the manuscript. Other authors assisted in the analyzing and interpreting data, finding the supporting journals, correcting the writing procedures, and finalizing manuscripts.

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# The Significance of Super Depo Sutorejo: Waste Management Project in Surabaya Municipality, Indonesia

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## Abstract

The Super Depo Sutorejo Surabaya (SDSS) project was created to separate household waste into fractions, but its separation effect is unknown. This study assessed the significance of the project in sorting general waste into biodegradable, non-biodegradable, and assorted. The t-test compared the means of general and biodegradable waste (normally distributed). The non-biodegradable and assorted waste were not significantly distributed; therefore, the Wilcoxon Signed Ranks Test was used to compare their medians against general waste. The multivariate analysis compared the significance level of each waste fraction. Each statistical analysis showed that the SDSS significantly sorts the general waste. The p-values were (0.000) < 0.05 for each type of waste fraction. Furthermore, the multivariate analysis showed that all variables were similar, and p-values (0.00) < 0.05. The biodegradable waste was the most significant fraction (Mean = 176,715.9; SD = 57,990.8), followed by the assorted (Mean = 171,412.5; SD = 94,631.3), and non-biodegradable (Mean = 35,243.8; SD = 17,290.7). The results showed that the SDSS significantly segregates general waste into biodegradable, non-biodegradable, and assorted, therefore hypothesis (H1) is accepted. This study recommends the Government of Surabaya to maintain and expand this waste management project throughout the city alongside the improvement of the community participation program.

**Keywords**: assorted waste, biodegradable, non-biodegradable, sorting, waste

## Introduction

Cities located in both developed and developing countries worldwide are confronted with devastating waste generation.[1,2] The Department of Ecology, State of Washington reported that city waste reached 9.7 million tons a year.[3] Melbourne City produced 10 million tons of garbage in 2016.[4] Furthermore, Kuala Lumpur, Malaysia, produced 3,000 tons of waste per day.[5] The Capital of Indonesia, Jakarta, generated 6,500 tons of waste each day, and Surabaya generated 1,450-2,000 tons per day.[6-8]

Waste handling requires adequate resources, advanced technology, and innovation. However, funding shortages, limited waste collection coverage, lack of knowledge on handling waste, coupled with irresponsible behaviors and practices of the residents in treating household waste pose challenges to city authorities.[9] The World Bank stated that waste management is expensive and may take up 50% of the budget of cities.[10]

The Government of Surabaya (GoS) has made substantial achievements in waste management. This made the city to have one of the best practices in waste management in Indonesia.[11-13] Various environment-friendly programs have been implemented, such as community-based composting, use of waste bank (residents deposit their recyclable waste for money). Other practices include spreading net between river banks to catch trashes and riverbank cleaning competition for residents living along the bank to maintain the rivers cleanliness. Currently, the GoS has introduced the "bus waste" in which passengers use plastic mineral water bottles as their tickets. The city also introduced the Black Soldier Flies (BSF) using the black flies' larvae to consume the biodegradable waste.[14-16]

Regardless of the tireless efforts of the GoS in caring for the waste of the city, the waste generation of residents is still alarming. Currently, it is obvious that the aforementioned waste handling practices have not entirely resolved waste matters. In 2015, waste production ranged between 1,450–2,000 tons per day.[7,13] The amount of waste generated in 2018 was 1,600 tons daily.[17] Waste began to pose a serious problem when adequate waste management was unavailable. The situation was worsened when households as the main generator of waste

failed to treat waste properly at home. Studies in different areas of Indonesia showed that community participation and poor awareness of residents to segregate garbage at the household level are still low.[18-20]

Responding to this issue, the GoS introduced advanced waste management, known as Super Depo Sutorejo Surabaya (SDSS) project. This is a collaborative project between the city of Surabaya and its sister city, Kitakyushu, Japan. The Nishihara Cooperation in Japan provides supervision, managerial, and technical supports for SDSS management. The project is aimed to separate the household general waste into three fractions; recyclable (non-biodegradable), organic (biodegradable), and assorted (miscellaneous) wastes. The management used biodegradable waste as raw materials for composting, sold non-biodegradable waste to recycling companies, and disposed of the miscellaneous or assorted waste to landfills.

Furthermore, the GoS claimed that the SDSS project is one of the city's best practices on waste management.[21,22] The project has been operating for nearly seven years since 2013. Based on the authors' point of view, the significance of the project in sorting waste before dumps from unusable fractions into landfills is unknown. This study aimed to assess the significance of the SDSS project in sorting general waste into biodegradable, non-biodegradable, and unusable-assorted waste. It was hypothesized (H1) that the SDSS project significantly sorted general waste into biodegradable, non-biodegradable, and assorted waste. Furthermore, this study was essential to assess the significance of the SDSS project as a sustainable waste management for the city of Surabaya.

**Method**

This study took place in the SDSS warehouse at Dukuh Village, Mulyorejo Subdistrict, Surabaya, East Java Province, Indonesia. It occupies nearly 1,483 m$^2$ alongside Kali Waron Street surrounded by crowded housing. A small river, called Kali Waron, flows just a few meters in front of the depo. The SDSS site is used as a temporary waste dumpsite for households before the dump trucks collect and disposed of the rubbish into the landfills. Additionally, the project sorted the general waste of two villages (Dukuh and Kalisari) comprising a total of 8,564 households. The waste collectors (known as *Tukang Sampah* in the Indonesian term) collect the general waste from door to door and drop the garbage at the SDSS warehouse, while residents pay them for these services.

This is a quantitative study using statistical tools for data analysis, comparing the means between the general waste and the means of the three fractions of waste sorted (biodegradable, non-biodegradable, assorted waste). The SDSS has a well-documented data of the general waste processed and the three waste fractions starting from January 2014 to December 2018. The record shows that the total weight of the general waste (4,599,256 kgs), biodegradable (2,120,519 kgs), non-biodegradable (422,926 kgs), and assorted waste (2,056,944 kgs). The waste records from 2014 to 2018 were all taken as the samples of the study. Data collection began with scrutinizing the weight (kgs) records of general waste processed from January 2014 to December 2018. The total number of each general, biodegradable, non-biodegradable, and assorted waste were recorded in a spreadsheet file. Afterwards, the authors calculated the total monthly waste of each group. The data were then simplified into the annually based calculation (see Table 1).

Data were statistically analyzed and followed the three steps. Firstly, the analysis began with the testing of data normality using the Kolmogorov-Smirnov test. This test showed that the biodegradable waste fell into a normal distribution, p-value (0.191) > 0.05. Meanwhile, the distribution of the non-biodegradable waste was identified (p-value = 0.01) < 0.05, and the remaining waste debris (p-value = 0.00) < 0.05 were not normally distributed. Secondly, the paired t-test was used to compare the means of general and biodegradable waste. Since both non-biodegradable and assorted waste were not normally distributed, the Non-Parametric Wilcoxon Signed Ranks test was performed to compare the medians of the general waste against non-biodegradable and assorted waste. Thirdly, multivariate analysis was also used to identify the most significant fractions of waste sorted from the waste processed.

**Results**

The SDSS is a warehouse which contains two waste conveyor belts, a waste-washing machine, a grinding or crusher machine, and a packing machine. A small office is available for three staff of *Dinas Kebersihan dan Pertamanan Kota Surabaya (DKPK)*, the department responsible for waste management and city park maintenance. The management installed a digital scale at the entrance floor to measure the weight of waste before and after the sorting process, and these records constituted the data set for this study.

The SDSS management employed 25 people to sort the waste. They were previously self-employed waste pickers at this temporary dumpsite, while some were itinerant waste pickers. The workers were bound to a one-year formal contract, which was extendable. The management paid USD 66.32 a month to the waste sorters, including a top-up incentive, approximately USD 22.11-29.48 per month, from the money earned, from selling non-biodegradable waste. Therefore, the workers took home payments of about USD 88-99.8 a month.

**Table 1. The Weight of Waste Loaded and Processed at The Super Depo Suterejo Surabaya Warehouse (2014-2018) (kgs)**

| Year | Waste Processed | Biodegradable | % | Non-Biodegradable | % | Assorted Waste | % |
|---|---|---|---|---|---|---|---|
| 2014 | 3,161,853 | 1,355,028 | 42.9 | 238,930 | 7.6 | 1,567,814 | 49.6 |
| 2015 | 3,037,107 | 1,638,707 | 53.9 | 238,601 | 7.9 | 1,159,908 | 38.2 |
| 2016 | 3,842,899 | 2,237,927 | 58.2 | 362,158 | 9.4 | 1,248,812 | 32.5 |
| 2017 | 5,684,276 | 2,574,094 | 45.3 | 625,974 | 11 | 2,484,204 | 43.7 |
| 2018 | 7,270,145 | 2,797,198 | 38.5 | 68,965 | 8.9 | 3,823,982 | 52.6 |
| Average | 4,599,256 | 2,120,519 | 47.8 | 422,926 | 8.9 | 2,056,944 | 43.3 |

**Table 2. Results of t-test on Paired Sample of Processed and Biodegradable Waste**

| | Paired Difference | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mean | SD | 95%CI | | t | df | Sig. (2-tailed) |
| | | | Lower | Upper | | | |
| Waste processed – Biodegradable waste | 206,555.433 | 108,511.205 | 178,524.017 | 234,586.850 | 14,745 | 59 | .000 |

**Notes:** SD = Standard Deviation; CI = Confidence Interval; df = Degree of Freedom

**Table 3. Results of Wilcoxon Signed Ranks Test**

| | N | Z | Asymp. Sig. (2-tailed) |
|---|---|---|---|
| Non-biodegradable waste – Waste processed | 60 | -6,736[b] | .000 |
| Assorted waste – Waste processed | 60 | -6,736[b] | .000 |

The working process begins when some of the *Tukang Sampah* rummages from door to door, collect, and transport waste to the SDSS warehouse. The carts pass the weighing scale to record the amount of trash before waste collectors load the rubbish onto the conveyor. The conveyor belt then moves forward, and the waste sorters (standing along with the conveyor belts) start separating the non-biodegradable (recyclable waste) and biodegradable waste (e.g., food leftovers, leaves, etc. from general waste) and place them into containers. Some workers also load the sorted non-biodegradable waste into the washing machine and leave for a couple of days to dry up. Finally, the workers pack and stack the non-biodegradable waste waiting for the recycling company for collection.

Similarly, some waste sorters work on biodegradable waste. They contain the biodegradable waste into several baskets, loaded into a grinding machine to produce waste debris for composting purposes. Other workers scale the waste fraction and wait for the trucks to collect and transport them to the composting warehouse about 5 km away. Meanwhile, workers receive the unusable miscellaneous waste at the end-point of the conveyor, load into carts, scale them at the entrance, and stack them in the front yard. The available trucks then transport the waste remains to the landfills.

The SDSS capacity is 500 kg/hour and treats nearly

**Table 4. Descriptive Analysis of Multivariate Test**

| | Mean | SD | N |
|---|---|---|---|
| Biodegradable | 176,715.90 | 57,990.79 | 60 |
| Non-biodegradable | 35,243.80 | 17,290.68 | 60 |
| Assorted waste | 171,412.52 | 9,4631.32 | 60 |

**Note:** SD = Standard Deviation

approximately 10 tons of garbage in one day. However, the records showed that the SDSS project operates beyond its capacity. The households' general waste generation is also on the increase. Table 1 describes the accumulation and outputs of waste sorting at SDSS. The record of waste handled by the SDSS was approximately 3,161,853 kgs in 2014, gradually increased to 3,842,899 kgs in 2016 and reached 7,270,145 kgs in 2018. Biodegradable waste was the highest fraction (47.8%), followed by miscellaneous (43.3%) and non-biodegradable waste (8.9%). Therefore, the SDSS project reduced waste sent to the landfill for final disposal by 56.7%. The non-biodegradable waste only reached 8.9% for the recycling process.

Table 2 shows the results of the t-test statistical analysis. The paired t-test of processed and biodegradable waste produced the p-value (0.000) < 0.05. This signified that the SDSS project significantly segregated biodegradable waste from general.

Similarly, the Wilcoxon signed-rank test showed that

**Table 5. Multivariate Test**

| Effect | | Value | F | Hypothesis df | Error df | Sig. | Partial Eta Square |
|---|---|---|---|---|---|---|---|
| Intercept | Pillai's Trace | .284 | 7.391[b] | 3.000 | 56.000 | .000 | .284 |
| | Wilks' Lambada | .716 | 7.391[b] | 3.000 | 56.000 | .000 | .284 |
| | Hotelling's Trace | .396 | 7.391[b] | 3.000 | 56.000 | .000 | .284 |
| | Roy Largets Root | .396 | 7.391[b] | 3.000 | 56.000 | .000 | .284 |

**Note:** df = Degree of Freedom

the medians of both non-biodegradable and miscellaneous waste were considerably lower after processing at the SDSS warehouse, p-values (0.00) < 0.05. Both paired t-test and Wilcoxon Signed-Rank tests confirmed that the SDSS project significantly separated general waste into non-biodegradable and assorted waste (Table 3).

To identify the most significant among the three outputs of waste processing, the descriptive analysis of the multivariate test showed that the biodegradable waste (Mean = 176,715.9; SD = 57,990.8) was the most significant fraction, followed by the assorted (Mean = 171,412.5; SD = 94,631.3), and non-biodegradable (Mean = 35,243.8; SD = 17,290.7) (Table 4). Therefore, the SDSS sorts more biodegradable waste compared to the other waste fractions.

Wilks' Lambada analysis was used to measure the simultaneous comparison of variables. It was observed that the value of F = 7.391 and p-value (0.00) < 0.05. Therefore, the SDSS significantly sorted general waste into three different waste fractions (Table 5).

**Discussion**

Sorting waste at the household level is a good waste management practice. It requires a strong commitment of residents to participate in treating their trash before disposal to the landfills. However, studies worldwide showed that community participation in waste segregation was still poor regardless of a continuous campaign.[23-26] Similarly, this study showed that waste sorting among residents around the SDSS working area was absent, as indicated by the increasing amount of waste sent to the SDSS project for sorting.

The GoS competed with uncontrollable waste generation, low community participation in waste separation, overloading of the landfills, and high cost of waste management. The SDSS project may be a solution to tackle the waste issue of the city. Furthermore, the SDSS project fulfilled the standard of waste management stated in the Act No. 18 of 2008 regarding Waste Management, which requires collection, sorting, and recycling, before final disposal of waste, Reduce, Reuse and Recycle (3Rs) principles of waste management. The 3Rs principles constitute feasible waste management practiced throughout the world.[9,27,28] These principles were applied by the SDSS project in handling the waste of households in both villages.

The sorting process substantially reduced general waste up to 57.7%, which comprises 47.76% for biodegradable, and 8.96% for non-biodegradable waste. Furthermore, only 42.5% of the household wastes ended up in landfills. This waste handling was a good practice to extend the operation time of the landfills. The city authority of Surabaya will save millions of dollars if this waste treatment operated throughout the city.

The t-test of biodegradable waste concluded that the p-values (0.00) < 0.05. This showed that the SDSS succeeds in separating biodegradable waste from the general. The Wilcoxon Signed-Rank Test also showed that the p-values of both non-biodegradable and assorted waste were lower than 0.05, which signified that the SDSS significantly segregates non-biodegradable and assorted waste from general waste. Therefore, the SDSS was a reasonable waste management for the city of Surabaya.

The results of multivariate analysis were similar to the mean comparison above. The multivariate descriptive analysis showed that the waste sorting process at SDSS produced more biodegradable waste (Mean = 176,715.9). This percentage was slightly bigger than the disposed waste (Mean = 171,412.5). Moreover, biodegradable waste was far bigger than non-biodegradable (Mean = 35,243.8). These results reconfirmed that the percentage of biodegradable waste (47.8%) exceeded the other fractions; non-biodegradable (43.3%) and disposed waste (8.9%). Also, the overall process of waste sorting signified that the SDSS significantly separated the general waste into biodegradable, non-biodegradable, and assorted.

Waste sorting at the point where it is produced, (e.g., households, community, construction, public facilities, industry, etc.) is widely practiced worldwide.[29-31] For example, waste separation was introduced in Bali, known as the Gianyar Waste Recovery Project, which sorted the waste of over 500,000 households. The sorting process produced biodegradable (85%), non-biodegradable (5%), and assorted waste fractions.[29] Furthermore, a study in India showed that waste segregation before final disposal was a workable technology for waste management, as it produced 50% biodegradable for composting, and 18-20% reusable or recyclable waste.[30] Norbu, *et al.*,[32] also observed that the pretreatment of waste for

composting reduced nearly 40% of solid waste thrown in landfills. A pilot project in China, at source-separated collection became the priority to overcome household waste.[33]

Waste is a disaster for both health and the environment, but it is an economic opportunity for some people (e.g., waste pickers) and recycle businesses. Besides reducing waste sent to, and prolonging the operation of the landfills, the SDSS project provided additional benefits for the city of Surabaya. The project separated nearly 9% of non-biodegradable waste and earned money from the sales of these recyclable materials. In addition, the recyclable waste generated benefits for both the worker and the SDSS management. Waste sorters potentially earn more incentive when the percentage of re-sellable waste is increased.

Biodegradable waste becomes an investment of the GoS. On average, the SDSS project generated biodegradable waste of 2,121 tonnes/year for raw material of compost. According to the experience of the Gianyar Project, one ton of biodegradable waste produces 300 kgs of compost.[32] The SDSS project produced 636.3 tonnes (636,300 kgs) compost in a year. Furthermore, the market value of a bag of 40 kgs compost in Surabaya is IDR 30,000 (USD 2.96).[34] The calculation of the economic benefit of the compost is IDR 477,225,00 (USD 47,086) a year. This signifies that compost enables the GoS to save approximately 50% funding to purchase fertilizers.[35]

Waste separation at the source before dumping into landfills are a sustainable and effective strategy to deal with the waste problem. The SDSS project is a success story of waste management in the City of Surabaya. The sorting process reduces nearly 60% of the waste before transport for final disposal. Waste management practices worldwide showed that waste sorting at the source is a successful mechanism to reduce waste send to landfills, and increase the recycling rate.[36] For example, the Sweden Waste Management Association reported that source separation reduced waste thrown in landfills from 62% in 1975 to 1% in 2016.[37]

Regardless of the success of SDSS, there are certain drawbacks which require solutions. The project may lessen community participation in waste handling. Although community participation is one of the best waste management practices, improving the awareness of the people is still a major problem in many developing countries.[38-40] The SDSS could also be contra-productive with a community participation campaign in waste management. Therefore, improving the community-based waste sorting through the "waste bank" and waste reuse-recycling home industries are essential to maintain household participation and a source of extra income for residents.[38-42]

Millions of waste pickers in developing countries rely on collecting, sorting, and selling recyclable waste.[43] Waste production, especially recyclable or reused waste, is important for their survival. Therefore, an advanced waste program or technology may be a threat to waste pickers. The integration of waste pickers is practiced worldwide to ensure that the hazardous impacts of waste are properly contained and waste pickers sustain their livelihoods.[44-46] The policy of the SDSS management to employ waste pickers is a good practice in integrating them into the city waste management. Therefore, the expansion of SDSS in the region of Surabaya also needs to secure the livelihood of waste pickers by involving them within the program.

The success of the SDSS program is not problem-free and bears challenges in the future. The results of this study showed a lacking of community participation and awareness of residents about waste pre-treatment at the household level. A further study is also important to overview the implication of the SDSS project toward these issues. Although the SDSS integrates some waste pickers within the program, further insight is important to overview the implications of the project against the itinerant and waste pickers working in landfills.

## Conclusion

This study concludes that poor awareness of residents to sort waste at the source reflects the consistent increase of waste generation at the household level. The SDSS projects succeeds in separating biodegradable and non-biodegradable waste from general waste. This results in the reduction of waste for final disposal at landfills. Furthermore, the SDSS is also economically beneficial for the waste sorter as well as the GoS Municipal. These show that the SDSS is a sustainable and reliable waste management for the city of Surabaya. This study, therefore suggests that the GoS expands or duplicates this type of waste management throughout the city and provide a more reliable payment for waste sorters.

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# Inter-related Factors Influencing Sexual Quality of Life among Women Living with HIV in Banten Province, Indonesia: A Mixed Methods Study

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## Abstract

Socio-cultural concerns often restrict women's sexual rights and well-being living with HIV (WLHIV) in developing countries. These convergent parallel mixed methods study combined quantitative and qualitative approaches to explore factors influencing WLHIV sexual quality of life in Banten Province, Indonesia. A 2017 cross-sectional survey of 207 reproductive-aged WLHIV was analyzed using univariate and multivariate logistic regression statistics. Furthermore, in-depth interviews with a sub-sample of survey participants (n = 30) were thematically analyzed. Most of the women (60%) involved reported loss of sexual pleasure and depressed sexual life. Meanwhile, 48% affirmed low sexual quality of life which was associated with unemployment (aOR = 2.90, and 95%CI = 1.51–5.58), limited sexual activities (aOR = 2.89, and 95%CI = 1.20–6.93), living with extended family (aOR = 2.68, and 95%CI = 1.27–5.65), and experiencing intimate partner violence (aOR = 2.28, and 95%CI = 1.03–5.03). The respondents described unsatisfactory sexual life in a belief that having sex is a wife's duty and choosing not to talk about sexual issues or refuse sexual invitation in fear of triggering intimate partner violence. Inter-related personal, social, cultural, and religious factors affected the sufferers' sexual life.

**Keywords**: HIV, mixed-methods, sexual life, women

## Introduction

In 2019, approximately 300,000 new human immunodeficiency virus (HIV) cases were detected, bringing the number of people living with HIV (PLHIV) in the Asia-Pacific region to 5.8 million.[1] In the same year, an additional 50,300 were reported, making 641,700 PLHIV in Indonesia.[2] New HIV cases proportion among this county's women is lower than men (35.5% vs 64.5%). However, new women cases have been more than doubled from 8,300 in 2010 to 17,800 in 2019.[3]

Banten has the eighth highest cases of new HIV infection among 34 provinces in Indonesia because there was a four-fold increase in the diagnoses rates from 433 in 2011 to 1,600 in 2019.[2] According to 2019 National Indonesian acquired immunodeficiency syndrome (AIDS) data, the dominant occupations of the newly diagnosed women were non-professional employees (1,800), housewives (1,100), and entrepreneurs (752), while the sex workers (113) were historically identified to be at risk. Over the past decade, AIDS cases among housewives have also notably increased,[3] suggesting possible prevalence of late diagnosis among this population.

Respecting the sexual and reproductive health (SRH) rights of women living with HIV (WLHIV) is crucial for improving their dignity, health, and wellbeing,[4] as postulated by United Nations Population Fund (UNFPA),[5] "… able to have a satisfying and safe sex life, the capability to reproduce, and the freedom to decide if, when, and how often to do so". When women express their SRH needs and rights, they attain better SRH and lower risk of ill-health.[6] Supporting these also contribute of eliminating the worldwide HIV epidemic along with reducing onwards transmission of other sexually transmitted infection (STI) and negative SRH outcomes.

Post-HIV diagnosis, varied bio-socio-cultural determinants lead to women experiencing less active and satisfying sexual lives. According to the past reviews, HIV disclosure removes sexual desire, intimacy, and satisfaction among WLHIV.[7,8] Some PLHIV fear infecting their partner/s, feel guilty for having sex, and also struggle to talk about sexual topics.[9] The high prevalence of sexual inactivity among WLHIV is influenced by HIV-related stigma, being single, and low-income status.[10] Some WLHIV, particularly young and unmarried, feel

forced to be sexually abstinent to prevent HIV transmission.[11] Social structures leading to gender inequalities, economic powerlessness, and disproportionate health burdens experienced by many women when combined with an HIV diagnosis increase the risk of living in abusive marriages and further restrictions to sexual and reproductive rights.[12-14]

A systematic literature review exploring the SRH of WLHIV in Muslim-majority countries found that after diagnosis, the women experience disappointment towards their sexual life, including stressful intimacy.[15] However, there has been limited examination of Indonesian WLHIV sexual life and satisfaction. Therefore, this mixed-methods study aimed to explore the multiple factors influencing WLHIV sexual quality of life in Banten Province, Indonesia. It was conducted as part of a pilot project entitled 'The Sexual and Reproductive Health of WLHIV in Banten Province, Indonesia'. A more contextualized understanding of these women's sexual lives is expected by combining quantitative and qualitative approaches.[16,17] Contextualizing the social, cultural, and religious determinants of WLHIV's sexual life is important for supporting SRH needs and rights. Furthermore, the invaluable understanding informs a development of much-needed appropriate and acceptable SRH health policy and strategies in preventing further HIV/STI transmission, intimate partner violence (IPV), and unplanned pregnancy.

New HIV cases high rates and increasing numbers of WLHIV in Indonesia, particularly in Banten province, supports the urgent need to understand the personal, social, cultural, and social caveats affecting WLHIV's sexual life since sexual dysfunction impacts women's reproductive outcomes, life quality, and further HIV transmission. Therefore, the objectives of this study were to carry out the following, (1) explore demographic characteristics, clinical history, sexual activities, and SQoL of the WLHIV; (2) analyze multiple factors associated with their sexual life quality; and (3) describe the inter-related factors contributing to the sexual life quality.

## Method

A convergent parallel mixed-method study, combining a cross-sectional survey with in-depth interviews, involving WLHIV of reproductive age (18–50-year-old) living in Banten Province, was conducted from June to November 2017. The quantitative and qualitative data collection, analysis, and interpretation were performed concurrently to reveal convergence, supporting evidence, and validation.[18,19] The WLHIV used as participants went for treatment in four public and one private hospital, as well as four primary health cares in Banten Province. They were recruited by five trained peer recruiters (PR) providing support for PLHIV that visit local

health care services, appointed by the collaborative study partner, Yayasan Kotex Mandiri. Yayasan Kotex Mandiri is a local non-governmental organization that provides care and support for PLHIV in DKI Jakarta and Banten Province through individual or group peer-accompaniment. The PRs were women with a minimum of high school education and trained on approaching the potential participants ethically and assist them in completing questionnaire.

The cross-sectional survey applied convenience and a snowball sampling to recruit 207 WLHIV of reproductive age (18–50-year-old) living in Banten Province and had a current or past history of sexual activity. Based on a target population of 1,721 WLHIV in the region in 2015,[20] the required sample size was estimated to be 315.[21] However, this minimum size was not achieved during six-month data collection as the available budget and timeframes were limited. After signing the informed consent, the participants completed an Indonesian version of a self-administered paper-based questionnaire with the PRs assistance. Each survey was conducted within 30 minutes in the place chosen by the women.

Quantitative data were collected using a structured questionnaire first prepared in English, then translated to Indonesian. The instrument was designed using items from the Women's Health questionnaire (WHQ) of the 2012 Indonesia Demographic and Health Survey (IDHS),[22] and the Sexual Quality of Life-Female (SQoL-F) questionnaire,[23] that adjoined questions about WLHIV demographic characteristics and HIV-clinical histories. The WHQ sought information on varied topics of women's SRH, including HIV, reproductive behaviors and intentions, as well as other sexually transmitted infections. Meanwhile, the SQoL-F was developed by Symonds and colleagues,[24] to measure women sexual dysfunction.

The survey instrument included 12 demographic characteristics variables (age, educational background, place of residence, religion, occupation, marital status, family income, and main source of income) and clinical histories (partner's HIV status, diagnosis time and knowledge, as well as infection source). This also contains eight sexual activities variables (first sexual encounter, number of lifetime sexual partners, last sexual intercourse, sexual-intimate partner violence (IPV) history, sexual activities, number and type of sexual partners in the past 12 months, and condom use) extracted from the WHQ- 2012 IDHS. Eighteen variables related to sexual quality of life from the SQoL-F scale were added. Each SQoL-F item has a six-point response (completely agree to completely disagree) and is scored 1-6. A total sexual quality of life (SQoL) score (0–100) was calculated according to an algorithm ([unstandardized score-18]*100/90) used for the initial questionnaire analysis,

with a higher score indicating a better sexual quality of life.[23] A low SQoL was defined as an SQoL-F score below the average, and vice versa. SQoL-F reliability analysis was conducted to ascertain whether it was reliable for Indonesian women and yielded a Cronbach's alpha of 0.89, which shows the questionnaire reached an acceptable internal consistency. [24,25]

Survey data were analyzed using statiscal software set up in University of Queensland computer for the staff and research students. Initially, all dependent and independent variables were presented in percentages and mean/standard deviation (SD). A binary logistic regression model, in which variables were set to be dichotomous, was used to assess the univariate and multivariate relationships between independent and dependent variables (SQoL). The categorical/dichotomous variables were compared using Pearson Chi-square for the univariate analysis. After testing for interaction effects and multicollinearity, multiple risk variables indicating a univariate association with the outcome variables (p-value < 0.10) were entered into a multivariate logistic regression to obtain significant risk factors for low SQoL (p-value < 0.01 or p-value < 0.05). A p-value with a cut-off point of < 0.10 was used to identify potential predictors rather than to test a hypothesis.[24,25]

To anticipate inconsistent and contradictory data and ambiguous health behaviors,[26,27] this study supplemented the survey data with qualitative in-depth interviews conducted for 30 WLHIV sub-sample of reproductive age (18–50-year-old). The interview participants were purposively sampled from those used for the survey to select various persons reflective of the target population demographics and experiences. The in-depth interviews were conducted individually and privately at the survey recruitment sites or in an alternate setting of the participant's choice. The interviews were directed following a semi-structured guide designed by the authors team in the planning phase and which on average took approximately one and a half hours to complete. The interviews were conducted in Indonesian by the first author that has extensive experience and speaks this language. The interviews were digitally recorded and transcribed verbatim, translated into English, coded, and thematically analyzed using qualitative data analysis software.

The thematic analysis involved several recursive phases suggested by Braun and Clark.[28] First, the study team tried to be familiar with the collected data by reading them several times and writing the initial impression had. Then, initial codes were generated and similar ones were collated into tentative themes. All data was gathered according to the potential themes and the developed themes were reviewed and revised until data saturation was reached and a study report was finalized.[16,29] The consistency of the codes and the contextualized themes were checked by the other two members that were experts in qualitative study and SRH issues. The qualitative analyses used pseudonyms (an unreal name chosen by the participants) to respect confidentiality in the final results presentation. This data collection's credibility was ensured by having an experienced and trained interviewer, opening access of the audio recording for other author members when necessary, and conducting probing to elicit vague or ambiguous responses.[30]

Last, the quantitative and qualitative data were compared, converged, and interpreted. Similar or different inferences were synthesized and organized into a joint display of women's sexual wellness.[31] The survey results were compared using qualitative data side-by-side to confirm or disconfirm similarities and enrich the explored phenomenon. This convergent process yielded a deeper final interpretation. The University of Queensland Ethics Committee (no. 2017000354) granted the ethics approval for this study in May 2017. A local study permit was given by the Yayasan Kotex Mandiri, as a partner, and the National Unity and Politics Agency of Banten Provincial Government.

## Results

Out of the 207 survey participants, most were in their thirties (60.8%). The majority had completed primary school (88.4%), were living in an urban area (79.7%), Muslim (87.4%), and had their HIV diagnosis more than one year before the study (61.9%). Many (54.1%) were not working, and only 28% had a HIV-positive partners. About 42 (20.3%) women did not know their partner's HIV status, and only 33.3% had disclosed their status. More than 80% acquired their HIV infection from heterosexual contact (Table 1).

Table 2 illustrates the average age of first sexual intercourse was 20.8 years, with the earliest encounter occurring at 12 years. More than half reported having beyond one sexual partner in their lifetime and had last sexual intercourse within the past four weeks. Less than one-third reported using a condom consistently during sexual intercourse in the past 12 months and also experiencing sexual-IPV. Most of the 171 (82.6%) participants with current sexual activities stated they had sexual intercourse with only one person (78.4%), particularly their husband (74.9%).

Most of the 207 participants that have been in a sexual relationship reported positive responses on their sexual and relationship satisfaction. Accordingly, 83.6% thought sex life meant talking to their partner about sexual matters is possible, 79.7% felt close to their partner, 74.4% thought sex was an enjoyable part of life, 69.1% had good self-feeling, and 66.2% were happy with the sexual activity frequency. Conversely, about two-thirds reported losing pleasure in their sex life (69.1%), also

**Table 1. Demographic Characteristics and Clinical Histories of Survey Participants (n = 207)**

| Characteristic | Category | n | % | Mean | Minimum - Maximum | SD |
|---|---|---|---|---|---|---|
| Age (years) | <30 | 56 | 27.0 | 32.7 | 18 - 50 | ± 5.6 |
| | 30-39 | 126 | 60.8 | | | |
| | ≥40 | 24 | 11.6 | | | |
| Highest level of education | Low education (primary school) | 24 | 11.6 | | | |
| | High education | 183 | 88.4 | | | |
| Living region | Tangerang City | 79 | 37.8 | | | |
| | Tangerang District | 62 | 29.7 | | | |
| | South Tangerang City | 28 | 13.4 | | | |
| | Cilegon City | 24 | 11.5 | | | |
| | Serang City | 9 | 4.3 | | | |
| | Serang District | 6 | 2.9 | | | |
| | Pandeglang District | 1 | 0.5 | | | |
| Place of residence | Urban | 165 | 79.7 | | | |
| | Rural | 42 | 20.3 | | | |
| Religion | Islam | 181 | 87.4 | | | |
| | Other | 26 | 12.6 | | | |
| Occupation | Housewife/unemployed | 112 | 54.1 | | | |
| | Employed | 95 | 45.9 | | | |
| Marital status | Currently married | 123 | 59.4 | | | |
| | Single/widowed/divorced | 84 | 40.6 | | | |
| Household monthly income* | ≥ Minimum regional wages | 139 | 67.1 | IDR 2,902,153.1 | IDR 200,000 - 30,000,000 | ± IDR 2,954,532.5 |
| | < Minimum regional wages | 68 | 32.9 | | | |
| Main source of household income** | Women's salary/wages | 82 | 39.6 | | | |
| | Other | 125 | 60.4 | | | |
| Current partner's HIV-status | Positive | 58 | 28.0 | | | |
| | Negative | 57 | 27.5 | | | |
| | Disclosure status to the partner | 47 | 82.5 | | | |
| | Don't know | 42 | 20.3 | | | |
| | Disclosure status to the partner | 14 | 33.3 | | | |
| | No partner | 50 | 24.2 | | | |
| Time of HIV diagnosis | <1 year | 64 | 30.9 | | | |
| | ≥1 years | 143 | 69.1 | | | |
| Source of infection | Husband/permanent partner | 134 | 64.7 | | | |
| | Temporary partner | 35 | 16.9 | | | |
| | Shared injecting device | 8 | 3.9 | | | |
| | Blood transfusion | 4 | 1.9 | | | |
| | Don't know/not sure | 26 | 12.6 | | | |
| Comprehensive HIV knowledge | | 153 | 73.9 | | | |

Notes: *Banten Province's minimum regional wage set by the Indonesian Government in 2017 was IDR 1,931,180. The standardized minimum wages in each city/district issued by Banten Provincial Government were: IDR 3,270,936.13 in Tangerang District, IDR 3,295,075.88 in Tangerang City, IDR 3.270.936,13 in South Tangerang City, IDR 3,258,866.25 in Serang District, IDR 3,331,997.63 in Cilegon City, IDR 2,866,595.31 in Serang City, and IDR 2,164,979.43 in Pandeglang District (From https://wageindicator.org/salary/minimum-wage/indonesia/archive/3/).
**Husband/partner, parents, siblings, kids, and/or friends.
SD = Standard Deviation

felt angry (66.7%) and depressed (64.7%) about it, and tried to avoid sexual activity (64.3%) as thinking about sex made them feel being less of a woman (60.9%) (Table 3). The participants' average score of all SQoL components was 56.7 (range: 7–94, SD: ±17.4), with almost half (99, 47.8%) reporting low SQoL.

The binary logistic regression was used to assess demographic, clinical, and sexual activity factors that influenced SQoL reported among 207 WLHIV (Table 4). Based on univariate logistic regression result, 13 risk factors contributed to low SQoL, including family monthly income (cOR = 20.08, 95%CI = 1.20–3.63, and p-value = 0.04) and living with extended family (cOR= 2.80, 95%CI = 1.47–5.31, and p-value < 0.001). Multivariate analysis indicated only six factors were significantly asso-

ciated with low SQoL. Surveyed participants that were housewives or unemployed and not sexually active in the past year were almost three-fold more liable to have low SQoL than those working (aOR = 2.90, 95%CI = 1.51–5.58, and p-value < 0.001) and sexually active (aOR = 2.89, 95%CI = 1.20–6.93, and p-value = 0.02). Meanwhile, low SQoL significantly related to living with extended family (aOR = 2.68, 95%CI = 1.2–5.65, and p-value = 0.01), IPV incidents (aOR = 2.28, 95%CI = 1.03–5.03, and p-value = 0.04), lack of understanding about HIV transmission (aOR = 2.26, 95%CI = 1.13–4.54, and p-value = 0.02), and on ART for less than a year (aOR = 2.14, 95%CI = 1.14–4.03, and p-value = 0.02).

The 30 WLHIV interviewed were aged between 22

**Table 2. Sexual Activities of Women Living with HIV**

| Sexual Activity | Category | n | % |
|---|---|---|---|
| Age at 1st sexual intercourse (years) (n = 207) | <20 | 89 | 43.0 |
| | ≥20 | 118 | 57.0 |
| Number of lifetime sexual partners (n = 207) | 1 | 87 | 42.0 |
| | ≥2 | 120 | 58.0 |
| Last sexual intercourse (n = 207) | Within the past 4 weeks | 139 | 67.1 |
| | 4 weeks–1 year ago | 32 | 15.5 |
| | >1 year ago | 36 | 17.4 |
| Sexual intimate partner violence (IPV) (n = 207) | No | 163 | 78.7 |
| | Yes | 44 | 21.3 |
| Having sexual activities in the past 12 months (n = 207) | | 171 | 82.6 |
| Number of sexual partners in the past 12 months (n = 171) | 1 | 134 | 78.4 |
| | ≥2 | 37 | 21.6 |
| Sexual partner(s) in the past 12 months (n = 171) | Husband | 140 | 81.9 |
| | Boyfriend not living with me | 22 | 12.9 |
| | Client/sex work | 13 | 7.6 |
| | Casual acquaintance | 5 | 2.9 |
| | Live-in partner | 5 | 2.9 |
| | Other/not mentioned | 2 | 1.2 |
| Consistent condom use (n = 171) | | 54 | 31.6 |

**Table 3. Sexual Quality of Life of Women Living with HIV in Banten Province, Indonesia, 2017 (n = 207)**

| | Completely/Moderately/Slightly | | | |
|---|---|---|---|---|
| | Agree | | Disagree | |
| Sexual Quality of Life Item | n | % | n | % |
| When I think about my sex life, | | | | |
| I feel that I can talk to my partner about sexual matters | 173 | 83.6 | 34 | 16.4 |
| I feel close to my partner | 165 | 79.7 | 42 | 20.3 |
| It is an enjoyable part of my overall life | 154 | 74.4 | 53 | 25.6 |
| I feel good about myself | 143 | 69.1 | 64 | 30.9 |
| I have lost pleasure in sexual activity | 143 | 69.1 | 64 | 30.9 |
| I feel angry | 138 | 66.7 | 69 | 33.3 |
| I am satisfied with the frequency of sexual activity | 137 | 66.2 | 70 | 33.8 |
| I feel depressed | 134 | 64.7 | 73 | 35.3 |
| I try to avoid sexual activity | 133 | 64.3 | 74 | 35.7 |
| I feel like less of a woman | 126 | 60.9 | 81 | 39.1 |
| I feel frustrated | 122 | 58.9 | 85 | 41.1 |
| I feel guilty | 118 | 57.0 | 89 | 43.0 |
| I feel anxious | 112 | 54.1 | 95 | 45.9 |
| I feel embarrassed | 106 | 51.2 | 101 | 48.8 |
| I have lost confidence in myself as a sexual partner | 104 | 50.2 | 103 | 49.8 |
| I feel like I have lost something | 98 | 47.3 | 109 | 52.7 |
| I worry about the future of my sex life | 93 | 44.9 | 114 | 55.1 |
| I worry that my partner feels hurt or rejected | 89 | 43.0 | 118 | 57.0 |

and 41 years, among which most lived in urban areas in six cities or regencies of Banten Province. Almost all women were Muslim and had completed high school, while the majority (19) were employed and three had been commercial sex workers. Many were in a marital relationship (20) as can be seen in Table 5.

The interview data indicated most women were sexually active in the past 12 months. However, over half reported unsatisfying sexual lives post-HIV diagnosis. Most talked about their concerns on maintaining enjoyable sexual relationships as their sexual life was interrupted by the inability to mention personal sexual needs and rights

and the intimate partner's violent behavior. The thematic analysis of in-depth interview data generated two themes namely, poor sexual quality and factors influencing SQoL.

Theme 1. Poor quality of sexual life

The in-depth interview data indicated many participants in a relationship did not report a satisfying sexual life. For many, the changes to their sexual lives occurred after diagnosing their partner had infected them with HIV. Sarah, a 39-year-old housewife, described her disappointment towards the man that had infected her, say-

**Table 4. Univariate and Multivariate Logistic Regression Analysis Assessing Risk Factors of Low Sexual Quality of Life among Women Living with HIV in Banten Province, Indonesia 2017 (n = 207)**

| Risk Factor | Category | Low SQoL | Univariate/Unadjusted Analysis | | Multivariate/Adjusted Analysis | |
|---|---|---|---|---|---|---|
| | | n (%) | cOR | p-value | aOR | p-value |
| Low SQoL occurrence | | 99 (47.8) | | | | |
| Occupation | Housewife/unemployed | 62 (55.4) | 1.94 (1.12 – 3.39) | 0.02 | 2.90 (1.51–5.58) | <0.001 |
| | Employed | 37 (38.9) | reference | | reference | |
| Marital status | Single/widowed/divorced | 51 (60.7) | 2.42 (1.37 – 4.26) | <0.001 | | |
| | Married | 48 (39.0) | reference | | | |
| Family monthly income | ≥ Minimum regional wages | 61 (56.5) | 20.08 (1.20 – 3.63) | 0.01 | | |
| | < Minimum regional wages | 38 (38.4) | reference | | | |
| Main source of income | Women salary/wages | 48 (41.4) | reference | | | |
| | Other | 51 (56.0) | 1.81 (1.04 – 3.15) | 0.04 | | |
| Living arrangement | Alone/with nuclear family | 62 (41.1) | reference | | reference | |
| | With joint/extended family | 37 (66.1) | 2.80 (1.47 – 5.31) | <0.001 | 2.68 (1.27–5.65) | 0.01 |
| Time on antiretroviral theraphy | 0 or <1 year | 50 (58.8) | 2.13 (1.21 – 3.74) | 0.01 | 2.14 (1.14–4.03) | 0.02 |
| | ≥1 year | 49 (40.2) | reference | | reference | |
| HIV status disclosure to the partner | No | 50 (56.2) | 1.81 (1.04 – 3.15) | 0.04 | | |
| | Yes | 49 (41.5) | reference | | | |
| Pregnancy post-HIV diagnosis | No | 58 (44.3) | reference | | | |
| | Yes | 50 (65.8) | 0.41 (0.23 – 0.74) | <0.001 | | |
| Current contraception use | No | 47 (58.8) | 2.05 (1.16 – 3.63) | 0.01 | | |
| | Yes | 52 (40.9) | reference | | | |
| Sexual intimate partner violence | No | 70 (42.9) | reference | | reference | |
| | Yes | 29 (65.9) | 2.57 (1.28 – 5.15) | 0.01 | 2.28 (1.03–5.03) | 0.04 |
| Sexual intercourse within the past one year | No | 25 (67.6) | 2.70 (1.27 – 5.73) | 0.01 | 2.89 (1.20–6.93) | 0.02 |
| | Yes | 74 (43.5) | reference | | reference | |
| Condom use in the last sexual intercourse | No | 65 (54.6) | 1.91 (1.09 – 3.35) | 0.02 | | |
| | Yes | 34 (38.6) | reference | | | |
| Comprehensive knowledge about HIV transmission | No | 35 (63.6) | 2.41 (1.27 – 4.55) | 0.01 | 2.26 (1.13–4.54) | 0.02 |
| | Yes | 64 (42.1) | reference | | reference | |

Notes: SQoL = Sexual Quality of Life, cOR = Crude Odds Ratio, aOR = Adjusted Odds Ratio.

ing:

*"When my husband revealed his HIV infection, I did not want to have intercourse with him anymore".*

Five women thought their low sexual desire was associated with aging and described how they had lost interest in sexual activities due to not enjoying the intimacy involved anymore. Meanwhile, eight also described not understanding what sexual pleasure was and have never talked about such with a partner. However, others described the need and/or pressure to focus on the importance of providing pleasurable services to their partner. Lia, a 23-year-old housewife, explained:

*"I never known what sexual enjoyment is yet and I feel satisfied only because my husband feels happy about it".*

Theme 2. Factors influencing the sexual quality of life
Sub-theme 2.1. HIV-related concerns

Some women indicated HIV related factors, such as low immunity and commencing on ART, had changed their interest in sexual activities and influenced their personal ability to maintain a satisfying relationship with the partner.

*"Yes, when my health dropped, my sexual desire de-*

creased significantly... that's when my CD4 is very low". (Ratu, 38-year-old divorcee)

Another woman, Yaya, a 23-year-old housewife, affirmed sexual life's disappointment since being diagnosed with HIV, primarily due to concern about the risk of infecting the partner, which had never had an HIV test. Also, it revealed poor personal understanding of safe sexual practices that constricted the sexual activities and enjoyment experienced in the relationship, saying:

*"I forbid my current husband to do.... to my genitalia with his mouth and not to insert his finger inside my vagina. I feared having a long kiss with him. Recently, I rarely had the climax."*

Sub-theme 2.2. Inability to talk about sexuality

During the interviews, most participants demonstrated embarrassment and shyness talking about their sexual life by speaking in low voices and giving short answers. Some showed a lack of interest in discussing this topic in-depth. Furthermore, many remarked on how challenging and 'taboo' it was talking to other people about sexual topics and the associated issues, particularly with their partner/s. However, after gaining trust with the interviewer, some women, including those that had never spo-

Table 5. Demographic Characteristics of the Interview Participants (n = 30)

| Pseudonym | Age (years) | City/District | Religion | Last Education | Occupation | Marital Status |
|---|---|---|---|---|---|---|
| Adel | 31 | Tangerang City | Islam | Senior high school | Employed | Married |
| Sarah | 39 | Tangerang City | Islam | Senior high school | Housewife | Married |
| Riri | 40 | South Tangerang City | Islam | University | Employed | Married |
| Ade | 35 | Tangerang City | Islam | Senior high school | Employed | Married |
| Eka | 32 | Tangerang City | Islam | Senior high school | Employed | Divorced/separated |
| Widy | 33 | Tangerang City | Islam | University degree | Employed | Married |
| Ayu | 35 | Tangerang City | Islam | Senior high school | Employed | Married |
| Ani | 34 | Tangerang City | Islam | Senior high school | Employed | Married |
| Kun | 38 | Tangerang City | Islam | Senior high school | Employed | Widowed |
| Niull | 33 | Tangerang City | Islam | Senior high school | Employed | Married |
| Roma | 41 | Tangerang City | Islam | Senior high school | Employed | Married |
| Arum | 33 | Tangerang District | Islam | Senior high school | Housewife | Married |
| Indri | 29 | South Tangerang City | Islam | Senior high school | Employed | Never married |
| Yaya | 23 | Tangerang District | Islam | Senior high school | Housewife | Married |
| Mercy | 33 | South Tangerang City | Islam | Junior high school | Employed/Ex-CSW* | Married |
| Jani | 24 | South Tangerang City | Islam | Senior high school | Housewife | Married |
| Lia | 23 | Tangerang District | Islam | Junior high school | Housewife | Married |
| Yulia | 22 | South Tangerang City | Islam | Junior high school | Unemployed/Ex-CSW | Never married |
| Ratu | 38 | South Tangerang City | Islam | University | Employed | Divorced/separated |
| Dian | 26 | Tangerang City | Islam | Senior high school | Employed | Married |
| Sys | 24 | Tangerang District | Catholic | Senior high school | Unemployed | Never married |
| Nia | 27 | Cilegon City | Islam | Junior high school | Housewife | Married |
| Yati | 34 | Cilegon City | Islam | Primary school | Employed | Married |
| Clara | 42 | Cilegon City | Islam | Primary school | Employed | Divorced/separated |
| Anita | 23 | Cilegon City | Islam | Junior high school | Unemployed | Divorced/separated |
| Rizky | 31 | Serang City | Islam | Senior high school | Housewife | Married |
| Iyah | 30 | Serang City | Islam | Senior high school | Employed | Married |
| Da | 33 | Pandeglang District | Islam | University | Housewife | Divorced/separated |
| Neng | 25 | Serang District | Islam | University | Housewife | Married |
| Iin | 33 | Cilegon City | Islam | Primary school | Employed/CSW | Divorced/separated |

**Note:** *Ex-CSW: Had history of working as CSW; Comission on the Status of Women

ken openly before on personal sexual life, eagerly talked about their sexual relationships. For example, Sarah mentioned,

> *"I have never told my current husband if I have less desire to sexual activities. I just follow what he wants... feel shy of talking about it [sex].".*

Sub-theme 2.3. An obligation to serve a husband

Sexual intimacy was described as the wife's obligation to their husband and also considered an important part of keeping peace in the relationship, but not necessarily fulfilling women's sexual needs. They had to 'serve' their husband since refusing to have sexual intercourse is a sin. Fifteen women said they had never experienced or already lost sexual pleasure after discovering being infected with HIV. They also declared it was the norm to put aside their desire for sexual intimacy and satisfaction. This belief was a part of the religious perspectives learned from family, friends, teachers, or social media. Kun, a 38-year-old widow, shared a personal story, saying:

> *"I never knew what climax is from my husband. What I knew was that as a wife, I must serve my husband."*

Sub-theme 2.4. Abusive partner

Almost half of the participants experienced IPV be-

fore and/or after their HIV diagnosis. In all cases, the women had not reported the incidents and described experiences of repeated violence. They considered their IPV experiences related to jealousy, arguing, and refusal of their partner's sexual invitation. Some participants that had such experience assumed it was due to the HIV diagnosis and treatment, often exacerbated by their partner's alcohol consumption. Two participants reported successfully leaving their abusive partner; however, most described the inability to make this decision. No one said the IPV incident to the legal authorities or sought help from health care professionals. Yaya sexual IPV experience was stating:

> *"He forced me to serve him and did it roughly. I told him that I did not want it, but he did not listen."*

Sub-theme 2.5. Peer group influences

Based on the results, most of the interview participants find it important to partake along with their partners in peer support activities, such as seminars about women's rights and IPV, because of being taught how to communicate personal desires and also respect each other's sexual rights. After understanding the women's SRH rights, they were more open in talking about their sexual desires and satisfaction. The partners were also

Table 6. Convergent Themes

| Convergent Theme | Key Finding | |
|---|---|---|
| | **Quantitative Variable** | **Qualitative Theme** |
| Unsatisfactory sexual life | 74.4% thought sex was an enjoyable part of their overall life. 69.1% had lost pleasure in their sex life 66.7% felt angry and 64.7% were depressed about their sexual life 64.3% tried to avoid sexual activity. 47.8% had low sexual life quality | Low sexual desire and satisfaction |
| Personal factor | Short-term of Antiretroviral theraphy Poor knowledge of HIV-transmission Housewife/unemployed Early age of first sexual encounter | HIV-related concerns: Low immunity Antiretroviral theraphy Fear of transmitting HIV |
| Social factor | Sexual intimate partner violence Living with extended family | Abusive partner Peer group influences |
| Culture norm and religious belief factors | | Inability to talk about sexuality An obligation to serve a husband |

more respectful of the right to refuse sexual invitations in certain circumstances. Ani, a 34-year-old married woman that began attending SRH seminars with the partner for PLHIV, saying:

*"He starts to understand me. For example, it is okay if I do not want it, and he asked me when I want it.".*

The similarities and disparities across the survey and interview data suggest overlapping sexual issues occurring within complex, inter-related factors as can be seen in Table 6. It was confirmed that on the whole, the quantitative were consistent with qualitative findings. Even though some differences were identified, there were no contradictions. The convergent theme of unsatisfactory sexual life was consistently supported by the statistics and interview data. Statistically, WLHIV low interest in sex and the associated distress were linked significantly to women's clinical status, working as a housewife, living with extended family, low HIV knowledge, and sexual IPV experience. Meanwhile, qualitatively, their sexual discomfort increased for those prioritizing the partner's sexual desire, while being bound with social norms and personal belief to impede sexual enjoyment and desire.

## Discussion

The mixed-methods study represented the convergence of findings from a survey and qualitative in-depth interviews to identify and measure the multiple factors influencing WLHIV sexual quality of life in Banten Province, Indonesia. While the survey indicated significant personal and social factors associated with sexual quality of life, the in-depth interview described deeper WLHIV SQoL explanation related to its personal, social, and religious-cultural contexts. Furthermore, both indicated predominant individual factors affecting the

women's low SQoL were ART, low immunity, and inadequate knowledge or fear of HIV transmission. These findings are consistent with a Morocco study that reported about 70% of WLHIV respondents had insufficient sexual activity and disorders such as decreased sexual desire and anorgasmia.[32] Unsatisfactory sexual life post-HIV diagnosis has been reported in a review in Muslim-majority countries, which similarly found the reasons were related to ART event, HIV status denial, and fear of transmitting the infection.[9,15] The present study also linked the sexual dissatisfaction with women's anger and disappointment to their partner that infected them with HIV.

Based on the findings, low SQoL was significantly associated with women's gender roles and work as a housewife or unemployed, while many concealed their sexual desire and prioritized the partner's, particularly husband sexual satisfaction. The women, were predominantly Muslim housewives, have little power or rights to demand sexual pleasure or safer sex due to existing cultural and religious belief. Indonesian culture prevents people from talking openly about SRH-related topics.[33] The study by Bennett, *et al.,*[34] affirmed the taboo of talking about sexual topics in the country, contributing to women's poor understanding of common SRH problems and preventive measurements to avoid pregnancy, HIV, and other STIs. The women also face religious-cultural difficulties when negotiating safer and satisfying sex practices with their partners.[35,36]

Gender imbalance and patriarchal culture in Indonesia have persistently assigned privileged positions and roles to men to control and sometimes violate women.[35,37] It is suggested that this continues today and also becomes amplified for WLHIV. Due to financial dependence on partners, many women have limited power

in their family to request or enforce condom utilization, refuse sex, including sexual practices that place them at increased risk of HIV, unplanned pregnancy and other adverse SRH outcomes, and ultimately to defend their SRH rights.[38,39] These align with Shahhosseini, et al.,[40] findings that reported low sexual satisfaction among WLHIV with no or low income and poor interpersonal communication skills. Also, many WLHIV described sexual activity as a means to maintain their relationships, not to obtain pleasure. These correspond with Asian cultural beliefs that women should prioritize their duty and obligation for their husbands.[41] According to similar findings in Bangladesh, women maintained sexual activities only to prevent conflict between partners.[42] Personal and community values strongly affected the WLHIV participants' sexual wellbeing. Moreover, religious and cultural gender norms and values hindered the ability to voice their sexual needs, as men maintain power to control and violate women. These gender inequalities have stopped many women, including WLHIV, in middle and low-income countries, from achieving their right to a safe and enjoyable sexual life.[15,35]

The interviews suggested women diagnosed over a long time and also involved in peer support activities demonstrated and reported higher levels of SRH literacy and confidence in negotiating their needs and rights. This indicates women's ability to negotiate SRH rights tends to be developed with community peer groups' support. The finding is consistent with the study that stated peer counselling, education, and accompaniment worked successfully in improving WLHIV SRH outcomes.[43,44]

This study has several limitations, such as being conducted primarily among WLHIV that accessed treatment in public HIV treatment facilities and *Yayasan Kotex Mandiri*. Furthermore, the surveyed sample size was relatively small and recruited using a non-probability sampling method. Therefore, this possibly lacks the perspectives of WLHIV that were not engaged in HIV care. The results tend not to be generalizable to WLHIV in rural settings and those not accessing tertiary referral hospitals. Data were self-reported by the participants in relation to issues considered sensitive, which gives rise to potential social desirability bias.

This study's major strength was that the mixed methods not only provided a quantification of sexual life quality but also more detailed information on the influencing factors. It is the first to comprehensively explore quality of sexual life among WLHIV in Indonesia using mixed methods approach. The results provided advanced insights into the socio-cultural factors impacting WLHIV's sexual quality of life. This is useful for informing future SRH health strategies and interventions for the wellness of WLHIV and the women population generally.

## Conclusion

Conclusively, the intersection of personal, social, and cultural factors attributing to women living with HIV experiencing unsatisfactory sexual life was identified. These inter-related factors, such as slow adjustment to HIV infection and treatment, abusive relationships, women's inability to express their sexual needs and to refuse invitations, present significant barriers to achieving healthy life and wellness by WLHIV. The support from their partner, family, peers, health professional, and community tends to offset some of these experiences and are also essential when WLHIV needs to achieve their SRH rights and well-being.

The findings highlighted the need for health systems enabling women to build confidence to voice their sexual needs and advocate personal rights. Support structures, local religious-cultural norms, and public policy are acknowledged and prepared to empower women in meeting their sexual health. Multi-discipline professionals, including sexuality specialists, psychologists, and public health practitioners, need to partner with the WLHIV to develop a health system and network of peer support that mitigates the challenges faced. Free availability of these services to the sufferers and all women at adverse SRH outcomes risk is necessary. Future study needs to develop skill-based interventions that increase women's communication and negotiation skills for safer sex practices and manage the IPV issues among WLHIV.

**Abbreviations**

aOR: Adjusted Odds Ratio; ART: Antiretroviral Therapy; cOR: Crude Odds Ratio; HIV: Human Immunodeficiency Virus; IDHS: Indonesia Demographic Health Survey; IPV: Intimate partner violence; PLHIV: People living with HIV; PR: Peer Recruiter; SRH: Sexual and Reproductive Health; STI: Sexually Transmitted Infection; SQoL: Sexual Quality of Life; SQoL-F: Sexual Quality of Life-Female; UQ: The University of Queensland; WHQ: Women Health Questionnaire; WLHIV: Women living with HIV.

**Ethics Approval and Consent to Participate**

Ethical approval was issued by the University of Queensland Human Research Ethical Committee (Approval Number: 2017000354). All individual participants recruited signed the research consent preceding the interview

**Competing Interest**

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

**Availability of Data and Materials**

All data were stored electronically in the University of Queensland data management system accessible by the authors team only considering

the topics' sensitiveness, but the information is available upon request.

**Authors' Contribution**

DJ initiated the research concept, while LF and JD assisted in developing the final protocol used. In addition, DJ collected the data which were analyzed by DJ, LF, and JD. This manuscript was drafted by DJ, while all authors interpreted the findings, contributed to the revisions, read, and approved the final manuscript.

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# Attitudes Concerning Sexual Behavior towards Risky Sexual Behavior of Sexual Transmitted Infections among Male Adolescents in Indonesia

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**Abstract**

There has been an increase of sexually transmitted infections (STIs) such as HIV/AIDS worldwide, especially in Indonesia. Several studies on adolescent behavior, especially the male as the main predictor, reported increased in STIs' cases due to risky sexual behavior. This study aimed to show the relationship between attitudes, sexual behavior, and the risks of STIs among male adolescents in Indonesia based on the Indonesia Demographic and Health Survey (IDHS) data in 2017. This cross-sectional study involved 10,547 male adolescents using the total sampling method according to the inclusion and exclusion criteria. Data were analyzed using a complex sample logistic regression test. This study was found that the proportion of risky sexual behavior of STIs was 10% of which 29.8% agreeable attitude male adolescents. Agreeable attitude male adolescents were found able to improve the risk of engaging in risky sexual behaviors of STIs (p-value = 0.018; prevalence odd ratio (POR) = 1.135). The male adolescents who had an agreeable attitude towards sexual behavior could improve the risk of having risky sexual behavior of STIs 1,135 times; however, the attitude variable was not necessarily a major risk factor for the risky sexual behavior of STIs. Knowledge and education were not related to the risky sexual behavior of STIs.

**Keywords**: attitudes, Indonesia, male adolescents, risky sexual behavior, sexually transmitted infections

## Introduction

Overcoming health problems is one of the main focus of many countries in reducing mortality rates. Currently, four out of ten ailments that leads to death originate from infectious diseases.[1] Furthermore, based on the Institute for Health Metrics and Evaluation (IHME) data, it was stated that during the Global Burden of Disease (GBD) in 2017 about 16.5 million people died due to infectious diseases continues to increase annually.[2] An example of an infectious disease that needs special attention is sexually transmitted infections (STIs). More than one million cases of this disease occur every day worldwide,[3] with an increasing number of both curable and incurable STIs.[4-6]

Sexually transmitted infection cases have become a major health problem in Indonesia. Based on the Integrated Biological and Behavioral Surveillance (IBBS) data in 2015, it was found that the prevalence rate of STIs has increased, especially for syphilis, which increased from 5 to 6% annually.[7] The human immunodeficiency virus (HIV) cases have also increased and are estimated to continue until 2025.[6]

Meanwhile, based on the age level, the highest number of HIV cases were experienced by age groups more than 30 years, followed by those between 15 to 24, and someone exposed to HIV would not show symptoms for an average of 8 years. Therefore, the age for first exposure is around 23 years.[7]

The increase in STI cases is inseparable from the result of risky sexual behavior. This behavior in adolescents initially started with premarital sex and can damage an individual's behavior, thereby leading to several adverse health consequences including an increase in cases of sexually transmitted infections.[8-11] There are factors that influence risky sexual behavior in adolescents, which ultimately results in sexually transmitted infections, namely age, gender, place of residence, attitudes, education, knowledge, media roles, lifestyle, and peer influence.[10]

Based on the description above, these factors are generally individual characteristics and an example is the attitude towards sexual behavior. Furthermore, several studies have shown a relationship between attitudes and risky sexual behavior of STIs. A study in Hong Kong recorded about 6.7 times the risk (95%CI = 4.10-10.96)

of adolescents engaging in risky sexual behavior.[11] Another study conducted on male adolescents in Tehran, Iran, showed that the attitudes towards sexuality 1.97 (95%CI = 1.28-3.04) affected risky sexual behavior.[12] In addition, based on the data from the 2017 Indonesia Demographic and Health Survey (IDHS), it was reported that the attitudes of adolescents that undergo sexual intercourse before marriage increased from 7% to 8%.[13]

Various studies have reported several factors affecting risky STIs other than attitudes. For example, the survey by Maryatun stated that street children with a lack of knowledge have four times greater chance of engaging in risky premarital sexual behavior than those with good knowledge (OR = 4.42, 95%CI = 1.797-10.894.[14] A study in France reported that the influence from peers was 2.7 times effect on risky sexual behavior (95%CI = 1.42-5.50).[15] Education and the use of alcohol and drugs are also other factors associated with it.[16-20]

The involvement of male adolescents in risky sexual behavior has become a significant public health problem. Furthermore, negative consequences as a result of this behavior and the risk of contacting sexually transmitted infections are often associated with males as the main predictor.[18] The proportion of male adolescents having multiple sexual relationship is four times compared to females.[19] They also experienced a twofold increase in having relationships with different partners,[20] and with condom use, they are substantially lower than adult males.[21]

Based on the data and information above, and since STIs have a significant impact on the health sector. Therefore, this study aimed to know relationship between attitudes, sexual behaviors, and sexually transmitted diseases among male adolescents in Indonesia by measuring the data and performing multivariate analysis. It also aimed to know the interactions and its confounders.

## Method

This study was conducted using secondary data obtained from the 2017 Indonesian Demographic and Health Survey (IDHS) and used a cross-sectional design. The 2017 IDHS used a two-stage sampling design with stratification into urban and rural areas. At stage one, the samples were selected based on the IDHS frame, while the second stage involved a complete listing of households in each selected cluster. This study was analyzed in March to July 2020 in Depok City, West Java. The sample in this study were all-male adolescents between the ages of 15 to 24, total population, and met the inclusion and exclusion criteria. The inclusion criteria were all male adolescents in Indonesia that were respondents in the 2017 IDHS between ages 15 to 24, not married, and had complete data. While the exclusion criteria were male adolescents without complete data and were married. The sampling flow started from a households

sample totaling 49,261 and from 13,860 respondents of unmarried male adolescents between ages 15 to 24. However, only 13,079 were successfully interviewed, while 10,574 male adolescents had complete data. Out of the total samples used from the data of IDHS, only 10,547 met the criteria.

The dependent variable of this study was male adolescents that had sexual intercourse before marriage.[22,23] The independent variable was their statement on risky sexual relations that was obtained from the answers agree or disagree of questions 718, 719, 720a-e, as well as several confounding variables including: 1) Age refers to the lifespan of the respondents from birth to the time 2017 IDHS data were collected and divided into two categories, namely "15-19" and "20-24"; 2) Education was defined as the last level that the respondent completed and was categorized into "Low" (primary and junior high school) and "High" (senior high school, diploma, and bachelor); 3) Residence refers to the dwelling place of the respondents' and was divided into "Urban" and "Rural" categories; 4) Knowledge refers to everything the respondents knew about STIs and risky sexual behavior that categorized into "Less" and "Good"; 5) Access to information refers to the use of the media in receiving information on reproductive health and STIs and was categorized into "Less" and "Good"; 6) Use of substances refer to the use of cigarettes/alcoholic drinks/drug, and was divided into "Yes" and "No"; and 7) Peer influence is the encouragement from friends that had sexual intercourse, which was used in shaping the respondents' sexual behavior. It was divided into "Take effect" and "No effect".

The analysis was carried out in stages starting from univariate, bivariate, and finally multivariate analysis. The univariate analysis displayed the percentage of each study variable based on its category. At the same time the bivariate was conducted to examine the relationship between the independent (attitude) and the dependent variables (sexual behavior), and also evaluated the confounding variables. A multivariate analysis was carried out using complex sample logistic regression based on the bivariate analysis' selection result. Furthermore, an interaction and confounding test was carried out by eliminating variable, starting with the one with the highest p-value.

## Results

The total number of respondents was 10,547. Based on Table 1, it was found that 10.0% of male adolescents were at risk of contacting STIs and 29.8% had an agreeable attitude. Based on the results from the analysis in Table 2, statistically, there were differences in the sexual behavior among male adolescents that posses the attitude of agreeing and disagreeing (p-value = 0.016). Those who

have a consenting attitude towards sexual behavior had a risk of 1.127 (95%CI = 0.940-1.352) times engaging in risky sexual behavior and contacting STIs compared to male adolescents with a disagreeing attitude. When viewed from the p-value in Table 2, only the variable for age and education level had a p-value greater than 0.05. In contrast other variables, such as residence, knowledge, access to information media, use of the substance, and peer influence had a p-value that was greater than 0.05. However, the variables of age and level of education would still be included in the multivariate modeling because there was a substantial relationship.

The analysis in this study was carried out using the interaction and confounding test. The interaction test was carried out by compiling a model that includes all variables, including those involving interactions. When the p-value is less than 0.05, it is stated that the variable has interactions. However, based on Table 3, the results of the interaction tests carried out on each variable obtained a p-value that was more than 0.05. This means that statistically there were no interacting variables. In the full model (Table 4), the prevalence odd ratio (POR) attitude

value was 1.135 (95%CI = 0.944-1.364). It was used as the reference value in calculating the changes that occur

**Table 1. Distribution of Respondents with the Risky Sexual Behavior of Sexually Transmitted Infections**

| Variable | Category | n | % |
|---|---|---|---|
| Sexual behavior | Risk of STIs | 1,053 | 10.0 |
| | No risk of STIs | 9,494 | 90.0 |
| Attitude | Agree | 3,142 | 29.8 |
| | Disagree | 7,405 | 70.2 |
| Age | 15-19 years | 6,165 | 61.0 |
| | 20-24 years | 4,382 | 39.0 |
| Education | Low | 2,687 | 25.5 |
| | High | 7,860 | 74.5 |
| Residence | Urban | 6,165 | 58.4 |
| | Rural | 4,382 | 41.6 |
| Knowledge | Less | 6,578 | 62.4 |
| | Good | 3,969 | 37.6 |
| Access to information media | Less | 9,792 | 92.8 |
| | Good | 755 | 7.2 |
| Use of substance | Yes | 7,119 | 67.5 |
| | No | 3,428 | 32.5 |
| Peer influence | Take effect | 6,303 | 59.8 |
| | No effect | 4,244 | 40.2 |

**Note:** STIs = Sexually Transmitted Infections

**Table 2. Relationship between Variables with the Risky Sexual Behavior of Sexually Transmitted Infections**

| Variable | Category | Risk of STIs | | No Risk of STIs | | Total | | POR | 95%CI | p-value |
|---|---|---|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % | | | |
| Attitude | Agree | 338 | 10.8 | 2,804 | 89.2 | 3,142 | 100 | 1.127 | 0.940-1.352 | 0.016 |
| | Disagree | 716 | 9.7 | 6,690 | 90.3 | 7,405 | 100 | | | |
| Age | 15-19 years | 641 | 10.0 | 5,788 | 90.0 | 6,429 | 100 | 0.996 | 0.843-1.178 | 0.969 |
| | 20-24 years | 412 | 10.0 | 4,118 | 90.0 | 4,118 | 100 | | | |
| Education | Low | 267 | 9.9 | 2,420 | 90.1 | 2,687 | 100 | 1.991 | 1.823-2.195 | 0.927 |
| | High | 787 | 10.0 | 7,073 | 90.0 | 7,860 | 100 | | | |
| Residence | Urban | 633 | 10.3 | 5,531 | 89.7 | 6,165 | 100 | 1.078 | 0.910-1.277 | 0.038 |
| | Rural | 420 | 9.6 | 3,962 | 90.4 | 4,382 | 100 | | | |
| Knowledge | Less | 613 | 11.1 | 5,965 | 88.9 | 6,578 | 100 | 1.826 | 1.704-2.986 | 0.018 |
| | Good | 440 | 9.3 | 3,529 | 90.7 | 3,969 | 100 | | | |
| Access to information media | Less | 982 | 10.0 | 8,809 | 90.0 | 9,792 | 100 | 1.176 | 0.799-1.450 | 0.028 |
| | Good | 71 | 9.1 | 684 | 90.9 | 755 | 100 | | | |
| Use of substance | Yes | 724 | 10.2 | 6,395 | 89.8 | 7,119 | 100 | 1.167 | 0.887-1.382 | 0.038 |
| | No | 329 | 9.6 | 3,098 | 90.4 | 3,428 | 100 | | | |
| Peer influence | Take effect | 658 | 10.4 | 5,645 | 89.6 | 6,303 | 100 | 1.133 | 0.952-1.349 | 0.038 |
| | No effect | 395 | 9.3 | 3,849 | 90.7 | 4,244 | 100 | | | |

**Notes:** POR = Prevalence Odds Ratio; CI = Confidence Interval; STIs = Sexually Transmitted Infections

**Table 3. Interaction Assessment Results**

| Variable | p-value | Information |
|---|---|---|
| Early models + attitude * age | 0.981 | NI |
| Early models + attitude * residence | 0.755 | NI |
| Early models + attitude * education | 0.136 | NI |
| Early models + attitude * knowledge | 0.823 | NI |
| Early models + attitude * media access | 0.483 | NI |
| Early models + attitude * use of the substance | 0.112 | NI |
| Early models + attitude * peer influence | 0.080 | NI |

**Note:** NI = Not Interaction

**Table 4. Full Model**

| Variable | p-value | POR | 95% CI |
|---|---|---|---|
| Attitude | 0.018 | 1.135 | 0.944-1.364 |
| Age | 0.666 | 1.038 | 0.875-1.232 |
| Residence | 0.021 | 1.058 | 0.890-1.258 |
| Education | 0.669 | 2.043 | 1.860-1.266 |
| Knowledge | 0.016 | 1.819 | 1.696-1.963 |
| Access to information media | 0.037 | 1.146 | 0.847-1.550 |
| Use of substance | 0.048 | 1.068 | 0.890-1.281 |
| Peer influence | 0.048 | 1.122 | 0.943-1.334 |

**Note:** POR = Prevalence Odds Ratio; CI = Confidence Interval

**Table 5. Confounding Assessment Results**

| Variables Excluded from the Model | POR Before | POR After | ΔPOR (%) | Information |
|---|---|---|---|---|
| Education  (p-value = 0.669) | 1.135 | 1.138 | 0.26 | NC |
| Age   (p-value = 0.666) | 1.135 | 1.136 | 0.08 | NC |
| Peer influence (p-value = 0.048) | 1.135 | 1.136 | 0.08 | NC |
| Use of the substance (p-value = 0.048) | 1.135 | 1.128 | 0.62 | NC |
| Access to media (p-value = 0.037) | 1.135 | 1.127 | 0.70 | NC |
| Residence (p-value = 0.021) | 1.135 | 1.125 | 0.88 | NC |
| Knowledge (p-value = 0.016) | 1.135 | 1.127 | 0.70 | NC |

Notes: POR = Prevalence Odds Ratio; NC = Not Confounding

**Table 6. Final Model**

| Variable | p-value | POR | 95%CI |
|---|---|---|---|
| Attitude | 0.018 | 1.135 | 0.944-1.364 |

Note: POR = Prevalence Odds Ratio; CI = Confidence Interval;

after the covariates were removed from the model. Further analysis was carried out to obtain the full model value, where the POR results from the full model would be used as a reference in the confounding test assessment (Table 5). Based on the changes in POR value (ΔPOR), there were no variables that had a change in POR>10%, which means that statistically, all covariate variables were not confounding. The confounding assessment was completed in order to obtain the final model of complex sample logistic regression analysis in Table 6.

Based on the whole process of multivariate analysis regarding the relationship between attitudes, sexual behavior, and the risk of STIs in male adolescents, the result showed insignificance between exposure and outcome, was possible due to the limited sample size. However, in epidemiology, male adolescents with an agreeable attitude towards sexual behavior have a 1.135 times risk of engaging in risky sexual behavior for STIs compared to those that disagree.

## Discussion

In the 2017 IDHS study, the prevalence of male adolescents having risky sexual behavior was 8%, while those that had risky sexual behaviors for STIs in the 2012 IDHS data were 4.5%. Furthermore, this situation has increased almost two times from the previous data. Risky sexual behavior of STIs in this case, was male adolescents who engaged in premarital sex.[13] It was different from the case size and the IDHS study in 2017 involving male adolescents with risky STIs. The number of cases of male adolescents that engaged in premarital sex was 10%. This difference was presumably because there were many missing data from some of the variables resulting in the different results between the IDHS data and this study. The prevalence of risky STIs among male adolescents has increased due to social changes, which include increased

peer influence and adolescents having sexual thoughts. Besides, there were changes, especially in current technology, that makes it easier for them to access negative sites that could lead to premarital sex.[24]

The variables that were proven to be related in the bivariate analysis with risky sexual behavior for STIs were residence, knowledge, access to information media, substance use, and peer influence. Meanwhile, age and education did not have a significant relationship with sexual risk behaviors for STIs. This occurred because the two groups of respondents were not representative. However, this was different from several studies which stated that there was a relationship between age and the level of education with risky sexual behaviors for STIs.[16,17,25-27]

Attitudes toward sexual behavior in several studies reported that it was a factor that influences the behavior of various individuals.[28,29] Based on the results of the bivariate analysis, there was a statistical relationship between attitudes, sexual behavior, and STIs. The result showed that male adolescents with an agreeable attitude had 1.127 times the risk of contacting risky STIs compared to those with a disagreeing attitude (p-value = 0.016, 95%CI = 0.940-1.352). The results of this study is in line with that of Yip, *et al.*,[11] in Hong Kong, which reported that adolescents' consent attitude was 6.7 times (95%CI = 4.10-10.96) engaging in risky sexual behaviors. Another study by Mohammadi, *et al.*,[30] on male adolescents in Tehran, Iran, showed that negative attitudes towards sexuality were 1.97 times (95%CI = 1.28-3.04) affected risky sexual behavior.

There were no interacting or confounding variables in the multivariate analysis between attitudes towards sexual behavior and STIs. Therefore, in the final modeling, only attitudes that influenced risky sexual behavior of STIs were found (p-value 0.018, POR = 1.135 (95%CI = 0.944-1.364)). Attitude is a behavioral mediator, meaning that everything whether knowledge, media access, use of alcohol/smoking/drugs, and others influences an individual's behavior. According to Azwar S,[31] when people are aware of a particular situation. It influences their behavior towards it and is mediated by an attitude. This means that no matter how much knowledge one has,

when a positive attitude does not support it, the effect on the behavior would be insufficient.

Although no interactions and confounders were found in this study, other studies reported that in addition to attitudes there are factors that influence risky sexual behaviors for STIs, including substance use such as alcohol/drugs.[32,33] The perception that using substances, in this case, alcohol to narcotics, has a disinhibiting effect (behavior that is not following with prevailing social norms due to disruption or loss of self-control function) on an individual's decision to engage in risky sexual behavior.

Adolescents usually make decisions that are more influenced by emotions than reason. Therefore, substance use could increase the likelihood of engaging in risky sexual behaviors.[34] A study has has shown that peer group influence has an effect on the sexual behaviors of adolescents.[15] Male adolescents would encourage their peer group to be sexually active even though they are not ready or interested. They are only challenged with courage and mostly do not know about safe sex.[35]

## Conclusion and Recommendation

It can be concluded that male adolescents who had an agreeable attitude towards sexual behavior could improve the risk of having risky sexual behavior of STIs 1,135 times; however, the attitude variable was not necessarily a major risk factor for the risky sexual behavior of STIs. Knowledge and education were not related to the risky sexual behavior of STIs.

The agencies and policymakers need to add questionnaires relating to the exposure to pornography and create a parent education program that involves parents and their male teenagers in forming positive attitudes.

## Abbreviations

STIs: Sexually Transmitted Infections; HIV/AIDS: (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome); GDB: Global Burden of Disease; IHME: Institute for Health Metrics and Evaluation; IBBS: Integrated Biological and Behavioral Surveillance; POR: Prevalence Odds Ratio; CI: Confidence Interval; NI: Not Interaction; NC: Not Confounding.

## Ethics Approval and Consent to Participate

Ethics approval was obtained by the Ethics Committee of the Faculty of Public Health Universitas Indonesia (Ethical Approval: 233/UN2.F10.D11/PPM.00.02/2020).

## Competing Interest

The author declares that there is no significant competing financial, professional, or personal interest that might have affected the performance or presentation of the work described in this manuscript.

## Availability of Data and Materials

The original data was made public in https://dhsprogram.com/

## Authors' Contribution

H and NM conceptualized this study, H created the methodology and joined NM in editing, reviewing, and writing the manuscript. In addition, they wrote the original draft.

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