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Original Research

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# FAMILY AWARENESS OF THE METHODS OF ORAL AND DENTAL HEALTHCARE FOR 5-16 -YEAR-OLD CHILDREN WITH DISABILITIES

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**ABSTRACT**

**Introduction**: Over half of disabled children (53%) suffer from oral and dental health problems (Alwadi et al., 2022) due to poor attention from healthcare providers. **Aims**: Determine the level of family awareness of oral and dental healthcare methods for 5-16-year-old disabled children in Saudi Arabia. **Methods**: To achieve the study objective, the descriptive method by the social survey method was used. The required ethical approvals of centers and associations caring for people with disabilities in the region were obtained. These centers cooperated in publishing the study tool through social media applications; the questionnaire link was distributed to a sample of (312) parents of children aged 5-16 years with disabilities in Najran region, south of the Kingdom of Saudi Arabia, in October and November of 2022. **Results**: There was a weak level of family awareness of the methods of oral and dental healthcare for children aged 5-16 years with disabilities. Also, statistically significant differences at $\alpha = 0.05$ were found in the level of family awareness of the methods of oral and dental healthcare for children aged 5-16 years with nature of the relationship with the child disability in favor of mothers and the academic qualification in favor of the university academic qualification. Nevertheless, the respondents' answers did not differ by their child's type of disability. **Conclusion:** The study recommended developing a comprehensive national strategic plan supervised by the Ministry of Health and the Ministry of Social Development to reduce the risk of oral and dental diseases.

**Keywords**: Awareness, Children with Disabilities, Family, Oral and Dental Health, Saudi Arabia

## INTRODUCTION

The individual needs to pay attention to the health of his mouth and teeth. Oral and dental health is a vital part of an individual's overall health. Therefore, developed societies have been educating their members, especially children, including children with disabilities and their families, of the importance of this, and providing all services that help them protect the mouth and teeth from many common diseases and treat them at an early date. That people with disabilities need special care comes from the perspective of restrictions on these people in performing basic self-care routines or main activities of daily living, which causes them to lack awareness of maintaining oral and dental health (American Academy of Pediatric Dentistry, 2021). This requires specialized health service programs, raising awareness among these people and educating their parents about special knowledge, practices, and proper behaviors towards oral and dental healthcare and prevention of diseases that affect them, and avoiding advanced and complex dental treatments in the future (Ramanandvignesh and Gurvanit, 2022). People with disabilities suffer from poor oral and dental health compared to normal people. They suffer a lot from issues such as severe gum, gingivitis, tooth decay, etc. (Alwadi et al., 2022). Some people with

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disabilities appear to need more complicated oral and dental healthcare than others (Owens and Jones, 2017). Also, the category of children with disabilities as a result of their congenital developmental disorders leads to poor oral and dental health. Open bites and dysphagia often occur, especially in those with rheumatoid arthritis. In addition, they lack equality with other normal children in the right to treatment and medication (Calis et al., 2008). The increase in calculus or tartar leads to an increase in forming the bacterial plate "plaque". This leads them to poor oral and dental hygiene, and thus exposes them to oral and dental diseases and lesions (Nirmala et al., 2018). Children with disabilities, as a result of some characteristics such as lack of focus and poor attention, and some of them suffer from behavioral problems such as distraction, hyperactivity, anger, and violence, are more vulnerable to trauma and frequent dental injuries (Sinha et al., 2018). They also suffer from poor gum condition, gingivitis, tooth decay and deep caries, malocclusion of teeth, and decaying and missing teeth. This is due to their wrong practices and behaviors, such as the consumption of sweets and sugars in abundance, the lack of frequency of brushing and toothpaste, and the increased consumption of sweets and sugar between meals (Purohit and Singh, 2012). As a result, there is a greater need to focus on the oral and dental health of children with disabilities.

Parents' preoccupation with the disabled's oral and dental health and the ways to rehabilitate them and take special care of them in terms of teaching them about oral and dental hygiene lead to many negative results and complications. Neglecting oral and dental health has a detrimental influence on one's self-esteem, feeling of quality of life, overall health, mental health, and social standing (Gardens et al., 2014). This category of children with disabilities is often marginalized from their families in following up on their medical treatment and assessing their oral and dental conditions (Alwadi et al., 2022). The result of refusal of disabled children to treat oral and dental problems as a result of fear of the dentist and medical equipment may increase among children with severe disabilities categories, which makes parents reluctant to take their children for treatment (Milano, 2017). Hence, whatever the type of disability the child suffers from, disabled children's oral and dental health should be taken care of by their families. Disabled children have the right to the prevention and treatment of their oral and dental diseases, just like other normal peers (Scambler, 2012). The role of the family also comes in choosing healthy foods for the child, avoiding eating foods harmful to the health of the mouth and teeth, and working to visit the doctor periodically or when needed to help the child treat or prevent the risk of cavities and gum disease. In addition, it requires the family more patience and endurance to teach and train the child to use the toothbrush and paste to clean his teeth in the morning and evening and after eating foods, drinks, and medicines Gurav et al., 2021). Often, dental care and treatment for children with disabilities are not different from that of ordinary children. However, some cases require special care and management. If the family, doctor, and patient cooperate, it achieves a great deal of success in enjoying good oral and dental health for children with disabilities. One of the most appropriate methods for oral and dental care in children with disabilities is the periodic visit to the dentist twice a year. Home care also includes removing the bacterial plate (plaque) daily because it is the main cause of both gum disease and tooth decay. This is done by brushing the teeth and using dental floss to clean between the teeth. It is also done by taking fluoride orally or applying it topically to the teeth to prevent cavities, using a piece of gauze moistened with water to clean the teeth, or using an electric toothbrush (Ningrum et al., 2012). In addition, they should use brushes and paste, use dental floss to clean between

the teeth, and take fluorine orally or apply it topically to the teeth to prevent caries helps to improve their oral health (Li Jeng et al., 2009). This allows the disabled to converse, chew, touch, taste, smile, swallow, and express smile, smell, taste, touch, chew, swallow, and express a variety of emotions with confidence and without pain or suffering by employing facial expressions. Thus, dental healthcare achieves happiness for children with disabilities and their proper integration into their community (Glick et al., 2016).

Clinical investigations of disabled children's oral and dental healthcare show that they have larger dental requirements than their normal peers. Ningrum et al. (2012) analyzed previous studies that concerned oral and dental health among children with disabilities in Asia, specifically Indonesia. The results showed that children with mental disabilities and autism spectrum disorders have major problems in oral and dental health such as tooth decay, gingivitis, and the delay in the emergence of permanent teeth and eruption compared to normal children. It also showed that children aged 12 years and under are more likely to suffer from these problems. In addition, children living in poor and middle environments were more vulnerable to these problems. The study emphasized the importance of an integrated and fair healthcare system to raise the level of oral and dental health among children with disabilities. Pouradeli et al. (2019) synthesized previous studies on oral and dental problems among hearing-impaired children. It was shown that hearing-impaired children had noticeable oral and dental health issues, such as the frequent spread of bacterial plaque leading to gum disease and tooth decay among the hearing-impaired category. This emphasizes the awareness and education of oral health in promoting the dental health children with hearing impairment. Mandic et al. (2016) indicated that children with disabilities in Serbia often demonstrated lower levels of oral and dental hygiene compared to other non-disabled children, a greater prevalence of caries, malocclusion, and a delayed eruption time of permanent teeth. Given the poor oral and dental health of this group of children, it is critical to provide preventative dental programs for disabled children and increase public knowledge about these matters. Gardens et al. (2014) showed a low level of awareness in families and children with mental disabilities in India about ways and methods of care and care for oral and dental health and preventing diseases and pests that affect them. Scambler (2012) showed that children with mental problems and those with learning difficulties in the United Kingdom have clear suffering in the care of oral and dental health. They came as a result of some wrong practices such as nail biting, which leads to malocclusion of the jaws, and these disabilities are accompanied by speech disorders, and excessive salivation out of the mouth, and the abnormal shapes of the teeth and others. Li Jeng et al. (2009) also showed that children with mental retardation, cerebral palsy, epilepsy, and autistic disorders in Taiwan lack general oral and dental health. In addition, the health services provided to them need more care and attention, as well as the family's participation in this aspect by raising awareness about it.

From the aforementioned, the justification for conducting this study comes from the obligation of those in charge of caring for disabled children, including the family, to assume responsibility with all honesty and sincerity. They should be patient to assist these children to reach good oral health and spare them tooth decay or premature extraction and gum infections. This, in turn, improves their health and brings them happiness. Raising awareness of the family about the importance of oral and dental health among children with disabilities should always remain a cornerstone in programs for the rehabilitation and integration of persons with disabilities in their societies. Also, it is necessary to educate children with

disabilities and their families about the importance of maintaining good health of the mouth and teeth and the prevention of the risks of dental and oral lesions to enjoy appropriate mental and physical health. As a result, the current study attempted to determine the level of family knowledge of oral and dental healthcare procedures for disabled children aged 5-16years in Saudi Arabia.

**Statement of the problem**

The problem of this study emerged from the suffering of disabled children from oral and dental health problems; they show poor oral and dental health, and the percentage of oral and dental lesions and diseases increases in these children. They also suffer from high levels of dental pain, either because of their disability or because of the medications they take, or because their family has little interest in these problems compared to the educational, social, and family problems related to their upbringing, finding their place in society and considering oral and dental healthcare as a secondary matter. The study's purpose is to identify the level of family awareness of the methods of oral and dental healthcare for children aged 5-16 years with disabilities. It provides survey indicators about the level of family awareness of the methods and methods of oral and dental healthcare for children with disabilities in the Kingdom of Saudi Arabia and its relationship to demographic variables, such as the nature of the relationship with the disabled child, the type of disability, and the educational level of the parents. These indicators contribute to providing valuable evidence indicating the need for the Ministry of Health and the Ministry of Social Development to work on creating effective plans and policies in the future to spread family awareness of the importance of methods and methods of oral and dental healthcare for children with disabilities in the Kingdom of Saudi Arabia. It also contributes to improving oral and dental care for disabled children and protecting them from the risks of oral and dental diseases. This enables them to enjoy healthy teeth that help them eat their food with comfort and enjoyment, and live with high-quality standards. Therefore, the study attempted to answer the following questions:

What is the degree of family awareness of the techniques of oral and dental healthcare for disabled children aged 5 to 16 years?

Does family awareness of oral and dental healthcare methods for the disabled children aged 5-16 years differ by the nature of the relationship with the child?

Does family awareness of oral and dental healthcare methods for the disabled children aged 5-16 years differ by the type of child's disability?

Does family awareness of oral and dental healthcare methods for the disabled children aged 5-16 years differ by the educational qualification level?

**Objectives of the study**

The purpose of this study was to determine the amount of family knowledge of the procedures of oral and dental healthcare for children aged 5-16 years with disabilities to work on enhancing them. In addition, the study sought to identify whether the responses of the study sample on the level of family awareness of oral and dental healthcare methods for disabled children aged 5-16 years differ based on the relationship with the child, the type of disability of the child, and the educational qualification level. This is so to see their views and know the impact of those variables to develop an improvement plan to raise the level of family awareness of oral and dental healthcare methods for children aged 5-16years with disabilities.

**Significance of the study**

This study is significant in that it contributes descriptive and exploratory information on the reality of the family's degree of knowledge of the techniques of

oral and dental healthcare for children with various impairments. This survey will provide indicators regarding the role of the family in the oral and dental health of children with disabilities in the Kingdom of Saudi Arabia, as well as its relationship to demographic variables such as the relationship with the disabled child, type of disability, and parents' educational level. Also, these findings will provide important evidence indicating the need for both the Ministry of Health and the Ministry of Social Development to work together in the future to develop effective plans and policies to raise family awareness of the importance of oral and dental healthcare methods for disabled children in Saudi Arabia. In addition, the results will help in developing plans to improve oral and dental care for disabled children and protect them from the risks of oral and dental diseases. These plans will also enable them to enjoy healthy teeth so that they can eat their food comfortably and with pleasure and live life at a high-quality level.

## METHODS

A descriptive approach employing the social survey method was used. Before distributing the questionnaire, the required ethical approvals of centers and associations caring for people with disabilities in the region were obtained. These centers cooperated in publishing the study tool through social media applications; the questionnaire link was distributed to a sample of 312 parents of children aged 5-16 years with disabilities in Najran region, south of the Kingdom of Saudi Arabia, in October and November of 2022. The ethical approval for the application of the study tool was obtained from the Scientific Research Ethical Committee -Deanship of Scientific Research at Najran University on October 20, 2022 with the code [Reference No: 444-45-18860-DS].

### Population and sample of the study

In October 2022, a purposeful sample including (312) parents of disabled children aged 5 to 16 years old in Najran in the southern part of Saudi Arabia was chosen. This selection was made due to the difficulty of enumerating the study population, in addition to reaching the current participants after they agreed to apply the study tool. The reports by the College of Dentistry at Najran University indicated problems in family awareness in Najran region regarding the most preventive and treatment methods for oral and dental healthcare for people with disabilities, especially children. They also emphasized a high level of oral and dental needs in children with disabilities (Najran University, 2022). In addition, there is an urgent need to educate and educate people with disabilities and members of society about oral and dental health and care for them. The study sample was dispersed based on the following demographic variables: the relationship with the child, disability type, and education level. Table 1 illustrates the distribution of the study sample.

**Table 1**. The Study Sample based on Variables

| Variable | Group | Freq. | % |
|---|---|---|---|
| Nature of the relationship with the child | Mother | 187 | 59.9 |
| | Father | 125 | 40.1 |
| Type of the child's disability | Hearing disability | 44 | 14.1 |
| | Learning disabilities | 60 | 19.2 |
| | Motor disability | 53 | 17.0 |
| | Mental disability | 33 | 10.6 |

| Variable | Group | Freq. | % |
|---|---|---|---|
| | Visual disability | 43 | 13.8 |
| | Autism spectrum disorders | 79 | 25.3 |
| Educational qualification | High school or below | 140 | 44.9 |
| | University | 172 | 55.1 |
| Total | | 312 | 100.0 |

**Instrument of the study**

To prepare the study tool, the study problem and its components were identified. Then, previous studies related to the current study's topic, such as Gardens et al. (2014) and Ningrum et al. (2021) were referred to and analyzed, and family methods in providing oral and dental healthcare for children with disabilities were extracted. They included choosing the right healthy food, visiting the dentist periodically, and when needed, using fluoride and adhesive fillings, and home care. The tool was made up of two sections. The first section is concerned with the sample's demographic data in terms of the relationship with the child (father, mother), disability type (learning, autism, mental, motor, visual, hearing), and the educational level of the respondent from the parents (secondary and below, university). The second section has 19 questions that assess family knowledge of oral and dental healthcare practices for disabled children aged 5 to 16 years. The study tool (the questionnaire) was developed for data collection based on theoretical literature and prior studies that dealt with A five-point Likert scale was used to analyze the replies to the second part of the tool (very strongly agree, highly agree, moderately agree, little agree, and very little agree), and the scores (5, 4, 3, 2, 1) were supplied to compute the respondents' scores. For the degree of the research tool items and the overall score for the categorization of means, the following grading was used: (1.00 - 1.80) very low, (>1.80 - 2.60) low, (> 2.60 - 3.40) medium, (>3.40-4.20) high, (> 4.20-5.00) very high.

**Validity and reliability**

The face validity of the study tool's content was validated by presenting it in its original edition to (10) experts in special education and dentistry from faculty members at different Saudi educational institutions. They assessed the tool's adequacy for achieving the study's objectives. The tool's validity for what it was designed to measure was reported by the experts. As a result, the tool was authorized in its final form, edition which had 19 components. The tool's reliability was validated by computing the reliability coefficient using the test-retest technique. It is one of the most popular methods used by researchers to measure the correlation coefficient in scientific research and to verify the tool's reliability and its results in the future (Nofal et al., 2022). The tool was used on an exploratory sample drawn from outside the research population, which included (30) parents of disabled children enrolled in special education centers in Najran region. Two weeks later, the tool was reapplied to the same sample in similar conditions. Following that, the Pearson correlation coefficient was computed between the two applications, and the tool's reliability coefficient was 0.85, a high coefficient acceptable for the instrument's and outcomes' reliability.

**Statistical processing**

In this study, the mean and standard deviation were used to answer the first question about determining the level of family awareness of the methods of oral and dental healthcare for children with

disabilities at ages 5-16 years. The t-test was also used for independent samples to answer the second and fourth questions to show the differences in the level of family awareness of the methods of oral and dental healthcare for children with disabilities at ages 5-16 years on the variables of the nature of the relationship with the child (father, mother), and the respondent's level of education (secondary or less, university) separately. Al-Mahmoudi (2019) argues that the t-test for independent samples is appropriate when comparing means drawn from independent samples when the variable used to form the groups may already exist. However, a cutoff point can be provided on a continuous variable to create clusters dynamically during analysis. To answer the third question, a one-way analysis of variance was used. This is a parametric test used to compare the means or reach a decision regarding the presence or absence of differences between the mean performance of the groups subjected to different treatments. This is done to find the factors that make one of the means different from other means (Al-Mahmoudi, 2019). In this study, this analysis was used to show the differences in the level of family awareness of the methods of caring for oral and dental health among children with disabilities in the ages 5-16 years, according to the variable type of disability and its different categories (auditory, learning difficulties, motor, intellectual, visual, autism spectrum disorders).

## RESULT

The researchers presented according to research questions:

### The degree of family awareness of the techniques of oral and dental healthcare for disabled children aged 5 to 16 years

The means and standard deviations of the level of family knowledge of the procedures of oral and dental healthcare for children with disabilities aged 5-16 years old were extracted to answer this question. The results are shown in Table 2.

**Table 2**. Descriptive Statistics of Family's Awareness of Oral and Dental Healthcare

| No | Dimension-statement | Means | Standard deviations | Rank | Level |
|---|---|---|---|---|---|
| 1 | I ensure proper nutrition for the disabled child by focusing on eating healthy foods such as fruits and vegetables | 2.59 | .540 | 1 | Medium |
| 15 | If my disabled child does not accept the toothbrush and toothpaste, I use a gauze piece moistened with water to clean the teeth | 2.51 | .550 | 2 | Medium |
| 18 | With my disabled child, I use preventive dental fillings to avoid the accumulation of food waste and germs and reduce cavities | 2.36 | .660 | 3 | Low |
| 3 | I encourage my disabled child to chew food well | 2.33 | .760 | 4 | Low |
| 2 | I make sure that my disabled child avoids eating unhealthy foods such as sweets, candies, sweetened milk, and juices rich in sugar | 2.31 | .680 | 5 | Low |
| 16 | I keep in touch with my disabled child regularly to protect his mouth and teeth and ensure that they are free from cavities, ulcers and dental lesions | 2.31 | .600 | 6 | Low |

| No | Dimension-statement | Means | Standard deviations | Rank | Level |
|---|---|---|---|---|---|
| 11 | I make sure that my disabled child uses a toothbrush to brush his teeth after eating foods and medicines | 2.28 | .630 | 7 | Low |
| 17 | I remove plaque daily for my disabled child because it is the main cause of both gum disease and tooth decay. | 2.26 | .740 | 8 | Low |
| 12 | I adjust the toothbrush to suit the type of disability my child has, which enables him to hold it easily. | 2.21 | .720 | 9 | Low |
| 14 | If my disabled child can't use a regular or electric toothbrush to brush his teeth, I can help him | 2.18 | .710 | 10 | Low |
| 10 | I make sure that my disabled child uses a toothbrush to brush his teeth in the evening before bed | 2.15 | .660 | 11 | Low |
| 19 | I cooperate with the doctor and a nutritionist to determine the healthy foods that are appropriate for the oral and dental health of my disabled child | 2.13 | .640 | 12 | Low |
| 4 | I make sure to visit the dentist immediately when problems and dental lesions appear in my disabled child and treat them | 2.08 | .760 | 13 | Low |
| 8 | I make sure to teach my disabled child the correct way to brush his teeth and be self-reliant | 2.05 | .710 | 14 | Low |
| 9 | I make sure that my disabled child uses a toothbrush to brush his teeth in the morning when he wakes up | 2.03 | .690 | 15 | Low |
| 6 | I use dental floss to clean between the teeth of my disabled child | 2.00 | .750 | 16 | Low |
| 13 | When my disabled child fails to use a regular toothbrush, I make sure to provide an electric toothbrush for him to use himself | 1.97 | .760 | 17 | Low |
| 5 | I make sure to visit the dentist at least once or twice a year to prevent the teeth of my disabled child | 1.95 | .670 | 18 | Low |
| 7 | I use fluorine orally or apply it topically to the teeth of my disabled child to prevent caries | 1.64 | .690 | 19 | Very low |
| | Total | 2.18 | .280 | | Low |

Table 2 reveals that the overall degree of the family's level of knowledge of the techniques of oral and dental healthcare for disabled children aged 5 to 16 years was low (M=2.18, SD=0.28). It was found that the families of children with disabilities have an average level of awareness in ensuring proper nutrition for their disabled children by focusing on eating healthy foods such as fruits and vegetables. They also make sure that their disabled children use a toothbrush and toothpaste. If the child does not accept it, they resort to a piece of gauze soaked in water to clean and preserve

the teeth. Weak practices were found among the families of children with disabilities in terms of caring for oral and dental healthcare methods for their disabled children. The most prominent of these were the lack of using dental floss to clean between the teeth of their disabled child or electric toothbrushes, the lack of keenness to visit the dentist periodically during the year, and the weak use of fluorine by mouth or applying it topically on the disabled child's teeth to prevent cavities.

**The nature of the relationship with the disabled child on family awareness of oral and dental healthcare methods**

The means and standard deviations of the study sample's responses on the level of family knowledge of oral and dental healthcare procedures for disabled children aged 5-16 years were extracted according to the relationship variable with the child to answer this question. The t-test was also used for independent samples to indicate the significance of the statistical differences between the means after the criteria for using the t-test were met to indicate the mean differences. The size of each sample in one category exceeds 30 individuals. The difference between the size of the two research samples was close, 187 fathers and 125 mothers. Likewise, the sample was homogeneous in terms of its affiliation to one nature, which is the parents of children with disabilities in Najran region in the Kingdom of Saudi Arabia; they are similar in their cultural and social characteristics, and the extent of the moderation of the frequency distribution for each of the two research samples. Besides, the data were free of outliers or randomness. Finally, the data curve was moderate and bell-shaped. This result was confirmed by the results of the Kolmogorov-Smirnov Test for Normality. The findings are shown in Table 3.

**Table 3**. T-test (Independent Samples) for any Significances in the Level of Family Awareness of Oral and Dental Healthcare Methods for Children with Disabilities Aged 5-16 Years due to the Nature of the Relationship with the Child

| nature of the relationship with the child | No. | Means | Standard deviations | T | df | Sig. |
|---|---|---|---|---|---|---|
| Mother | 187 | 2.21 | 0.27 | 2.523 | 310 | .012 |
| Father | 125 | 2.13 | 0.29 | | | |

Table 3 demonstrates that there were significant differences at 0.05 between the means of the study sample's responses about the family's awareness of the methods of oral and dental healthcare for disabled children aged 5-16 years with disabilities due to the relationship with the child (father, mother) for the benefit of the mother. The "t" value was 2.523, with a statistical significance of .012. This result suggests that moms of disabled children aged 5 to 16 years are more knowledgeable of the strategies for caring for their children's oral and dental health than fathers.

**The impact of the type of child's disability on family awareness of oral and dental healthcare methods**

To tackle this question, the means and standard deviations of the participants' responses to the degree of family knowledge of oral healthcare procedures for disabled children aged 5-16 years were retrieved based on the child's disability type. The one-way analysis of

variance was also performed to demonstrate the statistical significance of the variations between those means based on the categories of the child's disability type. It is a parametric test used to compare the means or reach a decision regarding the existence or absence of differences between the mean performances of the groups subjected to different treatments. It aims to uncover the factors that make one of the averages different from other means (Al-Mahmoudi, 2019). This test was used in this study to show the significance of the statistical differences between the arithmetic averages of the study sample's estimates about the level of family awareness of oral and dental healthcare methods for children aged 5-16 years with disabilities according to the various categories of the child's disability type. The results are displayed in Table 4.

**Table 4.** One-way Analysis of the Level of Family Awareness of Oral and Dental Healthcare Methods for Children Aged 5-16 Years with Disabilities due to Child's Disability

| Type of disability | No. | Means | Standard deviations | Source | Sum of squares | df | Mean of squares | P | Sig. |
|---|---|---|---|---|---|---|---|---|---|
| Hearing | 44 | 2.14 | .340 | Between groups | .784 | 5 | .157 | 1.981 | .081 |
| Learning disabilities | 60 | 2.19 | .250 | Within groups | 24.228 | 306 | .079 | | |
| Motor | 53 | 2.08 | .330 | Total | 25.012 | 311 | | | |
| Mental | 33 | 2.19 | .330 | | | | | | |
| Visual | 43 | 2.23 | .180 | | | | | | |
| Autism spectrum disorders | 79 | 2.22 | .240 | | | | | | |

Table 4 demonstrates no statistically significant differences at 0.05 between the sample's responses about the level of family awareness of methods of oral and dental healthcare for disabled children aged 5-16 years related to disability type. The "*P*" value was 1.981, with a statistical significance of .081. This result suggests that parents of disabled children aged 5 to 16 years are equally aware of the strategies for caring for their children's oral and dental health.

**The impact of the educational qualification level on family awareness of oral and dental healthcare methods**

The averages and standard deviations of the responses to the level of family knowledge of oral and dental healthcare techniques for disabled children aged 5-16 years were extracted according to qualification level. The t-test was also used for independent samples to indicate the significance of the statistical differences between the means after the criteria for using the t-test were met to indicate the mean differences. The size of each sample in one category exceeds 30 individuals. The difference between the size of the two research samples was close, (140) high school or below and (172) university degree. Likewise, the sample was homogeneous in terms of its affiliation to one nature, which is the parents of children with disabilities in Najran region in the Kingdom of Saudi Arabia; they are similar in their cultural and social characteristics, and the extent of the moderation of the frequency distribution for each of the two research samples. In addition, the data were free of outliers or randomness. Finally, the data curve was moderate and bell-shaped. This was confirmed by the results of the Kolmogorov-Smirnov Test for Normality. The findings are shown in Table 5.

**Table 5.** T-test (Independent Samples) for the Level of Family Awareness of Oral and Dental Healthcare Methods for Children with Disabilities Aged 5-16 Years due to the Educational Qualification Level

| Educational level | No. | Means | Standard deviations | t | df | Sig. |
|---|---|---|---|---|---|---|
| High school or below | 140 | 2.05 | 0.26 | 7.595 | 310 | .000 |
| University | 172 | 2.28 | 0.25 | | | |

Table 5 shows differences at 0.05 between the study sample's responses to family's awareness of oral and dental healthcare methods for disabled children aged 5-16 years with disabilities, attributed to educational qualification level in favor of the university. "t" scored 7.595 at .000. This result indicates that families with university education are more knowledgeable of the procedures of oral and dental healthcare for their disabled children aged 5 to 16 years old than parents with secondary education or less.

## DISCUSSION

This part presents the main results of the study, their discussion and interpretation, and the recommendations that emerge from its results.

Gardens et al. (2014) see that the family represented by fathers and mothers often focus on solving academic and social problems of their disabled children and view oral health as a secondary matter. The current result agrees with that of Li Jeng et al.'s (2009) study, which confirmed that there is a weakness in families of children with disabilities in Taiwan regarding awareness of the general health of the mouth and teeth and how to provide appropriate healthcare in this area. Also, the result accords with that of Gardens et al. (2014) showed a low level of family awareness about the ways and methods of oral and dental healthcare for children with mental disabilities in India. It appears that children with disabilities in the age group 5-16 years suffer from poor oral and dental healthcare compared to their non-disabled peers. Lack of dental care, oral hygiene, and factors related to disability may increase the importance of dentistry for children with disabilities and family awareness of the appropriate methods and methods for oral and dental health in this group. The results of this question also lead us to the importance of adopting good steps for families of children with disabilities to provide oral healthcare for children with disabilities. It is for the child to be reviewed periodically by visiting the dentist to secure primary dental care of all kinds, preventive and curative. Also, specialized dentists who can use special techniques, such as oral or intravenous Sedation preparation or general anesthesia should be reviewed. A team of specialists and consultants in pediatric dentistry who have all the capabilities and facilities for general anesthesia in specialized dental centers and hospitals should treat disabled children who have complex health conditions. It is very important for the family to provide all kinds of care and supervision for the disabled child and to encourage him to eat healthy and peaceful foods and avoid useless foods and foods that hurt his teeth.

The results showed statistically significant differences between the means of the study sample’s responses about the family’s awareness of the methods of oral and dental healthcare for children aged 5-16 years with disabilities due to the variable of the nature of the relationship with the child in favor of the mother. This result can be explained by the researchers' belief that mothers are more interactive and communicative with their disabled children compared to fathers because they are constantly at home given the scarcity of women going out to work outside the home

compared to men. They also bear the largest part in providing care and attention to their disabled children. Therefore, they are keen to provide the most important requirements that achieve oral and dental health and awareness of them to achieve happiness for their children (Alwadi et al., 2022). In addition, the mother is the most important person and the basis for caring for a disabled child and providing for his requirements and needs. She is the person most in contact with the disabled child and bears all his burdens in the family. Also, She is the person in the family who is most accepting of the disabled child, coexisting with him, dealing with him, and caring for him. Therefore, the mother has a major role in caring for her disabled child, raising his efficiency, ensuring his safety, and following up on his health, psychological and other conditions (Maghaz and Abdallah, 2021). Thus, mothers are more aware of the methods and methods of caring for oral and dental health in children aged 5-16 years with disabilities.

The results showed no statistically significant differences between the means of the study sample's responses about the family's awareness of the methods of oral and dental healthcare for children aged 5-16 years with disabilities due to the variable of the type of child's disability. This can be explained in light of all the different disabilities associated with health problems related to the mouth and teeth, such as gingivitis, the frequent spread of plaque, tooth decay, caries, etc. Ningrum et al. (2012) showed that children with mental disabilities and autism spectrum disorders have major problems in oral and dental health as a result of their poor ability to express their suffering from dental pain and identify what they suffer from those lesions and diseases. (Naidoo and Singh, 2018) noted that Autistic children exhibit poor dietary choices, particular behaviors, chewing hard objects, aversions, self-extraction, gum plucking, bruxism, and frequent regurgitation, which may need tooth removal. These activities may increase their susceptibility to oral and dental health issues, which require the family's fatigue and suffering and reflect in their ability to raise awareness of the importance of oral and dental health for their children with autism disorders. Pouradeli et al. (2019) that children with hearing disabilities, due to the need to communicate with them using signs and lip-reading in communication, it is often difficult to understand their suffering from the dentist or caregivers and those responsible for them their families, which makes families overlook what they need help taking care of their mouth and teeth. As for the visually impaired, including the blind and the visually impaired, Mandic et al. (2016) showed that some of them may neglect the health of their mouth and teeth because they do not see the color and shape of the teeth, which leads to the formation of calculus and the spread of caries. Therefore, it is difficult to deal with them and direct them to take care of their dental health and conduct periodic examinations on them to detect dental lesions early and treat them. Scambler (2012) indicated that children with learning disabilities have some wrong practices such as nail biting, sometimes suffering from speech disorders, and forgetfulness, and especially practicing the daily routine of brushing their teeth. These practices may pose problems in the mouth and teeth, which the family neglects due to the difficulty of expressing or performing them.

In this regard, researchers believe that these causes, their abundance and diversity, and their association with the occurrence of diseases and pests of the mouth and teeth in children with disabilities, make families confused (Purohit and Singh, 2012). Sometimes the family finds it difficult to deal with the disabled child, especially those with multiple and severe disabilities, which negatively reflects on the family's role in awareness of the importance of providing healthcare associated with them in terms of oral and dental safety (Ningrum et al., 2012). In this case, patience and

responsibility from the family should be exercised toward providing good levels of care for children with disabilities regarding their oral health because it is a task that may be difficult and needs close monitoring and follow-up.

The results revealed differences in the participants' responses regarding the family's awareness of the methods of oral and dental healthcare for disabled children aged 5-16 years due to educational qualification level in favor of university degree holders. Perhaps, this result can be explained from the point of view of the researchers that education is a crucial variable in human understanding and awareness of the scientific and cognitive progress that revolves around them. Thus, an educated person with high university qualifications seeks new knowledge. Learners often tend towards cognitive awareness of the importance of health and ways to maintain it, and they resort to it when needed (Dardas and Ahmad, 2014). Al-Awamleh's (2015) study confirmed that the families of children with disabilities with university qualifications can read deeply about disability to understand it and learn how to deal with their disabled child. They also can overcome problems and provide them with appropriate services. In addition, the families of children with disabilities with high academic qualifications have sufficient knowledge about how to live with their disabled child and provide them with appropriate services. Therefore, they are aware of the new developments in oral and dental care for their disabled children, such as providing healthy food, visiting food specialists, using fluoride, and adhesive fillings to prevent decay and caries, and using electric toothbrushes. It is noticeable that education gives man flexibility in his thinking and behavior. Thus, increased understanding of the methods of oral and dental healthcare for disabled children. Those with academic qualifications but no university education or who are illiterate rely on traditional techniques of caring for children with disabilities' oral and dental health, such as using a disabled child rinsing with water without using toothpaste or a wet cloth or depriving the child of eating candies and sweets.

## CONCLUSIONS

The study identified the level of family awareness of oral and dental healthcare methods for 5-16-year-old disabled children in Saudi Arabia. Based on the results, there was a weak level of family awareness of the methods of oral and dental healthcare for children aged 5-16 years with disabilities. Also, statistically significant differences were found in the level of family awareness of the methods of oral and dental healthcare for children aged 5-16 years with nature of the relationship with the child disability in favor of mothers, and the academic qualification of in favor of the university academic qualification. Nevertheless, the respondents' answers did not differ by their child's type of disability. The study implicates the importance of raising the level of family awareness of oral and dental healthcare methods for 5-16-year-old disabled children in Saudi Arabia. This awareness can be though providing preventable programs of the disabled's families on the methods of taking care of their dental health.

The current study had limitations. One of the most important limitations of this study is the scarcity of previous studies on the topic of the current study within the researchers' knowledge. This is somewhat under study in the interpretation, justification and discussion of the results. The use of the descriptive method in the social survey method and the questionnaire tool was among the limitations that determined the responses of the study sample. The researchers encountered, to some extent, restrictions in interpreting the results, especially the reasons for differences or non-differences on demographic variables. It was better to use other types of research methods such as the

qualitative method and other tools such as interview and observation to understand the phenomenon in more depth.

In light of the results that have been reached, it is recommended to work on the development of a comprehensive national strategic plan supervised by the Ministry of Health and the Ministry of Social Development to reduce the risks of oral and dental diseases. As this work is an integral part of comprehensive oral and dental healthcare for children with disabilities ages 5-16 years. Therefore, it is important to direct that ministry to work on establishing a home dental unit that will supervise the training of families of children with disabilities and educate them about the most important and correct methods for maintaining oral and dental health and preventing disease risks among children aged 5-16 years with disabilities in the Kingdom of Saudi Arabia. The Ministry of Education should also conduct wide-ranging, geographical-wide programs for oral health education and awareness for children with disabilities and their families in collaboration with university dentistry colleges. In addition, a national project should be adopted through the development of medical programs broadcast on satellite channels and the official websites of the Ministry of Health, centers, and hospitals on the Internet to highlight the importance of oral and dental health and awareness of the proper methods used to prevent the risk of oral and dental diseases and pests that affect children with disabilities. Furthermore, there is a need to direct health research centers in universities and researchers towards conducting more future research. These studies investigate and explore effective interventions by families and caregivers to improve the oral health of people with disabilities. In light of the results of the significant weakness in the level of family awareness of the methods of oral and dental healthcare for children aged 5-16 years with disabilities, which constitutes a large burden of oral and dental diseases among children with disabilities, future research can focus on further investigation and exploration to identify effective interventions from families and caregivers to improve oral health in children, adolescents, and adults with disabilities.

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Original Research

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# THE DEVELOPMENT AND VALIDITY OF MINDFULNESS DHIKR BREATHING THERAPY FOR INSOMNIA

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**ABSTRACT**

**Introduction:** The prevalence of insomnia in Indonesia is still quite high around 10% to 38.5%. Mindfulness is one of the therapeutic models that can overcome the weaknesses of previous therapeutic for insomnia. Muslims need therapy that uses elements of Islam to feel the benefits. **Aim:** to develop mindfulness dhikr breathing therapy for insomnia. In this study, we assess the face validity, content validity, and acceptability of the module and audio recording of the mindfulness dhikr breathing therapy. **Methods:** This research is part of a research and development model of mindfulness dhikr breathing therapy for insomniacs. Participant for the validity test was five experts in psychology. Participants for the acceptability test were 13 adults who suffered from insomnia. The object assessed was the module and audio recording of the therapeutical model. Analysis of face validity was using the subjective valuation by the rater. Analysis of content validity used Aiken's V coefficient. **Result:** From the rater's subjective assessment of the therapy module and audio recording of the therapy several suggestions were obtained. The content validity based on the average Aiken V coefficient was 0.99 (>0.84, p=0.021). The acceptability obtained average rating for all aspects of the acceptance assessment was 4,30 (>3). **Conclusion:** The mindfulness dhikr breathing therapy is worthy of use and acceptable as a therapeutic for insomnia. Researchers hope that the development of the module and audio recording of mindfulness dhikr breathing therapy can help the implementation of therapy so that it can be more optimal in overcoming insomnia.

**Keywords**: Acceptability, Development, Insomnia, Mindfulness Dhikr Breathing, Validity

## INTRODUCTION

Getting enough sleep at night provides the body with energy for daytime activities. Adequate quantity and quality of sleep will give healthier conditions and prevent the body from various diseases (Buysse, 2014). However, many people now do not have enough time to sleep. Most people today have a short sleep of 4 - 6 hours per day. Usually, the duration of sleep is short because a person still has activities at night that should be used as bedtime and shows workers go against their circadian rhythms because the night is a time for sleep and rest (Hastoro, 2022).

The most common health problems that society complains about and that become an economic burden today are sometimes caused by sleep disorders (Bollu and Kaur, 2019). Some commonly reported complaints related to sleep deprivation at night are difficulties falling and maintaining sleep or insomnia (Hubbling et al., 2014). Based on data from the American Academy of Sleep Medicine (AASM) in 2008 states that about 30% of adults have insomnia symptoms, about 10% of adults have severe enough insomnia, and less than 10% of adults have chronic insomnia (American Academy of Sleep Medicine, 2008). The prevalence of Indonesian insomnia is around 10%. Insomniacs are about 28 million out of 238 million people in Indonesia (Rimbawan and Ratep, 2016).

The main factors that cause insomnia are age, physiology, environment, and circadian rhythm (Taylor

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et al., 2014). Some theories emphasize the idea of arousal dysregulation as the etiology of prolonged sleep disorders and daytime dysfunction (Ong and Smith, 2017). Attempts to get more sleep and avoid daytime fatigue make chronic insomniacs fall into a vicious circle (Kim, 2021). Insomnia causes negative impacts such as decreased work performance (Yazdi et al., 2014), academic performance (Maheshwari and Shaukat, 2019) and the quality of life (Ishak et al., 2012).

Cognitive behavior therapy for insomnia (CBTI) is a prelude to psychological treatment and has been commonly used to treat insomnia (Carney and Edinger, 2010; Ong et al., 2014) ., But this intervention took a long time and experienced coaches (Friedrich and Schlarb, 2017). In addition, those who are curable from insomnia after this treatment are only about 30% to 40% of patients. Most patients re-suffer from insomnia due to having increased arousal before bedtime at the end of treatment (Ong and Smith, 2017). Therefore, an alternative approach that directly addresses the dysregulation of arousal in insomnia is urgently needed. Mindfulness-based intervention is one of the treatments that overcome barriers to accessing and correcting sequential cognitive behavioral therapy (Kim, 2021).

The principles and practice of mindfulness can provide metacognitive skills to work with insomnia problems. Mindfulness-based treatments can overcome stressful problems that arise because of the inability to sleep. Mindfulness in the treatment of insomnia is divided into three principles. First by raising awareness of the mental and physical states that appear when experiencing insomnia symptoms. Second, shifting mental processes to reduce sleep-related arousal. The third is to regenerate a conscious attitude to respond when insomnia symptoms appear (Ong and Smith, 2017). Several randomized controlled trials support the efficacy of mindfulness-based therapy (MBT) to improve sleep quality and reduce sleep disorders (Gross et al., 2011;Ong et al., 2014; Perini et al., 2021) suggesting that this intervention may serve as a viable alternative to CBT-I and pharmacotherapy for insomnia (Ong and Smith, 2017).

Belief factors can increase the feeling of well-being of cancer patients who have insomnia (Carmody et al., 2008). According to de Diego-Cordero et al. (2020), techniques involving spirituality and religiosity such as yoga, prayer/meditation, training and psycho-religious interventions have a promising role in better sleep. Islam is a religion that has a belief system that can be an additional element of therapy. Some studies using Islamic beliefs impact the therapeutic process (Soliman and Mohamed, 2013;Fandiani, Wantiyah and Juliningrum, 2017; Vitaliati, 2018). Research (Atiyaningsih and Wulandari, 2017) has proven that dhikr therapy can improve the quality of sleep of post-surgery patients. A study by Purwanto (2016) demonstrates the effect of Dhikr breathing therapy on sleep latency. Dhikr combined with breath causes a feeling of relaxation faster when going to sleep.

Researchers are interested in developing insomnia therapy that combines psychological methods with believe system, namely mindfulness dhikr breathing. This therapy combines mindfulness which has been proven to overcome insomnia (Ong and Smith, 2017) with dhikr breathing meditation because most Indonesians are Muslims and they need psychological therapy that involves religious or spiritual elements in this case the Islamic religion. The model of mindfulness dhikr breathing therapy for insomniacs was made based on the result preliminary survey related to the prevalence rate of insomnia is still high in Surakarta of 38.5% (Purwanto et al., 2023). This is the first step to developing the therapy for insomniacs with a mindfulness method combined with dhikr breathing meditation.

The feasibility of a tool and instrument depends on how exactly the identified variable is measured or what is more commonly known as validity. According to Kusumawati, Widyawati, and Dewi (2021), the validity of the instrument needs to be done because it is an important factor of instrument implementation. The types of validity in educational research are face validity, content validity, construct validity, and criteria validity (Oluwatayo, 2012). The appropriate validation formulation to perform the content validity against the media is very important. An acceptance test is also important to see how acceptable all components in the therapeutic model are to the target (Moore et al., 2021), which in this study the target was insomniacs. This study aims to develop mindfulness dhikr breathing therapy for insomniacs. In this study, we assess the face validity, content validity, and acceptability of the mindfulness dhikr breathing therapy.

## METHODS

### Study Design

This study is part of a research and development of mindfulness dhikr breathing (MDB) therapy for insomniacs. This research has been ethically approved by the Research Ethics Committee of The National University of Malaysia No.UKM.FSK.800-2/27/9(NN-2020-036). This research was conducted at the Faculty of Psychology, Universitas Muhammadiyah Surakarta.

### Raters

The raters in this study are divided into two purposes. Based on Table V (Aiken, 1985), theoretically the minimum limit to determine the number of raters is two people. The rater for validity was five experts in psychology with a minimum education in S2 Psychology and had filled in informed consent. According to Mutalazimah, Azwar and Murti (2014), the use of expert judgment is intended to minimize bias and improve the accuracy of research results. Experts in psychology have a role as a rater who provides an assessment related to the concepts, principles, and techniques of mindffulness dhikr breathing therapy, identifying weaknesses and advantages of the therapeutic. The raters for assessment of acceptability were 13 adults who suffer from insomnia.

### Objects

The media as a therapeutic aid designed are modules and audio recordings. The purpose of visual media and audio media therapy is as a tool in carrying out the therapeutic process. The validity and acceptability assessment includes all content of the module and the audio recording of therapy. The content of the module includes an introduction, and the four script materials, which are Mindfulness Body Scan, Mindfulness Breathing, Meditation Dhikr Breathing, and Mindfulness Dhikr This recording is divided into four recordings: the mindfulness body scan session (10 min 49 sec), the mindfulness breathing (8 min 39 sec), the meditation dhikr breathing session (7 min 46 sec), and the mindfulness dhikr breathing session (8 min 27 sec).

### Procedures

The procedure to create a mindfulness dhikr breathing therapy model refers to the 4-D mode (defining, designing, developing, and disseminating). A preliminary survey was conducted to analyze insomnia problems that occur in society. The results of a preliminary survey found that insomniacs in Surakarta in 2020 are still quite high both among workers and students (Purwanto et al., 2023). Insomnia treatment is still limited to pharmacology and psychological therapy and the treatment has not been able to be maximized in overcoming insomnia.

The design of therapeutic methods and media of therapeutic aids is carried out

to ensure that the therapy methods developed are in accordance with those needed by the community. The therapy developed to overcome insomnia in this study is mindfulness dhikr breathing. Mindfulness dhikr breathing therapy can only be used by people with the Islamic religion or Muslims because there is an additional Islamic belief, namely dhikr. Islamic elements are added in this therapy to meet the needs of Indonesians who are predominantly Muslim to overcome insomnia. In the implementation of therapy, therapeutic aids are needed, namely modules and audio recordings of therapy.

In the process of developing a mindfulness dhikr breathing therapy model, validation tests are carried out by psychologists to obtain a therapeutic model that corresponds to the objectives of the therapeutic model, targets, and psychological scientific material. The validation assessment is carried out by asking the experts to read the module and listen to the audio recording then assess the face validity and content validity of this therapy. The therapeutic acceptance test is carried out by insomniacs. The stage for this acceptance test begins with insomniacs following the four sessions of mindfulness dhikr breath therapies and reading the module. Trainers who train this therapy are pre-trained by developers. After completing therapy, insomniacs are asked to fill out a questionnaire for acceptance assessment. In this study, it did not discuss the process of disseminating modules and audio recordings of the mindfulness dhikr breathing therapy.

## Assessments

### *Face validity*

Face validity is performed to find out whether the instrument (module and audio recordings) in the mindfulness dhikr breathing therapy model is relevant, reasonable, clear, and unambiguous. In this study, the five experts in the field of psychology were asked to give a subjective assessment of the presentation and relevance of the module and audio recordings of each session in the mindfulness dhikr breathing therapy. Assessment criteria for face validity include module display and recorded audio display, grammatical suitability, clarity of therapeutic model, correct spelling of words, proper sentence structure, suitability of font size, well-thought-out construction and format of instrument structure, and clarity of sound in recorded audio (Oluwatayo, 2012).

### *Content Validity*

The content validity in this study refers to whether the content in the module and audio recording of mindfulness dhikr breathing therapy is representative and adequate when tested for insomnia therapy. The assessment of the contents validity in this study used an instrument in the form of a validity assessment questionnaire with a Likert scale of 1-4. "Highly Incompatible": 1, "Non-Appropriate": 2, "Appropriate" : 3, and "Very Appropriate": 4. The aspects assessed by the rater include the overall content (3 items); module introduction (3 items); The module script material has four sessions, namely Mindfulness Body Scan (4 items), Mindfulness Breath (4 items), Meditation Dhikr Breath (4 items) and Mindfulness Dhikr Breath (4 items); process/stage of therapy (3 items) and audio media recording (2 items). The content validity in this study was proven using Aiken's V coefficient as in the research by Sukmawati et al. (2022).

### *Acceptability*

This acceptance assessment aims to find out how acceptable the mindfulness dhikr breathing therapy is by insomniacs. Acceptability is measured by filling out an acceptance questionnaire by insomniac subjects (Moore et al., 2021). This acceptance questionnaire contains 17 items from the overall aspect of the therapy

process (3 items), modules of therapy (4 items), trainers (6 items), and audio recordings of therapy (4 items). The answer to each item was a Likert scale, ranging from 1 to 5 (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree).

### Data Analysis

There are two types of data in this study, namely qualitative and quantitative data. The qualitative data included comments and suggestions from raters (experts) obtained from the face validity test. The quantitative data include the rating results of all items for content validity and acceptability assessment from both raters (experts and insomniacs). The content validity of the therapeutic model was analyzed using Aiken's V coefficients. Aiken's V coefficient formula: [V=ΣS/(n(c-1))], S=r-lo, lo is the lowest validity assessment number (1), c is the highest validity assessment number (5), n is the number of raters, and r is the number given by the rater (Aiken's, 1985). The interpretation of Aiken's V coefficient values is influenced by the number of raters and the rating scale used. Based on the Aiken table, the number of raters (m) = 5 and the number of assessment options = 4, Aiken's standard V coefficient is valid when the V value reaches 0.84 with a probability of 0.021. The acceptability was analyzed using an average rating of each item. This average is used as an indicator of the agreement that the therapy model of mindfulness dhikr breathing was acceptable by insomniacs. Overall the mindfulness dhikr breathing therapy model is agreed to be acceptable if the rating per item is >3 (Moore et al., 2021).

## RESULT

### Face Validity of Mindfulness Dhikr Breathing Therapy

The face validity assessment obtained several comments and suggestions are shown in Table 1.

**Table 1.** Comments and Suggestions from experts on the Mindfulness Dhikr Breathing Therapy

| Aspect | Raters (Experts) | Comments and Suggestions |
|---|---|---|
| Module | 1,2,3,4, and 5 | The module material is clear and appropriate for sleep therapy |
| | 1 and 5 | Improve writing, foreign words, and typeface consistency |
| | 2,3 and 4 | Improve synopsis authorship systematics and complete synopsis |
| | 2 and 3 | Write specifics of training objectives and targets to be more concrete |
| | 2 and 3 | Give a description or definition of unfamiliar terms |
| | 1 | Highlights differences between training sessions |
| | 1 and 4 | Provide a training flow framework |
| | 4 | Clarify the steps of each training session |
| Audio Recording | 1,2,3,4, and 5 | Clear recorded sound |
| | 1 | Recorded sound can create a sense of relaxation |
| | 2 and 3 | The title of the recording file needs to be added |

**Table 2**. Aiken's V Coefficient

| Aspect | Item | V | Category |
|---|---|---|---|
| Overall content | Covers for sleep therapy | 1 | Valid |
| | Suitable for sleep therapy | 1 | Valid |
| | The material presented is the scientific truth of psychology | 0.93 | Valid |
| | **Mean** | **0.98** | |
| Introduction | Clarity of synopsis | 0.93 | Valid |
| | Clarity of purpose | 1 | Valid |
| | Target clarity | 1 | Valid |
| | **Mean** | **0.98** | |
| Module script materials | | | |
| a. Mindfulness body scan | Easy to understand | 1 | Valid |
| | Clarity of the material | 1 | Valid |
| | How the material is delivered | 1 | Valid |
| | Word selection and phrasing | 1 | Valid |
| | **Mean** | **1** | |
| b. Mindfulness breathing | Easy to understand | 1 | Valid |
| | Clarity of the material | 1 | Valid |
| | How the material is delivered | 1 | Valid |
| | Wording and phrasing | 1 | Valid |
| | **Mean** | **1** | |
| c. Dhikr breathing meditation | Easy to understand | 1 | Valid |
| | Clarity of the material | 1 | Valid |
| | How the material is delivered | 1 | Valid |
| | Word selection and phrasing | 1 | Valid |
| | **Mean** | **1** | |
| d. Mindfulness dhikr breathing | Easy to understand | 1 | Valid |
| | Clarity of the material | 0.93 | Valid |
| | How the material is delivered | 1 | Valid |
| | Word selection and phrasing | 1 | Valid |
| | **Mean** | **0.98** | |
| Stage of therapy | Therapeutic activities according to the process of the therapeutic sequence | 0.93 | Valid |
| | The activity of the therapist following the therapeutic process | 1 | Valid |
| | The activity of participants following the therapeutic process | 1 | Valid |
| | **Mean** | **0.98** | |
| Audio recording | Clear sound | 1 | Valid |
| | Able to usher in a state of sleep | 0.93 | Valid |
| | **Mean** | **0.97** | |
| | **Overall average** | **0.99** | **Valid** |

V= Aiken’s V Coefficient

Based on the subjective assessment of the module and audio recording therapy from the experts, several suggestions were obtained related to the alignment of writing and consistency of typefaces, the addition of less general definitions, the systematics of writing synopses, specifying the goals and target of therapy, the additional

therapeutic flow framework, highlighting the differences of each therapy session and the addition of a recording title to the recording file for easy use.

### Aiken's V Coefficient of Mindfulness Dhikr Breathing Therapy

The results of the content validity of the mindfulness dhikr breathing therapy analyzed by Aiken's V coefficients are shown in Table 2. Aiken's V coefficient values in 22 of 27 assessment items were 1.00. Five other items were 0.93, and the overall average was 0.99. The mean of Aiken's coefficient in the overall content aspect was 0.98, the introductory was 0.98, the material scripts of the mindfulness body scan session was 1.00, the mindfulness breathing session was 1.00, the meditation dhikr breathing session was 1.00, the mindfulness dhikr breathing session was 0.98, the stage of therapy was 0.98, and the audio recording was 0.97.

All averages of Aiken's V coefficient are higher than the standard Aiken's coefficient up to 0.84 (p=0.021). It concludes that the modules and audio recordings on the mindfulness dhikr breathing therapy model are valid, so they are worthy of use as insomnia therapy.

### Acceptability of Mindfulness Dhikr Breathing Therapy

The results of the acceptability assessment by insomniacs are shown in Table 3.

**Table 3.** Acceptability

| Aspect | Item | Raters (Insomniacs) | | | | | | | | | | | | | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | |
| Therapy | Appropriate for insomniac | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 4.23 |
| | Be able to implement well later in the research | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 3 | 4 | 5 | 5 | 4 | 4.31 |
| | May influence the decrease in insomnia disorders | 4 | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 3 | 4 | 5 | 5 | 4 | 4.31 |
| Module | Allotted time allocation accordingly | 5 | 4 | 4 | 5 | 5 | 4 | 3 | 5 | 3 | 4 | 4 | 5 | 4 | 4.23 |
| | Easy to understand | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 4.38 |
| | Step-by-step clarity on therapy modules | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 4.38 |
| | Contains complete material for the application of the therapy | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 3 | 3 | 4 | 5 | 4 | 4.23 |
| Trainer | Mastering training materials | 5 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 4 | 4.46 |
| | Easy-to-understand delivery | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 4.54 |
| | Body language supports the delivery of material | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 3 | 4.31 |
| | Intonation and rate of delivery can be followed | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 4.31 |
| | Attractive appearance | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 3 | 4.23 |
| | Delivery Interactively | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 3 | 4.54 |
| Audio Recording | Sound clear fairly | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4.23 |
| | Clear Narrative | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 5 | 2 | 4.15 |
| | Intonation appropriate | 3 | 5 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3.85 |
| | Easy to use | 4 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 4.46 |
| **Overall Average** | | | | | | | | | | | | | | | **4.30** |

Aspects assessed for the acceptability test are the overall therapy process, the module of therapy, the audio recording of therapy, and the trainer. The range of mean rating for the therapy aspect was 4.23 to 4.31, the module therapy aspect was 4.23 to 4.38, the trainer aspect was 4.23 to 4.54, and the audio recording was 3.85 to 4.46. Allover average of acceptability assessment was 4.30. This average rating is higher than a priory set criteria (>3) or has met the agreed limits regarding acceptance assessments. Therefore, the mindfulness dhikr breathing therapy model can be used as insomnia therapy because all aspects assessed have been declared acceptable to insomniacs.

## DISCUSSION

This study is the first to develop mindfulness dhikr breathing for the treatment of insomniacs. Before being applied to insomniacs, the mindfulness dhikr breathing therapy model must go through several stages to determine the feasibility of this therapy for insomniacs. The main objective of this study was to validate in terms of appearance and content through face validity and content validity by five experts in the field of psychology and test the acceptability of this therapy by 13 insomniacs. Face validity and content validity assessment aim to find out how feasible and relevant the appearance and content of the material in the mindfulness dhikr breathing therapy for insomnia therapy are.

From the content validity results, we found that the average Aiken's V coefficient (V) analysis of the mindfulness dhikr breathing therapy was 0.99 (>0.84). The results were also higher than the study by Andas, Effendi and Setyarini (2020) which obtained Aiken's V coefficient of 0.976 on the Sleep Quality Scale instrument. This average has exceeded the limit values for the analyses so the mindfulness dhikr breathing therapy model is stated to be very relevant and feasible to use as insomnia therapy, both module and audio recording. We also obtained qualitative feedback from the mindfulness dhikr breathing therapy model. Feedback from five experts in psychology will later be used as material to improve the appearance and content of mindfulness dhikr breathing therapy both modules and audio recordings of therapy.

Previous study by Purwanto, Anganthi and Yahman (2022) regarding the validation of insomnia therapy models with the dhikr breathing relaxation method shows that the model therapy is very suitable and can be applied to insomniacs. The study proved that dhikr breathing relaxation therapy can improve sleep quality. According to de Diego-Cordero et al. (2020) the addition of religious and spiritual techniques in the treatment of insomnia has a positive effect on improving insomnia. This research has similarities with the method used in the previous study by Purwanto, Anganthi and Yahman (2022), namely the Islamic method with the addition of elements of dhikr breathing meditation. The difference with the study is that the insomnia therapy model tested for validation in this study has the addition of an element of consciousness or mindfulness.

The mechanism of mindfulness can overcome insomnia beginning with building metacognitive awareness (Ong and Smith, 2017). Metacognitive awareness helps insomniacs to be aware of their thoughts and experiences while feeling trapped in the vicious cycle of insomnia, thus being able to disconnect to the next step (Kim, 2021). Then, insomniacs are also trained to maintain attention to breathing and direct attention to breathing whenever their mind wanders. Furthermore, insomniacs are trained to reduce automatic thoughts and negative self-referential thinking so that it can help reduce negative thoughts such as regarding daily problems due to lack of sleep (primary arousal) and metacognitive judgments such as why he does this to

make them feel bad and irritated (secondary arousal) (Ong and Smith, 2017). In addition, insomniacs are also trained to accept without judging any of their current thoughts and experiences. This reception reduces the pain of metacognitive judgment (secondary arousal), perception as well as distorted thoughts and continuous biases that occur in insomniacs. The increased acceptance of thoughts, emotions and difficult physical sensations makes insomniacs let go of the desires and desperate actions already carried out to put them to sleep (Kim, 2021).

The overall implementation of mindfulness dhikr breathing therapy is very suitable for sleep therapy. Mindfulness-based interventions have been proven effective in improving insomnia by several randomized controlled trial studies (Gross et al., 2011; Ong et al., 2014; 2018; Perini et al., 2021). According to research by Hubbling et al. (2014), the benefits of mindfulness therapy on improving sleep quality include easier sleep initiation, shorter nighttime awakenings, fewer morning awakenings and more satisfying sleep quality, has a direct impact on the ability to sleep and has a great ability to calm the mind and induce relaxation. In addition, the benefits of mindfulness methods in insomnia treatment may also motivate to adopt a healthy sleep lifestyle by making behavioral changes that include meditation practice and following sleep hygiene recommendations such as not picking up the phone at bedtime, not watching TV at night, not eating and drinking too much closer to bedtime (Hubbling et al., 2014).

The addition of dhikr and breath elements in this therapy is to focus the mind of insomniacs. Dhikr is an activity of worship for Muslims who connect their mind with their bodies. The relaxing effect of dhikr stimulates the hypothalamus to affect the pineal gland in producing melatonin so that it is easy to fall asleep. Evidence shows that dhikr therapy affects sleep quality and decreases insomnia levels (Fandiani, Wantiyah and Juliningrum, 2017;Vitaliati, 2018). Mindfulness in this therapy is to realize that what happens to the self either in the mind, feelings or body of insomniacs is fate from Allah and must be accepted with redha. Dhikr breathing can elicit the relaxation response needed by insomniacs. The state of sleeplessness is often stressful. This is because insomniacs cannot accept what is happening to them. The perception that not being able to sleep is Allah's fate and accepting the fate of Allah's will strengthen insomniacs to be more accepting. The more accepting the situation, the faster a person will get a relaxed state (Purwanto, Anganthi and Yahman, 2022).

Psychotherapy requires a manual book to guide participants and trainers in the implementation of therapy. Similar to CBT for anxiety (Heriansyah et al., 2021), mindfulness dhikr breathing therapy also requires a module or guidebook to guide the implementation of mindfulness dhikr breathing therapy. According to the expert judgment, the material in this module or manual book of mindfulness dhikr breathing therapy is suitable for sleep therapy and the material presented is also according to psychological science. In term of the insomniac's assessment, this therapy module has detailed therapy materials, easy-to-understand language, and sequential and clear steps.

The audio recording serves as a therapeutic aid to direct participants in the implementation of therapy in each session. According to insomniacs, this audio recording has a clear voice, appropriate intonation, and clear narration thus making this audio recording easy to use. Audio recordings of this therapy have a clear sound and can cause a relaxed state. Soothing sounds are those with a slow tempo and slow steady rhythm such as the sounds of Murottal Al-Qur'an, Dhikr and Nature Sounds. These sounds have been studied and shown to have a positive effect

in improving insomnia and improving sleep quality (Fitri and Andhini, 2016;Imardiani, Sari and Ningrum, 2019; Khayati, Adriani and Khasanah, 2022).

The average assessment of acceptance by insomnia sufferers of the implementation of therapy, modules, trainers, and audio recordings is over the predetermined cut-off score of >3 (Moore et al., 2021). Therefore, the mindfulness model of breathing therapy is very acceptable among patients with insomnia. Patients with insomnia assessed that the trainer who trained this therapy had a good mastery of the training material, an attractive appearance, the material was delivered interactively, body language supported the delivery of the material, intonation and speed of delivery could be followed so it was easy to understand. Research by Jernelöv et al. (2012) showed that brief structured guidance from a therapist can improve treatment outcomes, treatment gains and is likely to help large groups of individuals with insomnia including those with comorbid problems.

## Implications

Theoretically, the therapeutic methods developed in this study have been in accordance with existing theories regarding mindfulness methods that are beneficial for insomnia therapy by letting go, accepting, and not trying to fall asleep immediately. By combining with dhikr breathing, it can speed up relaxation so that insomniacs can fall asleep immediately. Through this research, it is hoped that it can encourage other therapists to develop therapeutic methods that not only focus on the patient's recovery goals but also involve spiritual aspects so that the benefits of therapy can be more felt by patients who are Muslim. The therapeutic model produced in this study can be used for insomnia therapy in Muslims, by practicing dhikr derived from Islamic values.

## The Strength and Weakness of the Study

The strengths of this study are, first, it is the first to successfully develop psychotherapy modules and audio recordings for insomnia using mindfulness-based intervention with the addition of Islamic meditation methods, namely dhikr breathing. Second, the validation method used in this study, namely face validity, is subjective and content validity is objective which is judged by experts as recommended by Taherdoost (2016) to assess validation. Therefore, the validity results can be appropriate and relevant. This study also has some limitations; first, the number of subjects willing to participate in the acceptance test is small because this study was conducted during the COVID-19 pandemic, so the acceptance test results obtained are quite invalid. Second, the age of the subjects who participated in the acceptance test was productive adults, so the acceptance test results are not suitable if interpreted for old age or the elderly. Third, the occupations of the subjects who participated in the acceptance test were students, so the interpretation of the acceptance test results is not suitable for other professions.

## CONCLUSIONS

In conclusion, the module and audio recording of the mindfulness dhikr breathing therapy is declared worthy of use and acceptable as insomnia therapy. Some suggestions that has been given will be followed up as material for improving the therapy model of both module and audio recording of this therapy. Researchers hope that the development of the module and audio recording of mindfulness dhikr breathing therapy can help the implementation of therapy so that it can be more optimal in overcoming insomnia. Furthermore, there should be further research on the effectiveness of the mindfulness dhikr breathing therapy

related to sleep quality and addressing the severity of insomnia.

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Original Research

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# EPIDEMIOLOGICAL CONTACT (EPICONTACT) INVESTIGATION OF COVID-19 AT ISLAMIC BOARDING SCHOOLS IN KUNINGAN REGENCY, INDONESIA

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**ABSTRACT**

**Introduction:** COVID-19 has spread throughout the world with more than 61, 27 million patients infected, including in education clusters that implement boarding schools. Contact investigations on the cluster are necessary to control the spread of the virus. **Aims:** To describe the epidemiological contact pattern of investigation results in the Islamic Boarding School cluster in Kuningan Regency. **Methods:** The design of this study is descriptive with epidemiological approach. The population is all students of Pondok Pesantren X, as many as 164 students, a sample of 157 students who are positive for COVID-19, and research instrument for the COVID-19 outbreak is investigation form, the variables studied included age, gender, symptoms, duration of contact, number of contacts, number of contact groups and place of contact. **Result:** Univariate data analysis with epi-contact analysis show: sex: 33.3% male, 60.03% female, average age 15.05 years, the average number of contacts 3.25 people, the average number of male contacts 2.62 and female 3.39, number of male contact groups 41, number of female contact groups 91. Age of value p=0.037. **Conclusions:** Contact pattern conclusions are mostly in female with the number of contacts between 3-4 people and age is related to the number of contacts. Limiting contact when there is suspicion is necessary to prevent transmission.

**Keyword:** Epidemiology Close Contact, Contact Investigation, COVID-19

## INTRODUCTION

The coronavirus illness 2019 (COVID-19), caused by the SARS-CoV-2 virus, is a pneumonia condition that became global in 2020. In December 2019, Wuhan, Hubei Province, China, became the site of the disease's initial discovery. The virus causes widespread human lung infection and has a detrimental effect on many aspects of life, particularly on physical and mental health. Between December 2019, the month of the initial COVID-19 patient discovery, and November 27, 2020, SARS-CoV-2 infected 61,277,488 people, with daily additions reaching +10,000 people and causing 1,436,796 deaths worldwide (OMS, 2022). Not only affecting the health aspect, COVID-19 also impacts the socioeconomic aspect of the population. Many people lost their job, which can have direct impact on household income. Decreasing of household income can impact on increasing the amount of poverty. Globally, poverty worldwide increased from 7.8% (before pandemic) to 9.1% (during pandemic). From the social challenge aspect, there occurred social inequalities between the stratum in society, such as low-skilled and high-skilled people, part-time and full-time worker, temporary and self-employed workers. Thus, COVID-19 leads the global burden around the world. The global burden can impact on the population in the future, such as economically, socially, etc.

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In Indonesia, in the same period, there were 522,581 confirmed cases with daily additions reaching +5000 people and causing 16,521 deaths (COVID-19 Handling Task Force, 2022). The highest number is in DKI Jakarta Province contributing 20.8% of daily cases, followed by West Java province with 15.3% of cases (PIKOBAR, 2022). Cases in Kuningan Regency are among the highest cases, with this being the most with a prevalence rate of 14/1000 of the population. This is due to the existence of public places that have the potential to hold large crowds, such as Islamic boarding schools, schools, offices and so on. Rapid transmission in clusters is due to asymptomatic cases with an asymptomatic prevalence in various adult clusters of 29.48% and in children at 24.09% (Ravindra, Malik, Padhi, Goel, & Gupta, 2022).

There are social restrictions in place to stop the spread of the disease, one of which is in schools and Islamic boarding schools. However, there are still a number of Islamic boarding schools that do not stop their operations, and as a result, there are crowds in the Islamic boarding school environment, which leads to an increase in cases in the surrounding area. One of them was at the Husnul Khotimah Islamic boarding school which occurred in October 2020 with the number of confirmed people reaching 467 people from 1083 people in the PCR test (KompasTV Bandung, 2020). At the Al-Mutawally Islamic boarding school in Bojong Village, Cilimus District, the Islamic boarding school cluster later reappeared, and up to 102 students tested positive for COVID-19 (Baskara, 2020).

Therefore, to study, prepare, and implement interventions against the outbreak, epidemiologists need extensive contact data analysis tools. Cluster transmission investigations are also needed to determine contact patterns and analysis of disease outbreaks involving various tasks, from data collection to exploratory analysis (Randhawa, Campbell, Crellen, Sudre, & Jombart, 2019). COVID-19 cluster investigation method and guidance was determined by the WHO. The WHO reveals that cluster investigation aims to rapidly identify, test of suspected people, and isolate properly people who probable and confirmed cases. Thus, cluster investigation is needed by epidemiologist to finding cases (World Health Organization (WHO), 2020).

Furthermore, epidemiological modelling is used for event prediction (Funk, Camacho, Kucharski, Eggo, & Edmunds, 2018) or the impact of certain interventions. Currently, The timing of symptoms, the definition of the distribution of major delays (such as the incubation time, serial intervals, and data on patient contact) are all important aspects of epidemic study (Nouvellet et al., 2018). The latter type of information is crucial for outbreak analysis since it can help identify epidemic triggers and limit ongoing transmission by identifying new cases earlier (Nouvellet et al., 2015). Because students living in boarding schools are very vulnerable, not only to the transmission of the virus among students but also, in the end, transmission to their families after travelling (Cesilia, Sudarmaji, Setiabudi, & Nataprawira, 2021). Students living in boarding schools are a closed population because they will stay there with same group there. Thus, infecting each other is the common phenomenon in boarding schools.

The research gap is related with the many previous studies which reveal the risk factor of COVID-19. However, few studies explained the COVID-19 situation through figures on a map. This study reveals both the risk factor and mapping the COVID-19 situation. Using this study, the policy makers can know what are the significant factors related with the COVID-19 and can also imagine the COVID-19 situation through a map provided in this research.

COVID-19 infection is a possibility for students who interact with cases in Islamic boarding schools, especially close acquaintances who are not shielded. After a

COVID-19 patient receives a diagnosis, his close contacts are identified. These individuals may be local or non-local to the boarding school (Luo et al., 2020).

To our knowledge, Indonesians still only have a basic concept of epi-contact. To better understand epi-contact in Indonesia, it is crucial to identify this problem. Epi-contact is a summary of each person's relationship from the results of case tracing and close contacts or people who are physically close while they have the potential to spread from person to person with the aim of stopping the spread of COVID-19. (Wu, Wang, Nicholas, Maitland, & Fan, 2020). The purpose of this study is to determine how epi-contact is used, row lists, and contact data, as well as the basic functions for handling, visualizing, and analyzing epidemiological contact data on ongoing events.

## METHODS

### Study design

A descriptive research design with epidemiological approach was conducted on November 27, 2020.

### Participants

The population is all students and teachers at Islamic boarding schools as many as 156 people. Sampling technique was with total sampling. A sample of 156 students who are positive for COVID-19 makes up the population of all students and teachers at Al-Mutawally, which is 156 students and teachers. The inclusion criterion was: Students and caretakers of Islamic boarding schools who have COVID-19 symptoms while at Islamic boarding schools. The exclusion criterion was: Invited guests visiting Islamic Boarding Schools.

### Data collection

Data collection was carried out by interviewing through epidemiological investigations and contact tracing. The research instrument used is the COVID-19 outbreak investigation form from Ministry of Health (Ministry of Health RI, 2020). COVID-19 surveillance uses a more detailed case investigation form that includes information about specific risk factors, vaccinations or other methods of disease prevention, more detailed clinical information, and names or contact information for other potentially exposed people. Case investigation forms are completed by healthcare providers, by public health surveillance staff interviewing healthcare providers, or through abstraction of charts from information collected in patient history (Teutsch & Churchill, 2000).

### Variables

The variables studied included age, sex, symptoms, duration of contact, number of contacts, number of contact groups and place of contact. Age is how long a person has lived according to the research. Male and female are the two primary categories (sex) into which humans and the majority of other living creatures are separated based on their reproductive capabilities. People with COVID-19 have reported experiencing a wide range of symptoms, from minor discomfort to serious sickness. Symptoms may start to show two to 14 days after virus contact. Anyone can experience minor to major symptoms. Fever or chills, coughing, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, and a new loss of taste or smell are some possible symptoms as are runny or congested nose, sore throat, vomiting or nausea, and diarrhea (CDC, 2020). People who are thought to be at risk due to their exposure to an infected person are referred to as contacts (Braithwaite, Callender, Bullock, & Aldridge, 2020). Contact duration or time of contact are measures how long a person has interacted with a COVID-19 positive person. The number of contacts is the total number of individuals who came in contact during the outbreak. The number of contact groups is the number of contact clusters from all contacts in one place. Place of contact is a location where

there us personal contact interaction with someone who is supportive of COVID-19.

**Data Analysis**

The data analysis carried out is univariate analysis with the online application Data Tab and visualization of the case network (Epi-contact) with the Flourish Studio online application. Bivariate analysis was used in this investigation to assess the relationship between age, the number or proportion of detected contacts, and the number or proportion of detected contacts who later turned out to be infected (Braithwaite et al., 2020). An analysis of bivariate data with Pearson correlation test was using SPSS. The statistical analyses were two-sided. Statistical significance was defined as a p-value <0.05.

**Ethical Consideration**

The ethical commission of the Institute of Health Science Kuningan No. 73/EP/STIKKU/2020 accepted the research's conduct in terms of ethics.

## RESULT

**Table 1.** Respondents' characteristics (n=156)

| Group | Frequency | % |
|---|---|---|
| Sex | | |
| Male | 52 | 33.33 |
| Female | 104 | 66.66 |
| Age | | |
| 6-19 Years | 152 | 97.43 |
| 20-29 Years | 1 | 0.06 |
| 30-39 Years | 2 | 0.12 |
| 40-49 Years | 1 | 0.06 |
| COVID-19 Status | | |
| Positive | 156 | 100 |
| Negative | - | - |

Based on Table 1, the univariate analysis for the characteristics of the respondents showed that the majority were female (66.66%) and the age of the respondents was mostly 6-19 years (97.43%) and all (100%) were positive for COVID-19. Figures 1 and 2 below indicate the epi-contact of cases in the group of male and female students as a result of the univariate analysis. Figure 1 shows the COVID-19 cluster pattern of male students. Interaction between respondents occurs in groups. The respondents contact at least two people, the most contact is about 42 people, and the average contact is 10 people; then, the spread occurs massively.

Figure 2 shows the COVID-19 cluster pattern of female students. Respondent contact occurs in a circular pattern with interactions between circles of more than one. This means that the respondent could spread the virus from one group to another more quickly.

Figure 3 displays the boxplot distribution of the number of contacts by age for both male and female students. The average contact is 15 years old, with the lowest being 13 years and the highest being 43 years. The most interactions (contacts) occurred 18 times at the age of 40 years, with an average of three contacts per day at the age of 15-20 years. The age of over 25 years shows that this is not a student but a teacher.

Figure 4 shows the epi-contact COVID-19 cluster model. The contact model that occurs in Islamic boarding schools with more than eight hours of

contact will be transmitted from case A to case B. The first case or case index (A) shows that five people (B, C, D, E, and F) are in contact as secondary cases before an active case occurs. After contact with the first case (A), two of them are in contact with each other, increasing the risk of spreading to the other, so that there is case seven (G) as a tertiary case.

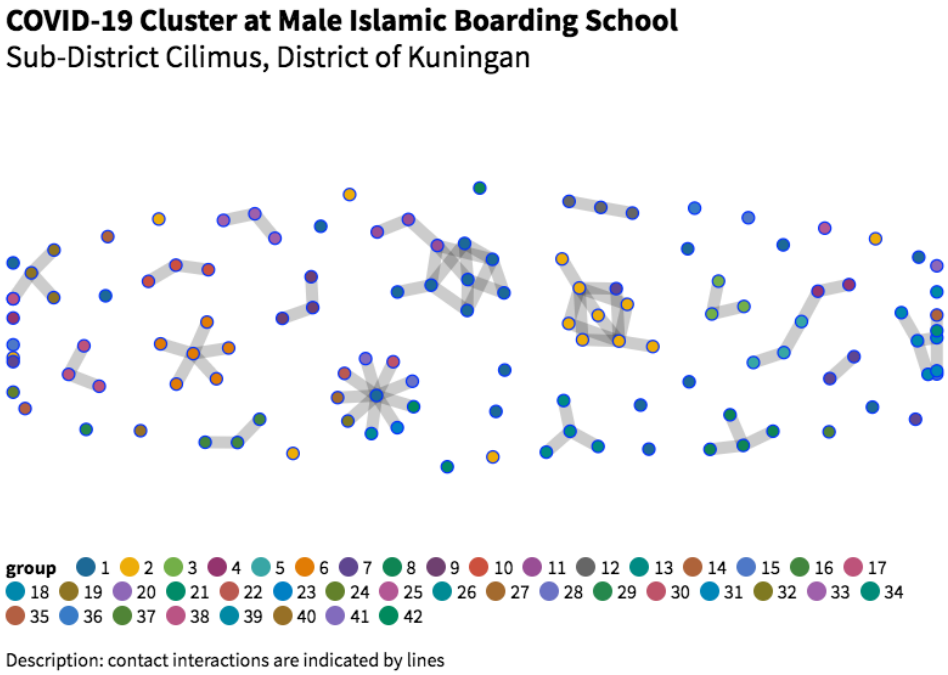


**Figure 1**. COVID-19 cluster contact pattern of male students

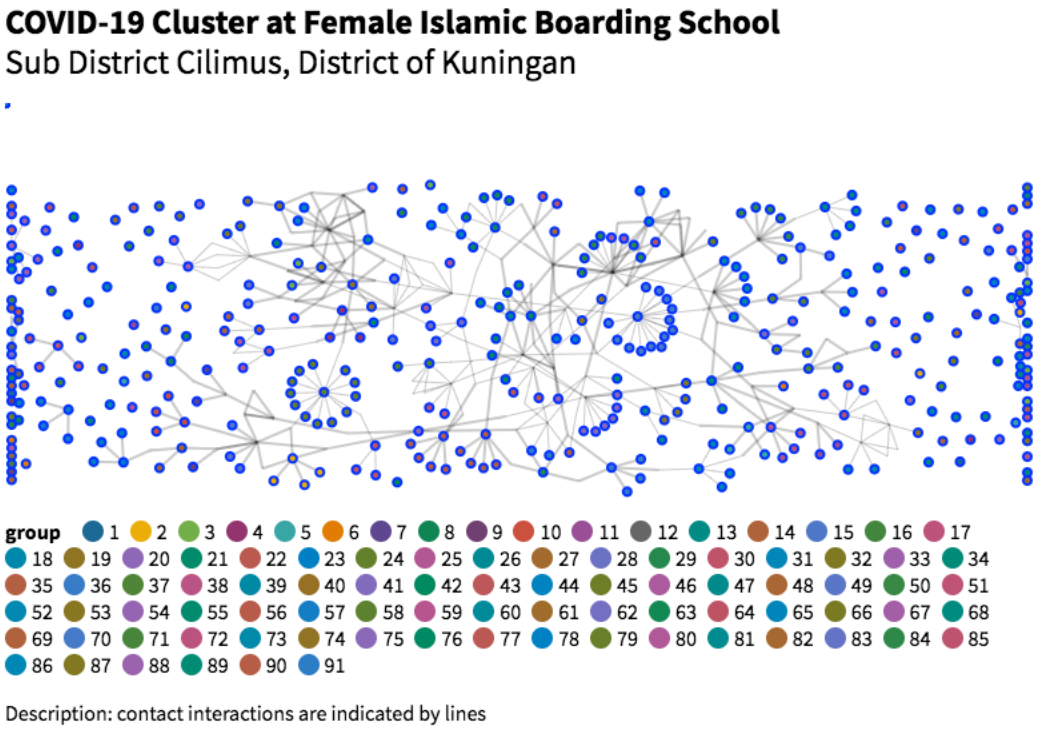


**Figure 2**. COVID-19 cluster contact pattern of female students

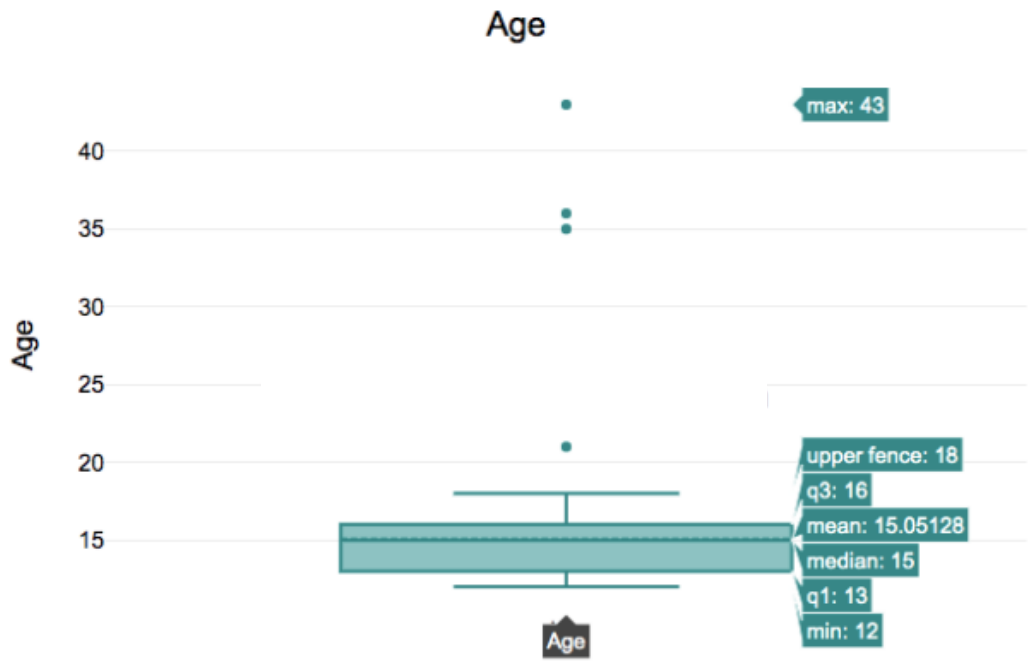


**Figure 3**. Boxplot showing the distribution of contacts by age among male and female students.

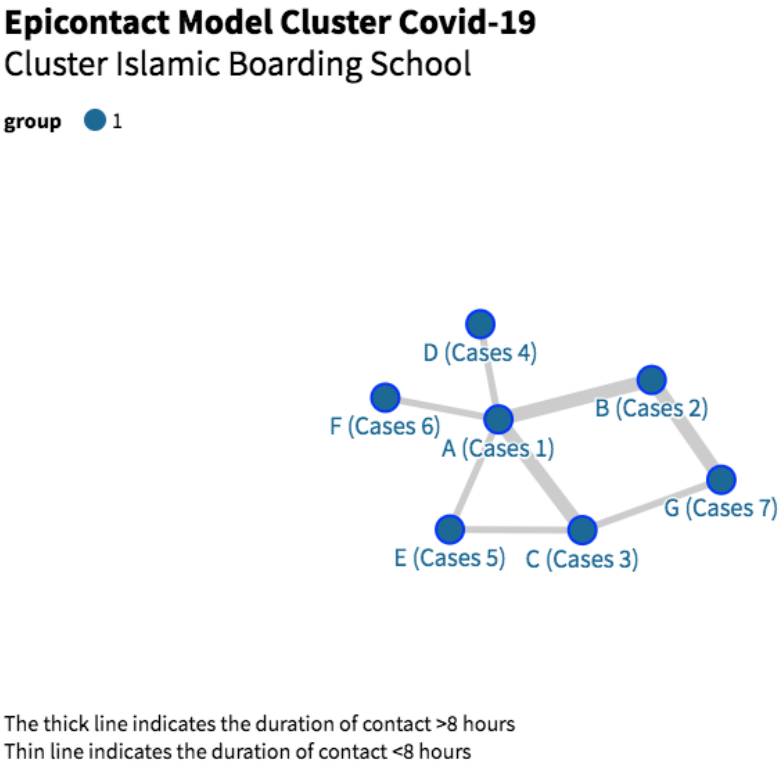


**Figure 4**. Epi-contact COVID-19 cluster model

**Table 2.** Correlation analysis of age and the number of contact in Islamic Boarding School Kuningan Regency

| Group | Mean | SD | Median | p-value | 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| **Correlation** | | | | | | |
| **Age** | 15,5 | 3.658 | 15 | 0.037 | 14.926 | 16.074 |
| **The number of contact** | 3.5 | 3.3 | 3 | | | |

*(SD: standard deviation; CI: confident interval*

The Pearson correlation test findings revealed that the association between age and contacts had a value of p = 0.037. In the COVID-19 cluster at the Al-Mutawally Islamic boarding school, Kuningan Regency there is a correlation between age and the number of interactions. Based on the confidence interval level (CI 95%), it reveals that the range is above 1 (14.926 – 16.074) which means the correlation between age is a risk factor to the number of contact among respondents,

## DISCUSSION

In this descriptive research design, we identify the use of epi-contact, row lists, and contact data, as well as the basic functions for handling, visualizing, and analyzing epidemiological contact data on ongoing events. Our study found that the average age of the respondents is 15 years old. Furthermore, 33.3% of respondents were male. Among male students, the average contact is 10 people, whereas among female students, the contact occurs in a circular pattern with interactions between circles of more than one. The contact model that occurs was more than eight hours of contact and will be transmitted from case A to case B. Furthermore, our research indicated a relationship between age and the quantity of contacts in the COVID-19 cluster at the Al-Mutawally Islamic boarding school, Kuningan Regency. To the best of our knowledge, this research is the first to demonstrate an epidemiological contact investigation (Epi-contact) of COVID-19 in an Indonesian Islamic boarding school.

Beginning with the prevention and application of social distance so that behavior does not adhere to health protocols that have an impact on the widespread transmission of COVID-19 and an increase in the number of positive patients and patients who die, there is still a low level of public understanding of COVID-19 (Tian et al., 2020). When viewed from gender, this study shows that women are twice as many as men with 33.3% men and 60.03% women.

This is in line with previous study (Ruapertiwi, 2021) that the sex of COVID-19 sufferers is mostly female The previous studies also found that close contact investigations in Shinzen China showed that women were 72% more than men 28% from the results of Contact Based Surveillance (Bi et al., 2020). This is because women have more social interactions. The population in the Islamic boarding school cluster is school-age children, so the average patient age is 15.05 years old. An increased risk of infection following contact with COVID-19 cases is linearly correlated with the age of close contact, with a 1.8% incidence rate in the adolescent age group of 0–17 years (Luo et al., 2020). Then the characteristics of COVID-19 sufferers are on average aged in the productive age range (10-40 years). In the productive age range (10-40 years) they have a high lifestyle, mobility and social interaction, so they are very vulnerable to being infected with COVID-19 (Supandi, Kandou, & Langi, 2021).

Previous studies have shown that children are more likely to have milder SARS-CoV-2 infections compared to adults. About 20% of the 171 confirmed cases of PCR, showed asymptomatic in children and adolescents (Cesilia et al., 2021). Plus the risk of transmission in Islamic boarding schools with activities in

classrooms, buildings or certain locations that are closed will cause influence on air quality which triggers the spread of the coronavirus so quickly (Ghiffari, 2020).

From the description above, it can be concluded that this study shows that women are more infected with COVID-19 due to environmental factors and are more at risk of spreading the virus. According to the study's findings, there are 56 more female instances than male cases (44 cases) ( Cheng et al., 2020).

Our finding showed that students had average contact with three other students before the PCR test was carried out. According to a previous study, children and teenagers interact with others more than adults do. Children may also not completely understand the health risks associated with not donning a mask; yet, even if they are aware of their risk of infection, they may feel more pressured to engage in social activities regardless of the risks (Doerre & Doblhammer, 2022). Thus, in the present study, one possible reason for this finding may be that adolescent students tend to have close friends who carry out their daily activities simultaneously because they help each other. So that the number of contacts is very risky for the transmission of COVID-19 because it is at risk of transmission between students. In addition, it risks transmitting to their families after traveling (Cesilia et al., 2021). Transmission is very fast in covid-19 in a short time, because of the transmission through droplets when interacting between students. The infection can happen if a person is within a relatively short distance of less than 1 meter because COVID-19 is spread by droplets (Susilo et al., 2020). With a person exhibiting respiratory illness signs (e.g. coughing and sneezing), droplet splashes are particularly at risk of transmitting to others if exposed to the oral and nasal mucosa or the potentially infective conjunctival mucosa of the eye (Nugroho, Alanish, Istiqomah, & Cahyasari, 2020). In addition, it spreads very quickly from other viruses, also not accompanied by knowledge about the virus (Rifaldi & Laiding, 2021).

This is consistent with the study by Nugroho et al. (2020) which contends that airborne transmission within the same setting increases the chance of the COVID-19 outbreak spreading. Therefore, as a mechanism in emerging infectious diseases, the risk of fomitus transmission exerts a greater influence than transmission through droplets (Yen, 2020). The duration of student interaction during concurrent activities increases the risk of transmission in addition to the quantity of contacts. The findings of a prior study revealed that the reported COVID-19 contact time within six feet of a subject, together with information from a personal tracking device, revealed 14 contacts in patient subjects who were students (Volpp, Kraut, Ghosh, & Neatherlin, 2021).

Breaking the chain of transmission can be accomplished by immunization, isolation, early detection, and basic protection measures like handwashing with soap, maintaining social distance, donning masks, sprinkling disinfectant in public areas, and screening for in-person visits. Then carrying out contact tracing and tracking (case investigations and outbreak investigations), as well as providing isolation and quarantine facilities to prevent case transmission (Cheng et al., 2020; Han et al., 2020). So, from the description above, it is concluded that the risk of spread occurs in a dense environment, especially in rooms where the air does not circulate properly and is coupled with the risk of the number of students interacting in the room.

The spread of COVID-19 cases can be minimized by breaking the chain of transmission, which can be done by vaccination, isolation, early detection, and basic protection by washing hands with soap, maintaining social distance, wearing masks, spraying disinfection in places public places and screening for in-person visits. Then carry out contact tracing and tracking (case investigations and outbreak investigations), as well as providing

isolation and quarantine facilities to prevent case transmission ( Cheng et al., 2020; Han et al., 2020)

## Risk of Contact Clusters in COVID-19 Transmission

Students at the Islamic Boarding School carry out daily activities by staying in one room containing 5-10 people according to the area of the room; this is a risk factor for contact and a high risk of transmission of COVID-19 because there is a transmission from person to person and frequent contact (Luo et al., 2020). Additionally, when there are exposures in confined spaces, information on the room's dimensions, ventilation, and whether windows were open could be linked to these, and then further linked to follow-up on cluster size (Tupper & Colijn, 2021).

The beginning of the spread of cases focused on one environment and gradually spread to another. The focus of one such environment is called a cluster, which makes it a risk of spreading the disease (Vermonte, 2020). A cluster is an accumulation of cases that are linked together in space and time and are believed to be more numerous than anticipated, even though the anticipated number may be known (CDC, 2012). A cluster is defined as an accumulation of actively rare events or illnesses in space or time in quantities that are thought or perceived to be higher than would be predicted by chance (Porta, 2008). The word is usually used to describe a cluster of cases of a rare (usually non-infectious) disease, and putative clusters of disease are often suspected to have an environmental cause based on anecdotal evidence. As a result, much effort is often expended in response to public outcry in attempts to determine whether a true cluster exists (Webb, Bain, & Page, 2017).

A COVID-19 cluster is characterized as having a minimum of five confirmed diagnostic cases, first positive test findings, or illness onsets within 14 days, and a credible epidemiologic relationship between cases (NCDHSS, 2021), or defining a cluster as two or more incidents connected to the same place, people, or event that happened at the same time (Madison & Dane County, 2020). Two or more COVID-19 test-confirmed cases among people connected to a particular non-residential context with disease onset dates within 14 days meet the criteria for a cluster (without specific information regarding the nature of contact between the cases). No cases with sickness onset dates in the previous 14 days and test-confirmed cases mark the end of the cluster (Gov.UK, 2020).

This cluster is possible because of the interests of the teacher or group leader who has to interact with other groups for the benefit of coordination and teaching. According to research conducted by Mahrania et al. (2020), the appearance of early patients and contact history are risk factors for the development of new clusters, clinical manifestations, supporting examinations of the lungs and treatment management. Then, transmission, in this case, is characterized by gastrointestinal symptoms (diarrhea and nausea), feverish patterns, namely higher temperatures at night to early morning (Wang, Tang, & Wei, 2020). The results of a contact investigation study in Shinzen China, showed that the attack rate of contact in the room (room / house) showed 11.2% with AN OR of 15, which means that household members who are in the same room or house are at risk of 15 times to contact it compared to those who are not in the same room or household. Additionally, students will eat meals together, which could result in face-to-face interactions between individuals who are at risk of spreading COVID-19 if someone in the group has the infection. The results of a study in Shinzen China, showed an attack rate when eating of 8.2% and AN OR of 23, meaning that those who contacted while eating together were at risk of contracting it 23 times compared to those who did not eat together. Eating together risks interaction and contact with the case for more than 15 minutes. A person

who interacts with this case is called a contact case. Tracing and monitoring of close contact cases of COVID-19 in Indonesia is carried out in full through the SILACAK Application. The use of contact tracing technology is in line with a directive from the WHO in February 2021 on COVID-19 Contact Tracing, which states that the use of digital technology is important in supporting the surveillance process of contact tracing of COVID-19 cases, given that tracing is a crucial part of emergency response efforts to prevent the spread of infectious diseases (WHO Indonesia, 2020).

**The relationship of age to the number of contacts**

The findings revealed a correlation between age and contacts (p = 0.037). This is because students are mostly teenagers. After all, the behavioral characteristic of adolescents is to have a peer playgroup. Teenagers will engage in a variety of daily activities at the playgroup, enhancing the possibility of increased contact. Given that there are still simultaneous activities of attending class and living in a room with, on average, 10 people, the number of contacts will rise. This is also due to the productive age, especially school age, having activities with high socialization and supported by a closed environment. So that if there is a case in that place, it will spread quickly and massively (Sirajuddin, 2020).

This research calls this secondary attack rate. Secondary attack rate is a measure of the frequency of new cases of a disease among contacts of cases. A secondary attack rate is calculated by dividing the total number of contacts during the research period by the number of cases among contacts of initial cases. Typically, we deduct the number of primary cases from the total number of people living in those households to arrive at the overall number of household contacts (Gregg, 2009).

According to a study's findings (Cheng et al., 2020) contact tracing revealed 23 secondary cases. It was estimated that the mean incubation period was 4.1 days (95% credible interval [CrI], 0, 4-15.8), and the median serial interval was 4.1 days (95% CrI, 0.1-27.8) (95% CI, 0.1-27.8) ( Cheng et al., 2020)

This is in line with research (Seftiya & Kosala, 2020) which suggests that the results of the study show a meaningful relationship between the number of contacts and age, with a p-value = 0.015 (p < 0.05). Additionally it is consistent with Satria et al.'s (2020), observational analytical research and bivariate tests, which, with a p-value of 0.041, found a correlation between the number of connections and age. Additionally, male sex, active smokers, and comorbid diseases like hypertension and diabetes mellitus are risk factors for SARS-CoV-2 infection (Susilo et al., 2022).

The COVID-19 Laboratory-Based Surveillance System in Islamabad, Pakistan, was evaluated by Mustaq et al. (2020) and the results show that the system was deemed to be straightforward because the laboratory was using a uniform and consistent WHO standard case definition. The system gathers vital data from all laboratories on demographics, clinical signs and symptoms, travel history, contact information, and co-morbidities (Mushtaq et al., 2020)

It is clear from the explanation above that there is a correlation between age and the number of contacts because it is influenced by a variety of factors. Social and environmental variables predominate. Because of its high fatality rate, relatively rapid transmission, and lack of an effective treatment, COVID-19 is still a disease to be on the lookout for. There are still many shortcomings in this study so further studies are needed.

This research has a weakness related with the research design which used descriptive and bivariate analysis. The descriptive analysis cannot reveal the association significantly and cannot reveal the causality between variables studied. However, the bivariate analysis can explain

the association between research variables. The data were obtained from respondents through cross-sectional design by which the design is related with the temporal ambiguity. The temporal ambiguity is the research error that has effect on the causality error. Thus, the association between variables is potentially on a bidirectional association. In addition, this study also did not include other variables as a confounding or mediating variables. If both variables were included in the study, the researcher can estimate the adjusted odds ration which is the goodness of fit model in a statistical method. However, this research has a strength related to explaining clearly through figures or pictures. Readers can imagine what this research result explains. On determining the COVID-19 variable, the researcher used the COVID-19 test kit to know the status among respondents whether positive or negative of COVID-19. Related with the instruments, this research used the COVID-19 outbreak investigation form. COVID-19 surveillance uses a more detailed case investigation form that includes information about specific risk factors, vaccinations or other methods of disease prevention, more detailed clinical information, and names or contact information for other potentially exposed people. Thus, this instrument cannot be doubted because it includes complete information

## CONCLUSION

The conclusion of contact patterns is mostly in women with the number of contacts between 3-4 people and age is related to the number of contacts. The advice is to limit contact when there is a need to prevent transmission

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Original Research

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# A COMPARATIVE OBSERVATIONAL STUDY ON EFFECTIVENESS OF PROBIOTICS AND ANTIBIOTICS IN BACTERIAL VAGINOSIS

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**ABSTRACT**

**Introduction:** Bacterial vaginosis is a common vaginal dysbiosis in women of reproductive age. Bacterial vaginosis is a dysbiosis characterized by a reduction of Lactobacillus species, such as L. crispatus, L. gasseri, and L. Jensenii. Anti-microbial resistance of BV pathogens and low long-term cure rates have been increasing in the few years. **Aim:** Probiotics are proposed as an alternative treatment for BV applying live micro-organisms with the capacity to confer health benefits to the patient. **Methods:** Patients with white discharge per vagina with or without foul smell, and itching visiting Obstetrics and Gynecology OPD are subjected to Amsel criteria. Those test positive for 3 out of 4 are diagnosed to have bacterial vaginosis and were enrolled in the study. **Result:** Highest prevalence of bacterial vaginosis was at the age group of 26-30 years (28%), with the lowest prevalence (16%) above 40 years of age. Among group A (probiotics), 68% and 32% of women were in not working and working groups, respectively, when compared with group B (antibiotics), 64% and 36% of women were in not working and working groups. Nulligravida (28% and 32%), Singleton Pregnancy (32% and 16%) in Group A and Group B. We observed that patients treated with both antibiotics (50%) and probiotics (50%) had similar recurrence rates of BV. **Conclusion:** Hence it would be prudent to prefer probiotics in patients with BV, as they colonize other normal commensals and have similar efficacy as that of antibiotics. The other beneficial factors of probiotics include acceptability to patients and nil side effect profile.

**Keywords**: Antibiotics; Bacterial Vaginosis; Contraceptives; Probiotics

## INTRODUCTION

Bacterial Vaginosis (BV) is a poly-microbial disorder characterized by altered normal vaginal flora, with loss of Lactobacillus species and predominated by Gardnerella species, Prevotella species, and Atopobium species, etc., affecting mainly the women of reproductive age group (Melo et al., 2008). The prevalence of Bacterial Vaginosis ranges between 5% - 58% of women globally highest in Southern Africa, and low in western Europe (DiFonzo and Bordia, 1998; Melo et al., 2008). A population-based prevalence study by Bhalla et al. (2007) in Delhi found that the highest prevalence was found in the urban slum (38.6%), rural (28.8%), and urban community (25.4%) (Bhalla et al., 2007).

The overall reproductive health of the women is depicted by the vaginal health which is influenced by varying extraneous and native factors which include medications, hormonal changes, stress conditions, cigarette smoking, black ethnicity, high use of vaginal douches, early age at first intercourse, unprotected sexual intercourse and so on (Cherpes et al., 2008; Schlosser and Mirowski, 2010; Waigwa et al., 2018; Seña et al., 2021). Also, Changes in vaginal pH during

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different phases of the menstrual cycle make it more prone during menstruation (Eschenbach et al., 2000).

The shift in the vaginal microbiota allowing the overgrowth of pathogens has to be heralded by considerable disturbances in the Lactobacillus population. The involvement of Bacteriophages in the etiology explains the higher recurrence rate in women/partners treated by antibiotics (Figure 1) (Pavlova et al., 1997; Blackwell, 1999).

Internationally, BV has been evaluated that, increase in the risk of HIV transmission 2-4 fold (Taha et al., 1998). It has also been shown that BV increases the risk of obstetrical complications which includes preterm labor and delivery, chorioamnionitis, and post-cesarean endometritis (Sweet, 2000; Ugwumadu, 2002; Anahtar, 2015; McClelland et al., 2018). Indeed many cases were found to be asymptomatic. Among symptomatic individuals, the most commonly noted include profuse vaginal discharge, rotten fish vaginal odor, and pelvic pain (Koumans et al., 2007; Narasimha Rao and Chandini, 2017) ). The recent guidelines given by Centers for Disease Control and Prevention for the treatment of symptomatic individuals includes, metronidazole 2g single dose or 400mg twice a day for five days orally a more effective regimen. Alternatives include metronidazole gel, tinidazole 1g/2g oral dose, clindamycin cream/ tablets/ ovules (Workowski, 2015; Amegashie et al., 2017; Pang et al., 2018).

Pavlova et al also speculated that these exogenous resistant lactobacilli would give an advantage over the endogenous vaginal lactobacilli, allowing long-term colonization (Pavlova et al., 1997). Many Randomized trials have come suggesting Probiotics as an alternate treatment to BV by enhancing the concentrations of habitual microflora. These are the live microorganisms when introduced in sufficient amounts offers health benefit to the host. Apart from only probiotics, the mixture of both prebiotics and probiotics practically add to the functional attributes of strains (Brocklehurst et al., 2013; Sheehy et al., 2015). The present study aimed to evaluate the effectiveness of probiotics and antibiotics in bacterial vaginosis.

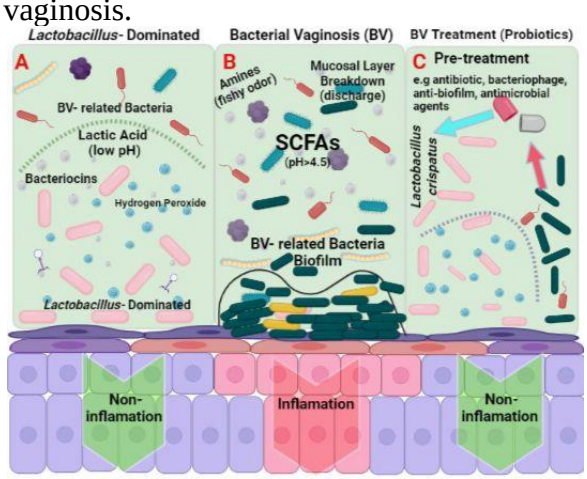


**Figure 1.** Diagrammatical representation of the cause of bacterial vaginosis (BV) and its treatment. This figure was created with biorender.com (Accessed on 24 November 2022)

## METHODS

A prospective comparative observational study was conducted at the Department of Obstetrics and Gynecology, in collaboration with the Department of Microbiology of IMS & SUM Hospital, Bhubaneswar. This study protocol was approved with Ref.no/DMR/IMS.SH/SOA/180379 by the Ethical Committee and Review Board of the institution for rights and safety of the research subjects. Written informed consent was taken from all the study participants.

As many as 414 patients with symptoms of white discharge per vagina with or without foul smell, and itching visiting Obstetrics and Gynecology OPD are subjected to Amsel criteria. 126 women who test positive for three out of four are diagnosed to have bacterial vaginosis and were enrolled in the study. Randomized

allocation was done in two groups' i.e. Group A probiotics (50) and Group B antibiotics (50). Non-probability convenient sampling was done and as many as consenting patients attending the O&G OPD were included in the study conducted over 1.5 years. The inclusion criteria are 1. Thin homogenous gray-white vaginal discharge; 2. pH > 4.5; 3. Presence of clue cells; 4. Positive whiff test (Amine test) and the exclusion criteria are 1. Any other active infection; 2. Immunocompromised state;3. Pregnancy; 4. PID; 5. Cervial erosion or ectropion

After implementing the informed consent process, a detailed patient history and examination were done. A complete history was taken for each study subject in the O&G OPD including: Occupation, Socioeconomic status, Clinical symptoms of BV, Menstrual history, Obstetric history, H/O Contraceptive usages. Past history of Diabetes Mellitus, Tuberculosis, Pelvic Inflammatory Diseases, Immuno compromised state, H/O prolonged steroid intake were also taken into consideration. Personal History like Cigarette smoking, alcohol intake, pan or guthkha intakes were also taken. Family history like presence of diabetes mellitus in partner was also taken for the study.

A detailed general and systemic pelvic examination was done for every patient. On pelvic examination, the normal color and contour of the vagina and cervix, the color and quality of the discharge was noted. Using Litmus paper, pH of the discharge was found. Using three sterile swab sticks, high vaginal sample was taken from the lateral vaginal wall and posterior vaginal fornix for gram stain, culture and sensitivity, 10% KOH for amine test. The samples were placed in a dry and clean container and sent to microbiology laboratory as soon as possible. Additional investigations including complete blood count, erythrocyte sedimentation rate, fasting and post prandial blood sugar for both partners to exclude other active infections and immuno-compromised state was also done. Once the diagnosis of bacterial vaginosis was made using Amsel criteria, patients were being treated with antibiotics or probiotics or antibiotics and probiotics in O&G department. Patients who were treated with only vaginal probiotics (Evanew, Zuventus pharmaceuticals) starting on Day 8 of menstrual cycle to Day 16 at bedtime for three months and only antibiotics (Tab. Metronidazole 500mg twice daily for seven days, according to CDC) are included in our study. Patients were informed about sexual abstinence and avoidance of vaginal douching during the course of treatment. After treatment, patients were asked to report any new symptoms, regression of existing symptoms and were subjected to pH and response to treatment was noted.

Hemoglobin, packed cell volume, differential count (neutrophils, lymphocytes, monocytes, basophils), total leukocyte count, fasting blood sugar, 2 hr post prandial blood sugar , pH of vaginal swab, amine test, microscopy of vaginal swab (presence of clue cells), vaginal swab culture and sensitivity, colony characteristics for biochemical and enzymatic test and antibiotic susceptibility testing like investigations were performed.

The statistical analyses were carried out using software like Microsoft Excel version 16 and statistical software SPSS version 20.0. Percentage calculation was used to assess all the variations.

## RESULT

In our study, we found that highest prevalence of bacterial vaginosis was at the age group of 26-30 years (28%), with lowest prevalence (16%) above 40 years of age, rest being 18% at the age group 21-25 years and 31-35 years, 20% at 36-40 years of age (Table 1). Among group A (probiotics), 68% and 32% of women were in not working and working group, respectively, when compared with group B (antibiotics), 64% and 36% of women were

in not working and working group. Among group A, 68% and 32% of women were in not working and working group, respectively, when compared with group B, 64% and 36% of women were in not working and working group.

We found that 80% of women were in married group and 20% were in unmarried group, 68% in married and 32% of women in unmarried group among Group A and Group B, respectively. In this study, prevalence of bacterial two or more pregnancies, including abortion, of about 40% and 52% in Group A and Group B, respectively, when compared to Nulligravida (28% and 32%), Singleton Pregnancy (32% and 16%) in Group A and Group B. The prevalence of bacterial vaginosis were high in women with regular menstrual cycle of 60% and 84%, when compared with 40% and 16% in women with irregular menstrual cycle , in probiotic and antibiotic group, respectively. Among married group of women, 46% of women were not using any type of contraceptives, while 16.2% were using oral contraceptive pills and 12.6% with intrauterine copper device, 21.6% were using barrier contraceptives. In unmarried 38.5% were not using any method of contraception, while the remaining 61.5% used barrier contraception.

Among 100 women with bacterial vaginosis, 18% had prevalence of diabetes mellitus in married group. No significant history could be documented regarding other predisposing factors for BV. In our study we found few proportions of married women in both probiotic and antibiotic group , had history of husband diagnosed with diabetes mellitus of about 20% and 23.5%, respectively. Unmarried women enrolled in our study did not give any significant history regarding their partner. In our study among 100 BV, 48% of women were moderate anemia, 18% had mild anemia, 2% had severe anemia, while 32% of women had no anemia (Table 1).

In this study, 64% of women had their main complaint as white discharge, 10% had vaginal itching or pain abdomen, while the remaining 16% had both white discharge and itching. Using Nugent score, 72 women were diagnosed with bacterial vaginosis, while 12 were intermediate and 16 were normal flora, respectively (Table 2). In our study, 78 women were positive for whiff test, while the remaining 22 women were negative for whiff test (Table 3). During treatment married women of about 80% and 68% were randomized into Group A and Group B, while only 20% and 32% of unmarried women were randomized into Group A and B, respectively (Table 4). Our study did not find any significant values of remission and recurrence rates among Group A and Group B. In Group A, among married women, 18 had recurrence of symptoms, while 22 had remission of symptoms. In unmarried group, four had recurrence of symptoms, while six had symptom cure after probiotic treatment. In the antibiotic group, 37.5% of unmarried women had recurrence of symptoms while 62.5% of women were free of symptoms; 47% of married women had recurrence while 53% had no recurrence after treatment.

## DISCUSSION

In our study among 100 bacterial vaginosis patients, 50 were randomly assigned to receive probiotic treatment (Group - A) and 50 were to get antibiotic treatment (Group - B). In our study the prevalence rate of BV in the age group 21-25years was found out to be 18%, 26-30 years was 28%, 31- 35 years was 18%, 36-40 years was 20%, >40years was about 16%. Highest prevalence was found between age group of 26-30 years and the lowest prevalence was between the age group >40 years. This was as compared with another study by Vani et al, (2018) which found that the highest prevalence of BV was found in the age group between 28-32 years. Similar study by Ronald et al. showed highest prevalence was among 20-24 years age group (Gray et al., 2009).

Bitew et al. (2021) found that high prevalence of BV was found in 31-35 years.

**Table 1.** A detailed patient history based on different factors.

| **Age** | **Frequency (n)** | | **Percentage (%)** | |
|---|---|---|---|---|
| 21-25 | 18 | | 18% | |
| 26-30 | 28 | | 28% | |
| 31-35 | 18 | | 18% | |
| 36-40 | 20 | | 20% | |
| >40 | 16 | | 16% | |
| **Occupation** | | | | |
| | **Not working** | | **Working** | |
| Group A | 34(68%) | | 16(32%) | |
| Group B | 32(64%) | | 18(36%) | |
| **Marital Status** | | | | |
| | **Married** | | **Unmarried** | |
| Group A | 40(80%) | | 10(20%) | |
| Group B | 34(68%) | | 16(32%) | |
| **No. of Pregnancies** | | | | |
| | **Nulligravida (0)** | **No. of Pregnancy (1)** | **2 or more** | |
| Group A | 14(28%) | 16(32%) | 20(40%) | |
| Group B | 16(32%) | 8(16%) | 26(52%) | |
| **Menstrual History** | | | | |
| | **Regular(0)** | | **Irregular(1)** | |
| Group A | 30(60%) | | 20(40%) | |
| Group B | 42(84%) | | 8(16%) | |
| **Contraceptive Types** | | | | |
| | **Married Frequency(n)** | **Married Percentage (%)** | **Unmarried Frequency(n)** | **Unmarried Percentage (%)** |
| No usage(0) | 34 | 45.9% | 10 | 38.5% |
| OCP (1) | 12 | 16.2% | | |
| Barrier (2) | 16 | 21.6% | 16 | 61.5% |
| IUCD (3) | 12 | 16.2% | | |
| **Medical History** | | | | |
| **H/O DM** | **Frequency (n)** | | **Percentage (%)** | |
| Yes(1) | 18 | | 18% | |
| No(0) | 82 | | 82% | |
| **H/O Diabetes Mellitus in Husband/Partner** | | | | |
| | **Married** | | **Unmarried** | |
| Group A | 20% (diabetic ) 80% (nondiabetic) | | 0 | |
| Group B | 23.5% (diabetic ) 76.5% (non-diabetic) | | 0 | |
| **Nutritional Status** | | | | |
| **Hb** | **Frequency (n)** | | **Percentage (%)** | |
| >12(0) | 32 | | 32% | |
| 11-11.9(1) | 18 | | 18% | |
| 8-10.9(2) | 48 | | 48% | |
| <8(3) | 2 | | 2% | |

**Table 2.** Nugent Score

| **Nugent score** | **0-3(0)** | **4-6(1)** | **7-10(2)** |
|---|---|---|---|
| Group A | 10(20%) | 2(4%) | 38(76%) |
| Group B | 6(12%) | 10(20%) | 34(68%) |

**Table 3.** KOH

| KOH | Present (1) | Absent(0) |
|---|---|---|
| Group A | 38 | 12 |
| Group B | 40 | 10 |

**Table 4.** Treatment Percentage

| | Married Frequency (n) | Married Percentage (%) | Unmarried Frequency (n) | Unmarried Percentage (%) |
|---|---|---|---|---|
| Group A | 40 | 80% | 10 | 20% |
| Group B | 34 | 68% | 16 | 32% |

In our study we found that 74% of people were married and the remaining 26% were unmarried. Though many studies had shown significant numbers in married women, presently increasing unprotected sexual activity is on the rise, thus future research should focus on sexually active people rather than focusing on married and unmarried people. 66 women in our study were in not under working group when compared with 34 working women. Bitew et al. (2021) found that 45.8 % among BV were housewives. There are contradictory views among the prevalence of disease in working group and housewives.

Though we did not have significant number of people enrolled in this group, further studies should focus on this point of view, as there is changing socio-cultural and environmental factors such as co habitation, women job empowerment in different sectors, usage of common lavatories probably might increase the disease incidence. Priestley et al. (1997) also found that BV and Candida species were present more during the first week of menstrual cycle. In our study, 60% and 40% had regular and irregular cycle, respectively, in Group A when compared to 84% and 16%. With more regular menstrual cycle, there is decrease in vaginal pH in more number of days, increased usage of vaginal tampons increasing the occurrence of BV.

On comparing our study with Bitew et al. (2021) 18% and 5.3% of women with BV had diabetes mellitus. Many studies have mentioned about high risk of acquisition of HIV, Herpes simplex virus associated with Bacterial Vaginosis. As we all know India is a diabetic country, we should decrease the incidence of diseases which increases the risk of diabetes mellitus, passing on to next generation. Priestley et al. (1997) found that among nine patients with intermittent BV, all had unprotected sex . Our study did not have any conclusive evidence regarding unprotected sexual intercourse. We suggest more number of people would have been affected, should volunteer for further investigations and treatment. It would be of great use for future researchers toward this group of people.

In our study, we tried to find out people using different types of contraception method. Among which 54% of married women were using either of one type of contraception, which includes 16.2% were using oral contraceptive pills and Intrauterine Copper device, 21.6% of them were using barrier methods . Among 61.5% of unmarried sexually active women using contraceptive methods, everyone utilized barrier method as a choice, as it is available at low cost, easily available. Theories suggest that use of Intrauterine copper device, Oral combined oral contraception might increase the risk of acquiring disease through changes in cervical mucous pattern, thread into vagina another source of ascending infection. Our study wants to throw light regarding the usage of barrier contraceptives, which would not only prevent sexually transmitted disease but prevent localization of pathogenic organisms in vagina without disturbing the local microenvironment 20% of women in Group A and 23.5% of

women in Group B had significant history of diabetes mellitus in the partner, while unmarried group of women were not ready to reveal any history about the partner.

In our study among 100 bacterial vaginosis patients, prevalence of anemia was found out to be 68%, among which 18% were mildly anemic, 48% were moderately anemic, 2% were severely anemic, while 32% were not at all anemic. Hence importance to health in terms of nutritional elements should be taken care of, to prevent other diseases. In a study by Katare et al. (2020), they concluded that cure rate of BV was high in patients taking probiotic treatment (n=42/44) when compared with antibiotic treatment (n=34/46). Contradictorily, our study found no difference in cure rate among both groups (56%). Lin et al. (2021) found significant improvement in color or odor of the vagina, itching, and reduced vaginal discharge in subjects taking probiotics at two and four weeks of treatment.

The recurrence rate of BV in Group A and group B was found to be 44% and also no significant difference in recurrence rate among married (45%) and unmarried people (40%). Faruqui and Chitra (2020) also showed that significant improvements in odor of vaginal discharge, itching, and pH after two weeks and four weeks of treatment. Vani et al. (2018) found that patients treated with probiotics in addition has shown better improvement (9.09% recurrence) than patients treated with only antibiotic group (66.66 % had recurrence). Though our study did not include probiotics and antibiotics treated patients, similar studies shows that probiotics offers significant benefit to patients. Aarti et al. also found no rate of recurrence within three months among patients taking probiotic treatment (Katare et al., 2020). Van de Wijgert et al. (2020) found that intermittent use of both antibiotics and probiotics will reduce the recurrence rate of BV. Ya, Reifer and Miller, (2010) found significant improvement in recurrence rate (n=9/57) when compared with placebo group (n=27/60).

In our study, 94% and 34% of people had alkaline pH before and after treatment with antibiotics or probiotics group, suggesting significant improvement in vaginal pH. But found no statistical improvement among probiotic (36%) and antibiotic group (32%) after treatment. Bitew et al. (2021) also found four times significant improvement with pH in patients taking probiotic group. Heczko et al. (2015) found improvement in Nugent score and pH after one week of intravaginal probiotic capsule. Faruqui and Chitra (2020) also showed that number of lacobacillus in the vaginal flora had increased after probiotics supplement when compared with antibiotics and probiotics supplements after two and four weeks of treatment.

In our study, 20%, 4%, 76% of them had negative, intermediate, confirmatory score for bacterial vaginosis according to Nugent criteria in Group A when compared to Group B 12%, 20%, 68% had negative, intermediate, confirmatory score, respectively. Though we did not correlate Nugent score before and after treatment with probiotics and antibiotics, many studies have positive results with probiotic treatment.

Lin et al. (2021) found significant improvement in Nugent score in subjects taking probiotics at two and four weeks of treatment. Van de Wijgert et al. (2020) also found more number of Lactobacillus colonization thereby direct improvement in Nugent scoring in group taking metronidazole. Heczko et al. (2015) found improvement in Nugent score after one week of vaginal probiotic capsules (Heczko et al., 2015). Ehrstorm et al. (2010) found high colonization of lactobacillus in patients taking probiotic group of 89% when compared to placebo group (0%). Russo Karadja and De Seta (2019) found oral supplementation of probiotics also increased the vaginal colonization of lactobacillus with

improvement in vaginal odor, discharge and itching. Nugent score also improved after 15 days (Russo, Karadja and De Seta, 2019).Vujic et al. (2013)found significant improvement of 61.5% in vaginal microbiota after 6 weeks of treatment with probiotic capsule when compared with placebo group about 26.9%

Though our study did not have any positive correlation with probiotic group, many studies have found significant improvement in vaginal pH, lactoba0cilli colonization in vagina, rate of improvement in symptoms, recurrence rate among probiotic supplementation group. The improvement in medical knowledge among public lead to usage of over the counter medications. Use of broad spectrum antibiotics at initial onset of symptoms also has more harm than benefit which includes, depletion of normal commensal bacteria in our body precipitating more pathogenic bacterial entry in all ways possible. Our study concludes in view of using probiotics supplement as a better option to maintain not only a healthy vaginal microbiota, but a healthy living.

## CONCLUSIONS

Previously done studies have contradictory findings regarding the recurrence rates and treatment modalities for bacterial vaginosis. In our study, we observed that patients treated with both antibiotics and probiotics had similar recurrence rates of BV.

Today, multi-drug resistance has become a global threat to the inadvertent use of antibiotics as they have the potential to demolish normal commensal bacteria of our body thereby increasing the risk of acquiring other infections. Hence it would be prudent to prefer probiotics in patients with BV, as they colonize other normal commensals and have similar efficacy as that of antibiotics. The other beneficial factors of probiotics include acceptability to patients and nil side effect profile.

The women of today have evolved and have become empowered due to better education than in previous times. They are well-informed and come forward to seek treatment at an earlier stage. This provides us a good opportunity to educate all women regarding the prevalence, outcome, and recurrence rates of bacterial vaginosis which would indirectly reduce the prevalence of HPV infection, as both share common risk factors.

A significant number of sexually active unmarried women have started seeking specialist care for their medical needs. Therefore, it is important to educate young women regarding the use of barrier contraceptives that would prevent unwanted pregnancies, vaginal infections, and other sexually transmitted infections. Our study suggests future researchers to focus on probiotics and its implications for a healthy living.

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Original Research

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# THE APPLICATION OF REVERSE SHIFT PATTERN TO OPERATOR WORKERS IN THE POWERHOUSE

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**ABSTRACT**

**Introduction:** Companies generally apply a shift system to keep production running. Implementing work shifts is not necessarily independent of the risks, especially for workers who carry it out. **Aims:** to analyze the impact felt by operator workers from the implementation of the shift work system that is currently being undertaken, in terms of its impact on physiological, performance, psychological, and social aspects. **Method:** This research used a qualitative approach. The research was conducted at the powerhouse and the informants in this study were management and employees of the powerhouse operator. Collecting the required data was done by interviewing and observation techniques. Meanwhile, the discussion used descriptive method. **Result:** The results showed that the backward shift pattern applied by the company did not have a break. It is known that there are several impacts felt by workers as a result of implementing backward work shifts, such as disturbed sleep patterns, experiencing digestive disorders such as bloating and diarrhea, feeling excessively depressed, and workers experiencing social interaction barriers outside of work. However, the shift pattern currently applied has no impact on the performance of the operator. **Conclusion**: The shift pattern implemented has an impact on operator workers, especially on physiological, psychological and social aspects. Therefore, there is still a need for improvement in the shift pattern applied.

**Keywords:** Operator workers, Physiological, Psychological, Reverse shift pattern

## INTRODUCTION

There are several sectors of a company that require continuous operation, because the company or job has an important impact for the wider community, in its implementation based on Decree of the Minister of Manpower and Transmigration Number 234/2003, which categorizes the work carried out continuously, namely tourism, postal, services in the field of health, transportation, telecommunications, security, and provider/power plant companies (Decree of the Minister of Manpower and Transmigration of the Republic of Indonesia Number: Kep.234/MEN/2003). Companies must implement a shift work system in order to operate sustainably so as to maintain or improve the company's services and production results. Working on a shift basis can cause various impacts for workers who run the work system. Shifts have an impact on circadian disruptions that cause decreased alertness, physiological, psychological, and also indigestion, decreased appetite, and stress in shift workers (Syafar and Fiatno, 2018; Bazrafshan et al., 2019). According to Maurits (2008), shift work has risks to physiological aspects such as sleep disorders, indigestion, and can affect aspects of employee performance, affecting social aspects, as well as psychosocial aspects of workers.

Human activities are normally carried out during the day, but for the asset shift workers these are not only done in the day but also at night (Arifah, Andarini and Dianita, 2019). Night work also creates conditions that can interfere with the ability to adapt biologically and socially. Various diseases directly related to shift work include fatigue, sleep disorders, jet lag, and gastrointestinal symptoms (Drake and

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Wright, 2010). From the results of annual global research data, it is estimated that about 20%-50% of adults report a sleep disorder and about 17% experience a serious sleep disorder (Saftarina and Hasanah, 2014). Research into accidents in New Zealand showed that of the 134 fatal accidents, 11% of them were caused by fatigue factor and of 1703 injuries due to accidents 6% were caused by fatigue in the operator (Adi, Suwondo and Lestyanto, 2013). Working shifts done long-term can increase the risk of developing cardiovascular disease, as well as obesity (Arifah, Andarini and Dianita, 2019). Therefore, Koemer provides criteria that need to be considered in the process of preparing or implementing work shifts, including the amount of night shift work time as small as possible; each night shift must be followed by at least 24 hours for rest (Gustafsson, 2002).

Powerhouse is a type of industrial work whose operation must be carried out continuously. This requires the power plant to implement a shift work system. In practice, the power plant divides work shifts into three shift times and uses a backward shift pattern, namely the night shifts/shift I, start from 10 PM until 7 AM (9 hours), the evening shifts/shift II, start from 3 PM until 10 PM (7 hours), and the morning shifts/shift III, start from 7 AM until 3 PM (8 hours). The implementation of the work shift that is applied is the shift starting from the night shift/shift I, then it will change after doing two times each shift. After that, workers are off for two days. The applied retreat pattern requires operator workers to return to work on the same day.

Based on the initial survey and interviews, it was found that the application of the backward shift pattern in the powerhouse was used with the approval of the operator workers with management, with the consideration that the vacation time that the workers got was longer. Workers complained about the lack of rest time available when moving from the first shift to the next shift. Workers also complained about the sleep disturbances they experienced. In addition, there was a finding of one worker who was carrying out an exchange of services so that the worker had to work 24 hours a day. Therefore, this study was conducted to analyze the impact of the application of the backward shift pattern on operator workers.

## METHOD

This research is a descriptive research with a qualitative approach with the main purpose of the study is to describe the circumstances objectively of the impact of the application of shift patterns on operator workers at PT X. Research is conducted in power generation companies. Informants in this study are operator workers who carry out shift work, which is divided into two people per group, namely in the operator supervisor, control room operator, and generator turbine operator, in addition, the management, who is the head of staffing who determines the application of shift systems at the powerhouse, is also used as research informants as well as senior supervisors of operators (**Table 1**).

**Table 1.** Informants' Characteristics

| No | Occupation | Initial |
|---|---|---|
| 1 | The Head of Staffing (HS) | E |
| 2 | Senior Supervisors of Operators (SSO) | AS |
| 3 | Operator Supervisor (OS) | Y |
| 4 | Operator Supervisor (OS) | MTM |
| 5 | Operator Supervisor (OS) | MSD |
| 6 | Control Room Operator (CRO) | TH |
| 7 | Generator Turbine Operator (GTO) | R |
| 8 | Generator Turbine Operator (GTO) | T |
| 9 | Generator Turbine Operator (GTO) | S |

| No | Occupation | Initial |
|---|---|---|
| 10 | Generator Turbine Operator (GTO) | TR |

The data collection technique in this study is to conduct in-depth observations and interviews by looking at the impact of shift work on four aspects by Maurits and Widodo (2008), namely physiological, performance, psychological, and social.

Ethics approval was obtained from The Health Research Ethics Commission of Public Health Faculty, Sriwijaya University No:269/UN9.1.10/KKE/2019), on July 30 2019.

## RESULT

The average age of informants working at the operator ranges from 24 until 31 years old, in the sense that the informant is in a productive age. The supervisor is in charge of all the work in their respective squads, the control room operator is in charge of operating the generation device through the controller on the computer, and the turbine generator operator in charge of operating and checking the generation aids. Based on the results of this study, an overview of the impact of the application of shift patterns to workers is seen from physiological, psychological s, performance, and domestic and social aspects as presented by Maurits and Widodo (2008).

### The Impact of Physiological Aspects

Based on the observations and interview results with informants about the impact caused by the shift work system imposed by the powerhouse on the physiological impact of sleep disorders in operator workers the following information was obtained:

> *"From the pattern of shift itself because the work is not normal where others rest while we have to work, with shifts like now where the night used to be, then to noon, then to the morning, it is rather heavy when moving the second shift of each shift so lack of sleep, I feel sleepy."(R, GTO)*
>
> *"Personally, when changing the night shift to the afternoon shift, it's very tired, we only have 8 hours of rest and it's still better if we can use it for rest, otherwise we can't usually use it to its full potential."(TH, CRO)*
>
> *"...for me, it's ideally around 8 hours, after the afternoon shift it's about 5 hours, if after the night shift itself it's shorter, at least sleeping at 8 or 9, at 11 or 12 I'm already awake..."(T, GTO)*
>
> *"...after coming home from the night shift, I feel sleepy but can't sleep..."(S, GTO)*
>
> *"...overtime work makes it easier for me to get the flu, cough, that is..."(TH, CRO)*

All informants experienced circadian rhythm changes from normal bedtime. The night generally used for sleep and rest turns into morning or daytime; this change in sleep patterns occurs when workers get part of the night shift. This causes the operator workers at the powerhouse to experience sleep deprivation. Based on the results of in-depth interviews information obtained was that the majority of workers' sleep duration decreased from the previous 6-8 hours to 4-5 hours per day. As a result, workers often feel sleepy, dizzy, unwell, and two informants often have difficulty sleeping after coming home from work shifts. In addition, six of the eight informants revealed that the milk they drank caused a digestive disorder. As the informant said:

> *"...sometimes i get stomachache after a day or night shift in the morning..."(MSD, OS)*
>
> *"...after coming home from the night shift, sometimes I often feel like I'm bloated like a cold, I've also had diarrhea..."(T, GTO)*

Operator workers suffer from indigestion such as flatulence, and diarrhea generally occurs in the morning, after doing

night shift work or day shift. Based on information obtained from informants, indigestion or diarrhea arises because it is caused by food eaten during shift work, and according to observations also operator workers often bring snacks or snacks from outside, consume caffeine, and some are also active smokers.

**The Impact of Psychological Aspects**

Based on the observations and interview results with informants about the impact caused by the shift work system imposed by the powerhouse about the psychological impact in this case work stress on shift operator workers in power houses, informants said:

"*Honestly, the shift like this makes me worry about my health because of lack of rest, yes...although the time off is a little longer, but with a little rest time this made me less comfortable,"(TH, CRO)*

*"Bored for sure with the shift pattern especially if you have rotation shift then you'll stay here for days…"(TR, GTO)*

*"...when you're often at work because of overtime, because the office is like this, you just keep on doing things like this, it's very boring…"(T, GTO)*

*"…in my opinion, the current shift is heavier. Sometimes because the house is far away, from the night shift to the afternoon shift it's lazy to go home because the time is short. So you have to stay for days here, and also if you change the second afternoon and the first morning you have to stay here too…"(TR, GTO)*

*"…every time there is a disturbance, you must be anxious because the pressure is high, it makes you anxious, tense, for example when there is a blackout incident..."(MSD, OS)*

From the interview, it can be concluded that most of the workers at the powerhouse experience work stress. Six out of eight informants feel challenged and worried about the shift patterns that are currently applied, which makes only a short time of rest available so that workers feel worried about their health in the future. While seven out of eight informants experience boredom, some of them are due to monotonous work every day, in addition, when workers have to do overtime or exchange services, that results in workers being continuously in the company environment for days.

Workers often feel depressed and agitated at certain times such as when the generating machine is experiencing problems. This can cause work stress because the pressure experienced by workers becomes higher and they are required to take quick action in overcoming the problem.

**The Impact of Performance Aspects**

Performance measurements in the powerhouse itself has used an application under the name IP Perform, and in the implementation of shift working hours, all informants at the powerhouse do not experience interference with their performance. Based on the results of in-depth interviews the following information was obtained:

*"We already have a special application to input and see the performance of each individual (IP Perform). The performance of shift workers here is included in good and excellent indicators."(E, HS)*

*"Their performance is on average good and very good so there is no problem with the shifts that are now with their performance because it can be seen for themselves the workload that is arguably not too much; on the other hand with six people in one squad it already felt effective and efficient to do all the tasks of the company for these operator workers."(AS, SSO)*

*"The division of tasks is quite ideal for the number of workers, so the*

*division of tasks itself is fairly even and not too burdensome for one part because the division of tasks has been adjusted to each part and is running well."(MTM, OS)*

The results of the interview showed that the current shift pattern is not a problem for the performance of operator workers at the powerhouse. The workload provided by the company is not too much and heavy, feeling that the division of job duties on each operator worker has been going well, on the other hand some parts in the operator, namely Control Room Operator (CRO) and Generator Turbine Operator (GTO), already have partners to rotate work, and all informants reveal that they can always fulfil their tasks properly and on time.

### The Impact of Social Domestic

The study results stated that the operator workers do not have social interaction barriers with colleagues in the company environment. In the domestic and social aspects of operator workers at the powerhouse, it was revealed that relationships and interactions with family, friends, and social communities outside the work are not good.

*"...quite impactful, because, for example, I go in at night so in the morning at home, we rest we go at night so if there are a neighbor gatherings so we can't get together... "(TH, CRO)*

*"...it affects my relationship with the environment since I usually rest during holidays."(TR, GTO)*

*"...family, there may be times where I want to play with family but I can't since I need to go to work on big days or Eid... "(S, GTO)*

Based on the interviews, with the current shift patterns imposed at the powerhouse, seven out of eight informants complained about their disrupted social interaction relationships, such as during get-togethers with relatives and family, get-togethers with friends, or activities at home with the community such as neighborhood gatherings or devotional work, which is not uncommon for these activities to be done during their shift schedules, and ordinary operator workers use time off to rest, which makes them rarely socialize with the outside environment; this affects their relationships and social interactions.

## DISCUSSION

### Impact of Physiological Aspects

Based on this study, it was found that the majority of workers who run shifts experience disorders in the physiological aspect, which are closely related to health problems. The physiological impact of workers can occur due to changes in circadian rhythms that occur during shift work. According to Rouch (2007), the shift system will disrupt circadian rhythms for workers who run it. Circadian rhythm is the basic nature of physiology, so if circadian rhythms are disrupted it will have a physiological impact on workers, such as disruptions in sleep patterns, digestive disorders, and other health disorders (Maurits, 2008).

Each individual has a different ability to adapt to the mismatch between circadian physiology and sleep-wake behavior. These differences can affect several aspects of physiology, such as gastrointestinal systems, cardiovascular, and sleep-wake in specific individuals. In addition, the other most common effects of working the night shift are excessive sleepiness and insomnia, which contribute to other hazards such as accidents, and are defining symptoms of Shift-Work Sleep Disorder (SWD) (Drake and Wright, 2010). SWD is diagnosed if there is a report of excessive sleepiness or insomnia for at least three months related to a repetitive work schedule that overlaps with regular sleep times (Burman, 2017).

From the theory it can be concluded that the results of this study show that workers experience physiological impacts where all informants experience changes in circadian rhythms from normal sleep time.

Night, which workers generally use for sleep and rest, turns into morning or daytime; this change in sleep patterns mainly occurs when workers get part of the night shift. This causes the operator workers at the powerhouse to experience sleep deprivation. Based on the results of in-depth interviews information was obtained that the majority of workers' sleep duration decreased from the previous 6-8 hours to 4-5 hours per day. As a result, workers often feel sleepy, dizzy, unwell, and two informants often have difficulty sleeping after coming home from work shifts.

The study results are in line with the research of Anggraeni (2015), which found that of the ten workers at PT. Admira there were eight workers who complained of experiencing physiological disorders such as sleep disorders, physical disorders, and indigestion. Similar research conducted by Sari (2020) obtained the result that doing night shift work resulted in disruption of workers' night sleep patterns. In addition, as many as 41 workers have poor sleep quality; workers who work in the night shift feel tired and sleepy, due to the night wind and this is also what makes during rest hours used by workers to sleep (Juliana, Camelia and Rahmiwati, 2018).

Cho and Duffy (2019) stated that recent research shows that disrupted sleep, insufficient sleep, and sleep disorders can affect sexual function. Individuals with Erectile Dysfunction (ED) or urological disorders may have sleep disorders that contribute to their urological or sexual dysfunction. All common sleep disorders, including Obstructive Sleep Apnea (OSA), insomnia, restless legs syndrome, and Shift-Work Sleep Disorder (SWD) are associated with ED and/or other urological disorders (Cho and Duffy, 2019).

In addition, sleep disturbances are causally linked to chronic disease although there is insufficient evidence to prove this ( Briançon-Marjollet et al., 2015; Kecklund and Axelsson, 2016). However, a systematic review and meta-analysis by Kecklund and Axelsson (2016) found there were inconsistencies between studies to prove the relationship between work shifts and accidents, type 2 diabetes mellitus, obesity (RR: 1.09-140), stroke (RR: 1.05), coronary heart disease (RR: 1.23), cancer (RR: 1.01-1.32), prostate, and colorectum. Laboratory studies show that cardio metabolic stress and cognitive impairment increase due to shift work, as well as sleep deprivation.

This study result also found six out of eight operator workers felt digestive disorders such as flatulence and diarrhea after working night shifts or day shifts, in addition some operator workers at the powerhouse also have a habit of bringing food from outside, morokok and drinking caffeinated beverages. Syifa et al. (2017) revealed that of 25 shift worker respondents, 72% of workers experienced indigestion that occurred when workers worked night shifts, while 28% did not experience indigestion. Other research conducted by Ihsan (2020) said the chronic fatigue experienced by night shift workers, if not balanced with healthy eating habits, can result in impaired digestion. Nea et al. (2017) also revealed that shift workers had poor and irregular diets, as well as an increase in the consumption of cigarettes and alcoholic beverages. Syafar and Fiatno (2018) stated that the level of consumption of light snacks among shift workers is higher than normal workers. In addition, the quality of the diet is lower and tends not to meet the requirements of balanced nutrition.

Therefore, to reduce the impact on physiology, such as sleep and indigestion disorders, the company can rearrange the scheduling and determination of shift patterns by using advanced shift patterns. The workplace needs to provide special time for a Power Nap (short sleep), with a duration of about 30-90 minutes of rest during the day (Garbarino et al., 2002). To avoid the problem of indigestion it is recommended in shift workers to reduce the consumption of salt and fatty foods, avoid junk food, provide extra food for workers, and consume foods with balanced and good

nutrition. In addition, avoid drinks that contain caffeine, and reduce smoking habits or food ingredients that contain nicotine while working so as to prevent the increase of stomach acid (Berger, 2005).

**Impact of Psychological Aspects**

Psychological aspects of workers are closely related to work stress. Stress due to shift work will cause fatigue which can lead to psychological disorders of workers, such as dissatisfaction (Maurits, 2010). Marchelia (2014) expresses that psychological symptoms when someone is experiencing stress are characterized by anxiety, tension, confusion, irritability, and boredom. The results of this study indicate that operator workers experience several symptoms of work stress, including experiencing dissatisfaction with the application of the current shift pattern. The lack of available rest time causes workers to worry about their health in the future. On the other hand, all operator workers felt anxious and depressed, whether there were problems with the generator equipment or machine. Then the operator workers also feel bored with the reverse shifts applied due to repetitive work activities. In addition, if operator workers have to work overtime or there are times when workers change schedules, it makes workers have to work two to three shifts at once in one day. This means workers have to be at work for days. Thus the application of the reverse shift pattern has an impact on the psychological aspects of operator workers.

The study results are supported by research conducted by Firmana (2011) in which operator workers experienced mild stress in 15 people (21.1%) and moderate stress in 16 people (22.5%). The results show that employees who experience moderate stress and mild stress amount to almost the same. One of which could be experienced by employees because there are many overtime activities on night shifts so that the rest time is little. Saleh (2018) said that workers with long shifts can cause psychological fatigue, feeling saturated. Research conducted by Marchelia (2014) on the comparison between the levels of stress in shift workers was categorized moderate as 78.5% and 13.2% experiencing mild stress, the most stress arises when working the night shift.

Other research states shift workers often complain about the effect on mood, anxiety, and nervousness in relation to working conditions, which cause workers to experience work stress (Costa, 2010). it was found that nurses who worked in shifts had a higher risk of overcommitment compared to those who worked on day/non-night shifts (Lin et al., 2015). Overcommitment, a kind of coping, is not only critical enough to result in emotional exhaustion but also exacerbates the negative effects of the effort-reward imbalance (Lin et al., 2015).

In this case, workers define the stress they feel at work as a "sense of fatigue." Work-related stress is considered a major risk factor in the emergence of health problems such as cancer, metabolic syndrome, cardiovascular diseases, cognitive impairment, and depression (Cannizzaro et al., 2020). Sleep disturbances are thought to increase oxidative stress, which is defined as an imbalance of excess pro-oxidative factors and reactive oxygen species over anti-oxidative activity. Oxidative stress can damage cells, DNA, and proteins and ultimately can lead to various chronic diseases such as diabetes, cancer, cardiovascular disease, dementia, and Alzheimer's (Gibson, 2021).

Thus to reduce stress, some relaxation techniques are believed to lower mental burden and stress levels. The easiest relaxation techniques such as listening to soothing music, socializing with friends, or pursuing hobbies should be chosen (Syafar and Fiatno, 2018). In addition, providing time off for shift workers is also considered effective in reducing health problems, as shown by the results of Lin et al.'s research which found that nurses who have two days off after carrying out the night shift show a

reduced risk of overcommitment (Lin et al., 2015).

In addition, Kim, Park and Niu (2017) stated the importance for the company to provide a special short time of about five minutes to give workers time to do cooking and stretching, which can relieve stress and work fatigue.

**Impact of Performance Aspects**

Based on this research, all informants have a good performance. Performance is success in completing a task or meeting a set target; the quantity and quality of work achieved by a worker in carrying out his duties following the responsibilities given to him. So the conclusion in this study is that the majority of operator workers have good performance and are affected by the shift patterns applied. This is considering that most operator workers are still in productive age, the division of tasks in each part of the operator is in accordance with the ability and skills of workers; in some parts such as the Control Room Operator (CRO), and Generator Turbine Operator (GTO) there are already partners to rotate work so as to reduce the intensity and burden of work done by shift workers.

Seguh, Kolibu and Kawatu (2019) state that 89.1% of nurses have good performance, and only 10.9% have poor performance. So it can be concluded that there is no relationship between shift work and performance. Similar research conducted by Firmansyah et al. (2014) shows that not working shifts does not have a significant impact with performance, be it morning shifts, day shifts, or night shifts; these three shifts have no effect on the performance of nurses. Another study conducted on the performance of nurses in night shifts found that as many as twenty-three people or 76.6% have a good performance category; this is due to factors from the relationship between the workforce, working with teams, working in turns, which makes shifts that are done not have a significant impact on the performance of nurses (Ahsan, 2016).

However, research of Nurbaity, Rahmadi and Fithriani (2019) at PT Techno Indonesia shows the higher the effect of work shift impact, the decreased employee performance, or vice versa, the impact of low shifts will make employee performance rise. In addition, research by Dall'Ora et al. (2016) and De Cordova, Bradford and Stone (2016), who conducted a literature review related to the impact of work shifts on worker performance, showed that working rotating shifts was associated with poor performance outcomes and night shift workers had poor health, which can lead to errors and decreased performance.

Therefore, the thing that the company can do to maintain the performance of operator workers is maintaining supervision so that in the implementation process there is no overlap in the division of duties of operator workers, for workers are expected to maintain consistency in the division of tasks when doing shift work.

**Impact of Domestic Social Aspects**

This research found that the operator worker complained about the pattern of shifts that workers lived, disrupting their social interaction. Shift work can cause effects in domestic and social aspects for workers and become a big problem due to disruption of family life, loss of free time, small opportunities to interact with friends, and disruption of group activities in society. Thus it can be concluded that the operator workers at the powerhouse who work with a backward shift pattern experience obstacles in interacting with social communities. This obstacle occurs when there an activity such as citizen gatherings, devotional work, gathering with friends, family, and community groups becomes very limited; in general, the time lag and holiday time is used by the operator worker for rest (sleep), thus the operator worker experiences obstacles in interacting and relating to social activities outside of work.

This research is also in line with research conducted by Supomo (2014)

There is a disruption to family life, loss of free time, lack of opportunity to interact with friends in addition to also inhibiting activities with groups in the community where the activity is generally done in the evening or evening. While for workers with night shifts, free time is often used for rest or sleep, thus they are unable to attend or participate in such activities, due to being excluded from the community environment. Maurits (2008) also says that night shifts greatly impact interaction relationships with family and social communities. Shift work makes some workers feel isolated from social activities and with interactions with family (Singh and Muninarayanappa, 2018). Work shifts or night shifts are conditions that can inhibit interaction with social life (Anggraeni et al., 2015). To overcome the impact of domestic and social aspects of workers, it is advisable for companies to hold regular programs such as family gatherings. Meanwhile, workers need to have quality time with family, or friends, such as walking, doing hobbies or sports together.

## CONCLUSION

The results of this study indicate that the application of the backward work shift pattern has an impact on workers. The impact on physiological aspects are such as workers experiencing disturbed sleep patterns, lack of sleep time, and experiencing digestive disorders such as flatulence and diarrhea. Psychological impacts are such as work stress, workers feel worried and depressed about their health, workers feel bored because of monotonous work. Finally, there is the impact of social interactions outside the work environment such as with family, friends, and the community. However, operator workers do not feel the impact of shifts on their daily performance; operator workers can always complete work tasks properly and on time. This is due to the division of labor, thus making the workload given lighter.

Recommendations are to rearrange scheduling and setting shift patterns using advanced shift patterns; the workplace needs to provide special time for a Power Nap (short sleep), with a duration of about 30-90 minutes of rest in the day. It is important for the company to provide a special short time of about 5 minutes to give workers time to do cooking, stretching, listening to music, so as to reduce fatigue in the work. They should also provide extra food for shift workers to meet the nutrition of the operator worker. In addition workers should avoid drinks containing caffeine, and reduce smoking habits or food ingredients that contain nicotine while working, to prevent the rise of gastric acid. In conducting supervision of the implementation of service exchanges to avoid workers who have excess work time in one day, so as to get enough rest time, the company can increase rewards, as well as a clear career level in workers so that workers are more motivated, which will make performance better. The company can hold a family gathering program, which can be used by workers to chat with family, and they can change the shift pattern to give a longer time lag to the operator's work.

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Original Research

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# THE CORRELATION OF QUALITY OF ANTENATAL CARE, MATERNAL COVID, AND MATERNAL MORTALITY DURING THE PANDEMIC PERIOD IN EAST JAVA, INDONESIA

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**ABSTRACT**

**Introduction**: Indonesia's *maternal mortality rate* is still above the target of the *Sustainable Development Goals* (SDGs). Meanwhile, the trend of maternal mortality in Indonesia during the COVID- 19 pandemic in 2021 increased sharply from 4,627 to 6,865 cases in 2021. **Aims:** This study was conducted to analyze the relationship between the quality of maternal health services on the incidence of *maternal COVID* and *maternal mortality* during the COVID pandemic in East Java, Indonesia. **Methods**: The research was conducted in East Java Province in 2021. The sample was randomly selected as many as 35 samples from a total of 38 samples of Regencies / Cities. The data used secondary data sourced from data from the East Java Health Office. Data analysis used *Person Correlation analysis* with *Chi-Square analysis* method. **Results**: The first hypothesis did not find a relationship between quality of *Antenatal Care services* and *Maternal COVID* cases (p- value: 0.195, r: -0.087). The second hypothesis has a significant relationship between the *Maternal COVID* and the *Maternal Mortality* (p- value: 0.040, r: 0.548). Also, the third hypothesis showed a substantial correlation between *Maternal Mortality* and quality of *Antenatal Care* (p- value: 0.001, r: -0.555). **Conclusion**: There is a strong relationship between the high *Maternal COVID* cases and the quality of access to *antenatal care* services to the high *Maternal COVID* cases during the pandemic. There needs to be a strategy to improve the quality and access of *antenatal care* services in reducing the high *maternal mortality rate*.

**Keywords**: Antenatal Care, Correlation Analysis, Maternal COVID, Maternal Mortality, Pregnancy.

## INTRODUCTION

Antenatal care (ANC) is a monitoring and examination process that is important for the health of pregnant women and their babies. This process offers highly efficient medical interventions that can reduce maternal and newborn morbidity and mortality. The World Health Organization (WHO) recommended in 2002 that pregnant women with positive pregnancies undergo a minimum of four ANC visits during the course of their pregnancy (Kasagama, Todd and Renju, 2022). This is also stated in Regulation of the Minister of Health of the Republic of Indonesia No. 21 of 2021, which specifies that K1 (An indicator of the first visit on the examination of pregnant women) coverage is a useful indicator for describing pregnant women's access to pregnancy services. A third of pregnancy issues will be discovered with the cooperation of pregnant women performing ANC. Meanwhile, indicators that can describe the quality of service are the coverage of K4 and K6 (4th visit and 6th visit) and subsequent visits if necessary (Regulation of the Minister of Health of the Republic of Indonesia Number 21 of 2021). According to the WHO statement, antenatal care that is both adequate and of high quality will effectively influence the promotion of

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better maternal and fetal health outcomes (WHO, 2014). Utilizing maternal health care effectively can help lower MMR. Strengthening antenatal care (ANC) is a typical MMR intervention, particularly in impoverished nations (Nuryana, Viwattanakulvanid and Romadlona, 2022). According to a study conducted in Indonesia, fewer women are using ANC due to a number of variables, including low maternal education, poverty in rural areas, and relatively tight childbirth intervals (Kurniati et al., 2018).

The severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) pandemic, which is to blame for the 2019 coronavirus illness (COVID-19), has spread globally, causing a significant shift in health trends and big cases that happen very quickly. By the end of 2020, there were 61,869,330 confirmed cases of COVID worldwide, resulting in 1,448,896 fatalities (Suhariyanto, Rangkuti and Hartono, 2020). Pregnant women are a condition that is prone to developing more severe symptoms after experiencing this respiratory viral infection. This occurs as a result of the physiological modifications that every pregnant woman's immunological and cardiovascular systems go through during pregnancy (Cuñarro-López et al., 2021). The pandemic case had slowed down in early 2021, but along with the easing of the pandemic status and the many holidays that occurred which led to a decline in existing health protocols, finally in mid-2021, precisely in July and August there was a second spike, the peak of which far exceeded the peak of the first spike. . The spike in these two cases was in line with the discovery of a new variant, namely the Delta variant, which has a more infectious nature with a higher severity and mortality rate than the previous COVID variant. The Indonesian government was overwhelmed with the high occupancy rate of the hospitals which were *overloaded* at that time. The death rate has increased significantly, resulting in health workers and the public owning many comorbid victims. There will be 1280 maternal deaths in Indonesia in 2021 as a direct result of this ailment, with a particular impact on the East JavCOVID-19) caused 793 of these deaths, and the remaining 487 instances weren't COVID-related (East Java Health Office, 2022).

In 2021, maternal *health services* will have problems related to the development of COVID, which is quite worrying. This condition affects the mobility of people, including pregnant women, to visit health facilities for routine check-ups. However, the government has initiated an indirect health check-up program, where pregnant women can still have their condition checked using existing communication tools to monitor their health. If you need immediate help, health workers will pick up the patient with standard prevention equipment according to the established COVID prevention protocol. With this condition, it was found that 536,669 (90.54%) pregnant women had made their fourth visit (K4) out of the total target of *592,735* pregnant women. This achievement is still below the national target where the central government targets 95% of pregnant women to receive pregnancy services four times (K4) during their pregnancy. Meanwhile, the development of COVID data in Indonesia grew rapidly in 2021 due to the spread of a new variant with the name of Delta. As a result of this variant, there was an explosion of extraordinary cases with a higher severity and death rate than in the previous variant. Multiple and Mixed variants of SARS-CoV-2 are circulating globally in all regions and countries. One of them is the B.1,617 lineage (Delta variant) which was first detected in India starting in 2020 (Monajjemi, Kandemirli and Mollaamin, 2021). This variant shows more severe symptoms and has a high mortality rate with a high transmission rate and is resistant to vaccination (Moghaddar, Radman and Macreadie, 2021). The increase in cases of the Delta variant of

COVID resulted in a significant increase in *maternal COVID cases* in East Java. As many as 5022 cases of pregnant women exposed to COVID- 19 were recorded in all districts and cities in East Java in 2021 (East Java Health Office, 2022).

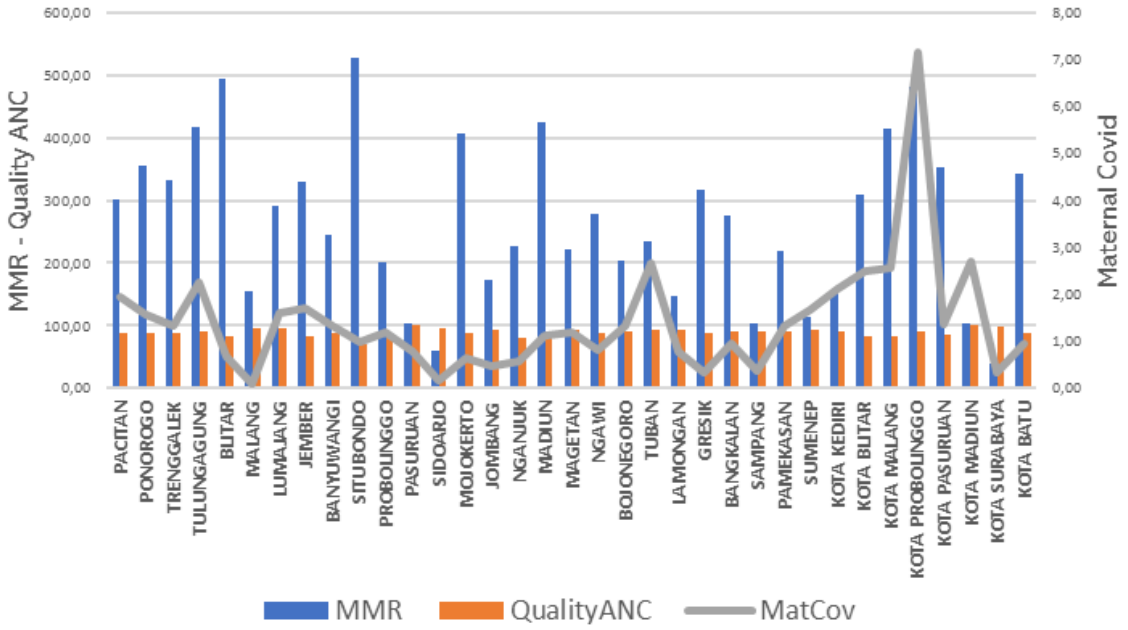


**Figure 1.** Distribution of MMR, K4, and Maternal COVID Cases in East Java 2021 (East Java Health Office, 2022).

The Sustainable Development Goals' (SDGs) target for maternal mortality in Indonesia is still being exceeded (Fadilah et al., 2019). According to estimates, 77% of Indonesian women between the ages of 15 and 49 had at least four ANC visits in 2017. Data indicate a gradual reduction from 88% coverage for this number since 2012. Maternal mortality ratio (MMR) of 126 per 100,000 live births in Indonesia remains quite high compared to high-income nations, despite the fact that national ANC coverage (minimum of four visits) can be deemed satisfactory at the current level of 77% (Unicef, 2021). Maternal mortality climbed from 4,623 instances in 2020 to 6,865 cases in 2021. East Java became the largest contributor to maternal deaths in 2021 with 1280 cases of death (Rustandi, 2022). A study in India also stated that national health policies are needed to pay attention to the health needs of everyone because maternal healthcare requires special attention. After all, women are considered the most vulnerable group in society (Katyal, 2018).

Many theories mention the cause of *maternal* death. Maternal death is a condition that can be prevented by identifying high-risk patients, conducting quality antenatal check-ups, and identifying complications that may arise (Sulistyono and Joewono, 2020). One of these complications affects the increase in *sectio surgery caesarean section*, such as the research conducted by Debrabandere, Farabaugh and Giordano (2021).which stated that the COVID-19 pandemic caused an increase in *emergency cases so that* cesarean delivery was unavoidable Numerous specialists have already investigated the pattern of causes of maternal death, which is impacted by a number of circumstances. One of the theories from McCarthy and Maine provides a detailed determinant framework for analyzing maternal mortality and morbidity. According to this idea, there are three different categories of determinants:

distant, intermediate, and proximal or direct. The direct causes of maternal mortality, which begin in pregnancy and may result in pregnancy-related problems such as hemorrhage, infection, pregnancy-induced hypertension, and obstructed childbirth, are influenced by the remote determinants and the intermediate determinants (Karkee, 2012). The following figure is a theoretical framework for the incidence of maternal death according to McCarthy And Maine. We use this framework to develop a research framework.

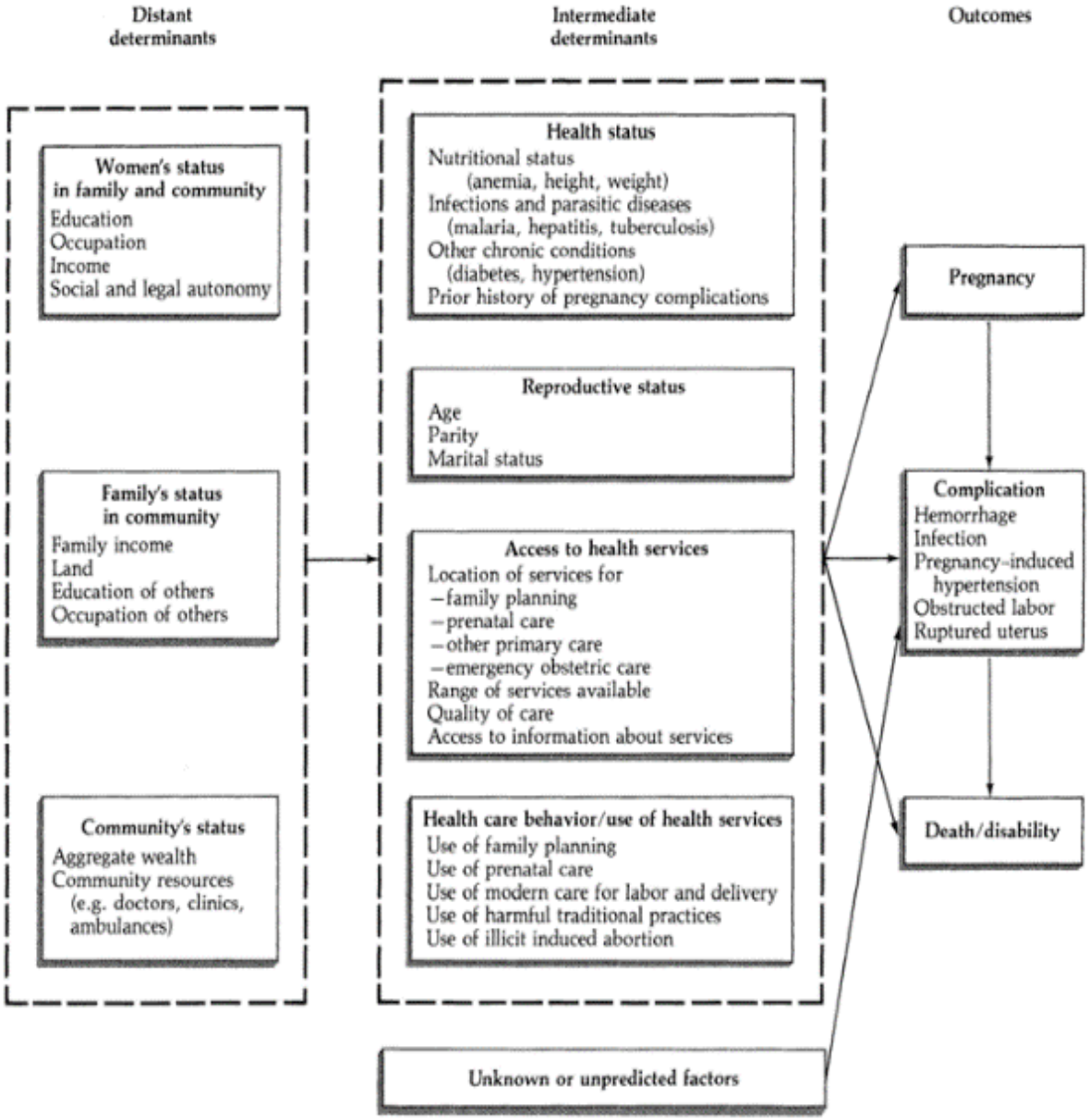


**Figure 2.** An extensive framework for divining the factors that influence maternal mortality and morbidity (McCarthy and Maine, 1992)

Improving the quality and access of services for pregnant women needs to be done to maintain the condition of pregnant women during the current COVID pandemic. It is hoped that maintaining the condition of pregnant women, both in conditions of COVID infection and in other infectious conditions, will reduce the maternal mortality rate which is currently still an obstacle that needs to be solved. By

knowing the relationship between the quality of antenatal care service variables, the incidence of cases of pregnant women with COVID, and the maternal mortality rate, it is expected to formulate strategies and policies related to services for pregnant women in the future.

## METHOD

The study used secondary data by comparing report data from all districts and cities in East Java Province. The data used are on the achievement of Maternal and Child Health (KIA) program activities from all districts/cities in East Java province in 2021. The data used for the sample are secondary data obtained from year-end reports from the East Java Provincial Health Office. The sample calculated using the Slovin formula was obtained from as many as 35 selected samples in East Java Province. Then the sample was chosen randomly from a total population of 38 regencies/cities in East Java. All data have been verified at the Provincial Health Office level, which was carried out in early 2022. The data obtained were used in the variables in this study.

The data in this study represent three variables that are used to test the three hypotheses of the relationship between the quality of *Antenatal Care (*ANC) services with the incidence of pregnant women and maternal mortality. The three hypotheses are: (H-1) there is a relationship between the quality of *antenatal care* (ANC) services with the incidence of COVID-19 in pregnant women. (H-2) There is a relationship between the incidence of pregnant women and maternal mortality. (H-3) There is a correlation between the quality of ANC services and the maternal mortality rate. The three hypotheses are presented in the framework of conceptual research adapted from McCarthy and Maine's theoretical framework, which can be described as follows.

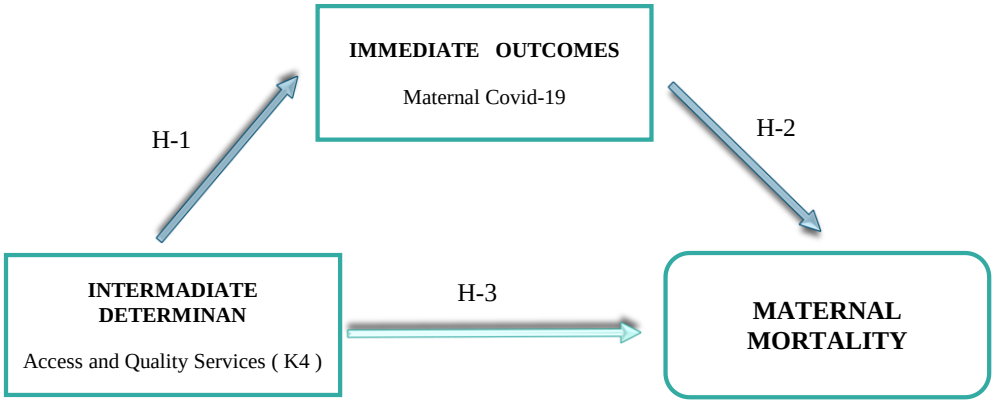


**Figure 3**. Research Conceptual Framework

As depicted in the figure, three variables will be analyzed to obtain the relationship between the three. The third variable, Maternal COVID-19, reflects the immediate factor. The fourth ANC visit variable (K4) describes the availability and quality of antenatal care (ANC) services. The number of maternal deaths serves as a proxy for the pandemic's outcomes and maternal mortality. After determining the variables used, the next step is the operational definition of the variables.

The constraints and knowledge that the three variables have in accordance with the conceptual framework utilized are the operational definitions used in this study. The first is that the quality of antenatal care is a variable description of service health of mothers rated pregnant _ from the visit of pregnant women according to

the procedures contained in the report of the 4th ANC visit (K4). K4 is the contact of pregnant women with health workers who have the competence to get integrated and comprehensive antenatal care according to standards during pregnancy at least four times with an inspection interval of once in the first trimester (0-12 weeks), once in the second trimester (between 12 and 24 weeks) and twice in the third trimester (more than 24 weeks until delivery), divided by the total population of expectant women, multiplied by 100%, and then summarized at the puskesmas and district levels, followed by periodic reporting to the provincial health office (Regulation of the Minister of Health of the Republic of Indonesia Number 21 of 2021). The data are divided into two categories: data with a value greater than or equal to 95% are classified as *Low*, while data with a value less than or equal to 95% are classified as *High*. The second is the Maternal COVID Variable, which is a symbol for identifying a pregnant woman who has symptoms of the Corona virus by validating her diagnosis using an antigen swab or PCR swab. The data for this variable were collected in 2021 and then collected and recapitulated by each district to be reported to the Province East Java. The results of categorical data are divided into two categories, namely *Low*-value data if the incidence of maternal COVID-19 occurs below 1% and if the value above is equal to 1% it becomes a category with *High* value. The third is the Maternal Mortality variable. ) which is the maternal mortality rate divided by the number of live births multiplied by one hundred thousand which is recapitulated in one year in each district and city in East Java Province. The data are then categorized based on the national target of reducing maternal mortality, namely 183. The data are then divided into two categories: *Low* (data less than 183), which is included in the low category, and *High* (data over 183). The data are then analyzed by entering then in the analysis table after being processed to create categorical type data. Then, the analysis is continued with a Pearson correlation test using the *Chi-Square test* on the three research hypotheses with an error rate (*error rate* ) of 5% (= 0.05), and with a correlation coefficient (r value) ranging from -1 to 1. The research has also received ethical clearance from Unair University with the following number: 130/EA/KEPK/2022.

## RESULT

In this study, the relationship between variables was determined using *Chi-Square analysis* or the Chi-Square test, which a form of analytical technique to test the level of relationship between categorical variables (Negara, 2018). This Chi-Square correlation analysis produces a correlation conclusion in the form of a table which must be interpreted based on the rules of interpretation. The procedure for interpreting the *Chi-Square* correlation is as follows. If the value of $r < 0.05$ is found, then there is a significant correlation. On the other hand, if the r value > 0.05, the measured variable has an insignificant correlation (Bramantoro, Alhaq and Prasetyo, 2020). While the r table is a formula that has been determined based on the number of samples and the level of significance. After mastering the interpretation technique, the next step is to analyze variables and research hypotheses.

The data obtained from the three variables in the early stages were analyzed descriptively and the results obtained are as listed in Table 1. According to the findings of the descriptive analysis, there were noticeably more areas and districts with high mortality categories for the Maternal Mortality variable. Meanwhile, in the ANC quality variable represented by the K4 variable, it was found that more regions/regencies had poor results in measuring their ANC quality. In the province of East Java, it was discovered that there were numerous regions/districts

with high categories of maternal COVID instances in each of them.

**Table.1** Descriptive analysis of the three variables

| Variable | Frequency | Percentage |
|---|---|---|
| **Maternal Mortality Rate (MMR)** | | |
| High ( > 183 ) | 27 | 71.05 |
| Low ( < 183 ) | 11 | 28.95 |
| **K4 visit** | | |
| Low ( <= 90% ) | 20 | 52.63 |
| High ( > 90% ) | 18 | 47.37 |
| **Maternal COVID** | | |
| Low ( <1% ) | 15 | 42.86 |
| High ( >=1% ) | 20 | 57.14 |

There are three hypotheses that the analysis process must carry out to get results that prove the truth of the hypotheses that have been made. The analysis is carried out by contrasting the studied variables from the three prevailing hypotheses. The analysis technique uses *Chi-Square* and *Fisher exact* analysis test.

**Table 2** . Chi-Square H-1. Correlation Test Results

| Variable | Maternal COVID | | Total | p value | r value |
|---|---|---|---|---|---|
| | Low | High | | | |
| **K4 visit** | | | | | |
| Low | 11 (46.7%) | 18 (53.3%) | 29 (100.00%) | 0.1954 | -0.087 |
| High | 4 (15.0%) | 2 (85.0%) | 6 (100.00%) | | |

In the first hypothesis, correlation test measurements were carried out on two variables, namely the service quality variable (K4) with the incidence of *Maternal COVID*. As shown in the table below, the results of the *Chi-Square calculation* show that the correlation relationship is not significant (P- value: 0.195). Unusual findings show there is a tendency in the other direction from the hypothesis where the higher quality ANC visit found upgraded case maternal COVID occurrences.

**Table 3.** Chi-Square H-2. Correlation Test Results

| Variable | Maternal Mortality | | Total | p value | r value |
|---|---|---|---|---|---|
| | **Low** | **Tall** | | | |
| **Maternal COVID** | | | | 0.04015* | 0.548 |
| Low | 7 (46.7%) | 8 (53.3%) | 15 (100.00%) | | |
| High | 3 (15.0%) | 17 (85.0%) | 20 (100.00%) | | |

In the second hypothesis, a correlation test was conducted on the *Maternal COVID* variable and the *Maternal Mortality* variable. As shown in Table 3, in this hypothesis, trying to find out the relationship between the two variables by calculating using the analysis method found a significant relationship (p-value: 0.04)

**Table 4**. Chi Square H-3. Correlation Test Results

| Variable | Maternal Covid | | Total | p value | r value |
|---|---|---|---|---|---|
| | Low | Tall | | | |
| **K4 visit** | | | | | |
| Low | 5 (5.0%) | 24 (95.0%) | 29 (100.00%) | 0.001106** | -0.555 |
| High | 5 (55.6%) | 1 (44.4%) | 6 (100.00%) | | |

In the third hypothesis, a correlation test was carried out on two variables of service access quality (K4) with *Maternal COVID*. As can be seen in Table 4, based on the results of processing the existing data, very significant results were found in testing this third hypothesis (p- value: 0.001, r-value: -0.555). So that a strong relationship was found between the Maternal COVID variable on maternal mortality.

## DISCUSSION

The findings of calculations using the Chi-Square approach allow for an analysis of the association between the variables of the fourth visit (K4) to ANC on the incidence of pregnant women with COVID and cases of maternal death. From the analysis, it has been able to determine the three hypotheses in this study. The first hypothesis is related to the effect of the fourth ANC visit (K4) on pregnant cases with COVID that occurred in 2021 and showed no relationship was found regarding this first hypothesis. This is consistent with Pareek et al.'s (2020) research, which found that ethnicity has a major impact on the incidence of COVID, a condition that is also strongly influenced by cultural and behavioral aspects in how people react to the development of a disease. So individual decisions, including pregnant women, to check conditions at health facilities when symptoms of illness occur will determine how big the impact of the incidence of COVID-19 on pregnant women will be. Maternal mortality is influenced by determinants, such as quality and availability to services that affect outcomes and conditions of pregnant women, which in turn shape the condition of maternal mortality, as stated in the context of McCarthy's and Maine's (1992) theory. The K4 sub-variable in this study served as a replacement for the quality and service access variables, while the occurrence of pregnant women served as a proxy for the complications variable. COVID brings up a different fact. The current coronavirus condition makes it particularly difficult to detect all pregnancy issues during antenatal care visits. Then, the psychological factors that were gripping during the high number of COVID-19 cases in mid-2021 had a tremendous psychological impact, so that pregnant women were afraid to be tested for reasons of fear of being diagnosed with COVID and carrying out a quarantine process. This is also most likely related to the officer's understanding of health services regarding *screening* and ANC service standards in COVID conditions are still lacking so that activities have not been carried out optimally. The relationship of other variables will be discussed through the next hypothesis analysis.

The second premise of this study is to determine whether there is a connection between the prevalence of COVID-19 in pregnant women and the high rate of maternal mortality in East Java. It is well-documented that, during this pandemic, there was a spike in the number of COVID cases, which had an effect on how often COVID cases were transmitted to pregnant women. According to existing data, there is an explosion of COVID cases in pregnant women with 6190 cases, most of which appeared during the *spike* in cases in July and August 2021. Based on the analysis calculations, there was a significant correlation (P <0.05) related to

the variable incidence of cases of pregnant women with COVID to the increase in maternal mortality cases. This is in response to a number of studies, one of which was suggested by Allotey et al. (2020) in "*Clinical manifestations, risk factors, and maternal and perinatal outcomes of Corona virus disease*" that the presence of COVID in pregnant women will increase the likelihood that they will require intensive care in the ICU and will increase the likelihood that other complications, such as preeclampsia and eclampsia, will occur. According to study from Public Health England, which claimed that death is consequential, this is made even worse. Due to an increase in instances, COVID in expectant women will worsen.

Home care is needed during the increasing incidence of COVID cases. However, there are some differences in views on research conducted before 2021 and research conducted in 2021. As research conducted by Kotlar et al. (2021) in "*The impact of the Covid-19 pandemic ounces maternal and perinatal health: a scoping a review*" concluded that COVID cases did not carry an increased risk of contracting COVID which ended in death. This contradicts the findings of Villar et al.'s study (2021), "*Maternal and Neonate Morbidity, and Mortality among Pregnant Women with and Without Covid-19 Infection: The INTERCOVID Multinational Cohort Study*," which found that pregnant women with COVID have a higher risk of death and worse health outcomes than pregnant women without COVID-19 conditions. This condition indicates that, in 2021, there will be an increase in cases of the new COVID variant (Delta) which incidentally has different characteristics from the nature of the COVID infection in the previous year. So that the cases that occur in pregnant women with COVID in East Java in 2021 are a transmission of COVID caused by the Delta variant which, from research, shows a strong connection to the incidence of maternal mortality. COVID-19 infection in pregnant women appears to have negative effects on both maternal and neonatal outcomes, according to a study conducted in Italy. It is crucial to note that the majority of maternal deaths include patients who have severe SARS-CoV-2 infection-related symptoms and significantly changed parameters (Di Guardo et al., 2021). So this conclusion is in line with research that concludes that COVID cases will directly increase maternal mortality cases.

In the third hypothesis, the fourth visit research variable. Antenatal Care (K4), represents the quality and access of services in terms of the association between maternal mortality cases and the quality and access of services provided to expectant women. From the results of the calculation of the relationship analysis using the Chi-Square technique, it was found that there was a fairly strong relationship between the two variables. This is related to a study conducted in Central Java by Prahutama et al. (2021), which found a strong relationship between the first visit (K1), fourth visit (K4), administration of vitamin Fe, delivery complications, and birth attendants on the rate of maternal mortality. These findings are consistent with Jones et al.'s (2021) research on the quality of ANC, which found that, even though the number of ANC visits is high, individuals do not always conduct ANC examinations promptly because they are afraid of the results. This results in subpar ANC quality, which raises the risk of maternal mortality. Aini, Purhadi and Irhamah (2020) did a similar study in Central Java Province the next year, and likewise demonstrated a substantial relationship between K1 and K4 on the risk for maternal death. The quality of *antenatal care services* is also inseparable from the role of health duties, especially midwives who also make an important contribution to preventing complications of death

during pregnancy and childbirth (Hiola and Badjuka, 2020).

Like research in general, this research also has strengths and weaknesses. The weakness of this research is it only aims to describe trends from the current picture of the condition of maternal health services during the pandemic so the data used are only secondary data. So that still needs research on direct targets to obtain more valid data. The data used are only in one province of East Java, so it does not fully describe the general conditions in Indonesia. The advantages of this research are in complete secondary data for all districts and cities in East Java Province. The data have also been verified at the provincial level so that the data presented are real and valid.

## CONCLUSION

This study concludes from the three hypotheses regarding the relationship between quality and service access to *maternal COVID cases* and the occurrence of maternal deaths, which so far have been the Indonesian government's work to resolve. The results of *Chi-Square* analysis obtained that there was no significant relationship (p> 0.195) between the quality and access of pregnant women's services to the high cases of COVID that occurred in 2021. Then a significant result was found (p=0.0 4 0) between the high *maternal COVID cases* and the high maternal deaths during the 2021 pandemic. There is a fairly significant correlation (p=0.0012) between quality and access to services for pregnant women and high maternal mortality cases in East Java. From the results of these calculations, conclusions can be obtained.

Further research is needed regarding the relationship between ANC quality and the incidence of maternal COVID-19 which shows results that are contrary to the theory that has been put forward. It is hoped that there will be empirical evidence of the real conditions that occur in health services in Indonesia. The strong relationship between the quality of ANC services and efforts to reduce maternal mortality is expected to be implemented immediately. It is hoped that knowing the relationship between the quality of ANC, the incidence of COVID infection, and maternal mortality, can provide input on policy recommendations at all levels of policy makers from the central and regional levels so that there is an improvement in the quality of services for pregnant women, maternity and postpartum mothers during the increasing threat of global infection that occurs.

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# COMPLIANCE LEVEL ANALYSIS OF COVID-19 HEALTH PROTOCOL AMONG KARANG TARUNA MEMBERS AT PANDANLANDUNG VILLAGE, MALANG

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**ABSTRACT**

**Introduction:** One of the keys to success in efforts to overcome the COVID-19 pandemic is to comply with health protocols. The COVID-19 health protocol compliance level is known to be low in the adolescent age group. The low level of compliance is related to the role of Karang Taruna as a village-level organization in providing education and examples to their peers, namely adolescents. **Aims:** This study was conducted to describe the level of compliance of Karang Taruna members in Pandanlandung Village, Wagir District, Malang Regency to the COVID-19 Health Protocol. **Methods:** The design used in this research is cross sectional with a quantitative descriptive method. This research was conducted in March-October 2021 with the number of respondents as many as 24 members of the Karang Taruna Pandanlandung Village who were selected using a total sampling technique. **Results:** This research study found that the compliance level of members of the Karang Taruna Pandanlandung Village was in the "Good" category, especially in the aspects of "Using Masks" 70.83%, "Washing Hands" 79.17%, "Avoiding Crowds" 50% and "Limiting Mobility" 50%. **Conclusion:** from this study is that, in general, the implementation of the COVID-19 health protocol is good, but the implementation of health protocols in daily life must still be improved by reminding fellow members of Karang Taruna to continue to carry out the health protocol because the pandemic is not over so as to reduce the transmission rate of COVID-19.

**Keywords**: Compliance Level, COVID-19 Health Protocol, Karang Taruna

## INTRODUCTION

The COVID-19 pandemic has been going on since a year ago. According to the Worldometer report, as of February 16, 2021, COVID-19 cases in the world has decreased by 109.71 million, of which 2.4 million patients died, 84.26 million recovered and 22.88 million active COVID-19 cases were reported. This decreased trend of COVID-19 was also seen in Indonesia. Since February 8, 2021, the number of COVID-19 cases has been below 10,000 cases per day. Even on 15/2/2021, the addition was only 6,462 cases (CNBC Indonesia, 2021). However, this still placed Indonesia as the country with the most active cases in Asia (Dwianto, 2021).

The government has launched various policies and strategies to control COVID-19 which started by establishing the Task Force for the acceleration of handling COVID-19 in Indonesia that stated in Presidential Decree No. 7 of 2020. A prevention strategy that was called by 3M health protocol (washing hands, wearing masks, and physical distancing) was also being massively promoted by the government. Other policies made to control COVID-19 transmission were establishing large-scale social restrictions (PSBB) in various regions, optimizing 3T (test, tracing, and treatment), and also increasing the testing capacities of laboratories (Gitiyarko, 2020). Starting February 9, 2021, the government also implemented the public activity restriction (PPKM Micro) policy through Ministerial Instruction Number 3 of 2021 (Bramasta, 2021). In February 2021, the Ministry of Health Republic Indonesia refined the 3M Health Protocol to 5M which consists of wearing masks, keeping physical distance, washing hands, avoiding crowds, and

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limiting mobility (Ministry of Health Republic Indonesia, 2021). This is because 3M alone is considered unable to reduce the spread of COVID-19 (Sukmana, 2021). According to Zahrotunnimah (2020), the local government has implemented a communication strategy to the community through various techniques such as coercive, e-mailing, informative, educative, persuasive, and redundant in making appeals to the community in order to prevent the transmission of COVID-19. However, the local government has not given sanctions for violators of health protocols, so people tend to ignore it (Rumengan, Ruru and Londa, 2021).

One of the factors that cause the high number of COVID-19 is the lack of compliance with applicable health protocols. The level of community compliance with health protocols in some areas has not been satisfactory. A total of 184 people (44.1%), students of UIN Syarif Hidayatullah Jakarta, have poor physical distancing behavior (Syadidurrahmah et al., 2020). The public's ignorance of the program makes the transmission of the COVID-19 virus difficult to stop. Adolescents are part of society that cannot be underestimated in suppressing the incidence of COVID-19. The application of health protocols to break the chain of transmission of COVID-19 in adolescents requires good understanding and knowledge (Anggreni and Safitri, 2020). In a survey conducted by Wahana Visi Indonesia (WVI) on adolescents in four provinces in Indonesia including North Maluku, East Nusa Tenggara (NTT), Papua, and West Kalimantan, it was found that only 35% of adolescents have good knowledge about COVID-19 (CNN Indonesia, 2021). The level of adolescent compliance to health protocols in some areas is still low because sometimes adolescents need more effective message delivery techniques (Artama, Rif'atunnisa and L, 2021). This of course has an impact on the spread of the virus to the community, including adolescents. Adolescents have a relatively better immune system than their parents and have higher mobility. This makes adolescents vulnerable to being asymptomatic people (OTG) who have the potential to infect their family members.

The community, in this case (Karang Taruna), is one that can be relied on in mitigating the COVID-19 disaster. According to the Minister of Social Affairs Regulation No. 5 of 2019, Karang Taruna is a kind of youth organization established in the community that can be a forum to develop any hard and soft skills. They can grow and have contribution to achieve social welfare for the community (Ministry Of Social Republic Indonesia, 2019). Karang Taruna with government's and other components of society take part to overcome various problems that occur, both in preventive, rehabilitative, or developing the potential of the human resources in the village.

During the pandemic, Karang Taruna has participated in many COVID-19 prevention activities. Some of the activities were done in some areas in Indonesia. In the Mungkid area, Magelang Regency, Karang Taruna works together with Indonesian family welfare movement (PKK) cadres and neighborhood (RT) representatives to provide socialization on how to wash hands and make hand sanitizers independently (Widyasari et al., 2021). Wonokerto Village, Wonogiri District has also empowered its youth groups in outreach to the community regarding the prevention of the spread of COVID-19 (Sugiyarto, 2020). In Kalibening Village, Musi Rawas Regency, Karang Taruna carried out socialization activities on the importance of education during the pandemic era (Sari, Nugroho and Putra, 2021).

Malang was designated as one of the red zones in the transmission of the COVID-19 virus (Yuswantoro, 2020). According to data as of March 14, 2021, in Malang Regency there are 536 confirmed positive cases of COVID-19 and 154 of them have died (COVID-19 Response Acceleration Task Force Kab. Malang,

2021). Pandanlandung Village is one of the contributors to patients who have been confirmed positive for COVID-19. There are 60 people who have been diagnosed with COVID-19 living in this village. The people of Pandanlandung Village are still low in implementing health protocols. In the judicial operation which was held several times in this village, there were still many violations. Many residents who cross the street do not wear masks and most of them are adolescents. Compliance with health protocols is an act and attitude to comply with existing regulations. In terms of preventing COVID-19, the compliance level of community groups in carrying out health protocols is important to find out appropriate and effective educational efforts to increase the level of compliance (Wulansari and Prabawati, 2021).

In breaking the chain of transmission of COVID-19, the role of Karang Taruna is very much needed, because they will become role models for adolescents of the same age in their villages. For this reason, Karang Taruna is required to behave in a healthy way, more specifically to comply with the health protocols. It is hoped that the compliance of the youth of Karang Taruna will motivate villagers to participate in complying with the health protocols. Currently, no research has been conducted on the level of compliance of Karang Taruna in Pandanlandung Village. So the compliance level of Karang Taruna members with the COVID-19 health protocol needs to be known.

## METHODS

The design of this research is cross-sectional, with quantitative descriptive method. This research is located in Pandanlandung Village, Wagir District, Malang Regency, from March to October 2021. The population is Karang Taruna groups who live in Pandanlandung Village, Wagir District, Malang Regency, amounting to 40 people. The sampling technique used is total sampling. The inclusion criteria in this study were Pandanlandung villagers who were members of the Karang Taruna and were willing to become respondents, while the exclusion criteria were Pandanlandung villagers who were not members of the Karang Taruna and who refused to become respondents. Of the 40 members of Karang Taruna, only 24 people were willing to be respondents. So that the number of respondents who became the sample in this study amounted to 24 people.

The variables studied in this study are individual characteristics (sex, age, marital status, level of education, and type of occupation) and the level of compliance in implementing COVID-19 health protocols. Individual characteristics were assessed by enquiring to the respondents. Sex was categorized as male or female. Age was calculated by subtracting the date of data collection from the respondent's date of birth and classified as < 17 years, 17-25 years, and 26-35 years. Marital status was classified as single or married. Level of education was based on the highest level of education completed by the respondents. It was grouped into elementary, junior, senior, and college. The occupation was assessed by asking the respondents about their current occupation or job title from a list, such as student, housewife, entrepreneur, private sector employee, laborer, administration staff, or not work.

In terms of the COVID-19 health protocol, the attitude and action of being submissive is aimed at the presence of Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07 / Menkes / 382 / 2020 / Regarding Health Protocols for the Community in Public Places and Facilities in the Context of Prevention and Control of CoronaVirus Disease 2019 (COVID-19) included using masks, washing hands, keeping physical distance, avoiding crowds, and limiting mobility (Ministry of Health Republic Indonesia, 2020; Wulansari and Prabawati, 2021). The respondent's level of compliance in implementing the 5M health protocol is

measured through "Level of Doing" by four categories namely "always," "often," "rarely/sometimes," and "never." The cut-off point used in this study is categorized as good if the compliance score reaches 76-100%, is categorized as sufficient if the score reaches 56-75%, and is categorized as bad if the score is around 40-55% (Arikunto, 2013).

The instrument used was an online questionnaire that had been tested for validity and reliability. The construct validity was measured by Factor Analysis. Out of 29 items, 23 items were retained. The reliability of the instrument was measured using internal consistency reliability with the result of Cronbach's alpha = 0.897.

Data analysis technique in this research used univariate analysis by presenting data on the age, gender, education and/or occupation of the respondents. Aspects that will be discussed further are the implementation of health protocols, including 'wearing masks," "washing hands," "keeping physical distance," "limiting mobility," "avoiding crowds," "avoiding eating together," and "avoiding taking photos together." The data were processed descriptively by presenting the distribution of COVID-19 health protocol compliance in each 5M aspect. Presentation of data is using tables and horizontal compound bar charts. Before being conducted, this study received ethical clearance approval from Health Research Ethics Committee, State Polytechnic of Health Malang with registration number: 182 / KEPK-POLKESMA / 2021.

## RESULT

These are the characteristics of respondent based on gender, age, marital status, education and occupation. We can see in Table 1, from a total of 24 respondents, the majority of respondents are female (66.67%) and the remaining 33, 33% of respondents are male. It is also known that the respondents in this study ranged in age from 15 years to 33 years, which was dominated by the 17-25 year age group (58.33%). The marital status of the respondents was dominated by unmarried (62.5%). Then the education level of the respondents varied from elementary school to college, but most of the respondents received education up to Senior High School (58.33%). Then, for the type of work, it is known that most of the respondents are students (37.5%) followed by private employees as much as 29.17%.

**Table 1.** Characteristics of respondents

| Variable (n=24) | Frequency N | Percentage (%) |
|---|---|---|
| **Sex** | | |
| Male | 8 | 33.33 |
| Female | 16 | 66.67 |
| **Age (years)** | | |
| <17 | 1 | 4.17 |
| 17-25 | 14 | 58.33 |
| 26-35 | 9 | 37.5 |
| **Marital Status** | | |
| Single | 15 | 62.5 |
| Married | 9 | 37.5 |
| **Level of Education** | | |
| Elementary | 1 | 4.17 |
| Junior | 5 | 20.83 |
| Senior | 14 | 58.33 |
| College | 4 | 16.67 |
| **Type of Occupation** | | |
| Students | 9 | 37.50 |
| Housewife | 1 | 4.17 |
| Entrepreneur | 2 | 8.33 |
| Private Sector Employee | 7 | 29.17 |
| Laborer | 1 | 4.17 |
| Administration Staff | 1 | 4.17 |
| Not Work | 3 | 12.50 |

**Table 2.** Implementation of COVID-19 Health Protocols

| Health Protocols Items | Compliance Level | | | |
|---|---|---|---|---|
| | Good | | Enough | |
| | n | % | n | % |
| Wearing a mask | 17 | 70.83 | 7 | 29.17 |
| Washing hands | 19 | 79.17 | 5 | 20.83 |
| Keeping physical distance | 11 | 45.83 | 13 | 54.17 |
| Avoiding the crowd | 12 | 50 | 12 | 50 |
| Limiting mobility | 12 | 50 | 12 | 50 |
| Avoid eating together | 4 | 16,67 | 20 | 83,33 |
| Avoid taking photos together | 8 | 33.33 | 16 | 66.67 |
| **Average Total** | **12** | **49.41** | **12** | **50.59** |

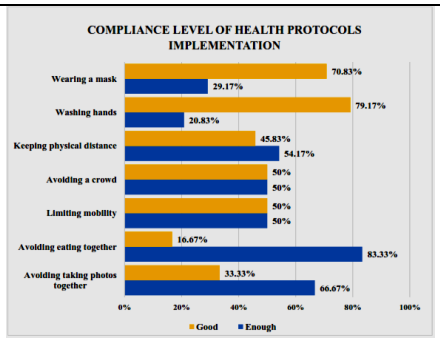


**Figure 1.** Implementation of Health Protocol

Table 2 and Figure 1 show that, from seven health protocols items, none of the respondents is in the bad level of compliance. Seventeen respondents (70.83%) are in a good category and only seven respondents (29.17%) are in the enough category on items “Using a Mask.” The highest level of compliance is in the “Washing Hands” protocol (79.17% of respondents are in a good category). While the lowest level of compliance is in the protocol of “Avoiding Eating Together without Wear a Mask,” which is only eight respondents (16.67%) having a good level of compliance. Even so, from the diagram above it can also be seen that respondents have a "good" level of compliance that is greater than "enough" in the aspects of wearing masks and washing hands. Which, when compared to aspects of avoiding eating and taking photos together, have a compliance category "Enough" which is greater than the "Good”.

In Table 3 the question that has the highest level of compliance in the aspect of wearing a mask is to use a mask correctly, namely covering the nose, mouth to the chin with the number of respondents who answered "Always" as many as 20 people or 79.17%. While those who have a compliance category the lowest was the item "Change the mask every 4 hours" with the percentage of answers "Always" as much as 20.83% and the item "Don't touch the front of the mask" with the answer "Always" as much as 12.5%. In the aspects of hand washing, the health protocol that has the highest level of compliance is washing hands before eating with the number of respondents who answered "Always" as many as 20 respondents or 83.33%, while the lowest level of compliance was in the question of washing hands before and after using masks with the number of respondents who answered "Always" only seven people or 29.17%. In the aspects of maintaining physical distance, all questions answered "Always" have a percentage below 50% (half of the number of respondents). Likewise with the

aspects of avoiding crowds, eating together, taking pictures together, and limiting mobility with one question asked with the answer "Always" as much as 50%.

**Table 3.** Frequency Distribution Level of Doing Based on Question Items

| Item of Questions | Level of doing (n=24) | | | |
|---|---|---|---|---|
| | **Never** | **Sometimes** | **Often** | **Always** |
| **Wearing a mask** | | | | |
| 1. Wear masks according to health standards or those recommended by the Indonesian Ministry of Health | 0 | 1 (4.17%) | 4 (16.67%) | 19 (79.17%) |
| 2. Wearing a mask correctly, covering the nose, mouth and chin | 0 | 0 | 4 (16.67%) | 20 (83.33%) |
| 3. Not touch the front when the mask is used | 1 (4.17%) | 4 (16.67%) | 16 (66.67%) | 3 (12.5%) |
| 4. Change mask every 4 hours | 0 | 12 (50%) | 7 (29.17%) | 5 (20.83%) |
| 5. Change the mask when the mask is damp/wet | 0 | 1 (4.17%) | 4 (16.67%) | 19 (79.17%) |
| 6. Remove the mask by unhooking the mask from the ear or the mask ties and not holding the front of the mask | 1 (4.17%) | 4 (16.67%) | 9 (41.67%) | 10 (41.67%) |
| 7. Not take off the mask when talking | 1 (4.17%) | 3 (12.5%) | 11 (45.83%) | 9 (37.5%) |
| **Washing hands** | | | | |
| 1. Wash hands with running water and soap (at least 20 seconds) | 0 | 5 (20.83%) | 10 (41.67%) | 9 (37.5%) |
| 2. Wash hands by following the 7 steps of washing hands | 0 | 1 (4.17%) | 12 (50%) | 11 (45.83%) |
| 3. Wash hands before touching your eyes, nose or mouth | 0 | 6 (25%) | 10 (41.67%) | 8 (33.33%) |
| 4. Wash hands before eating | 0 | 0 | 4 (16.67%) | 20 (83.33%) |
| 5. Wash hands before and after using a mask | 0 | 4 (16.67%) | 13 (54.17%) | 7 (29.17%) |
| 6. Wash hands after touching objects (such as doorknobs, tables, etc.) | 0 | 4 (16.67%) | 9 (37.5%) | 11 (45.83%) |
| 7. Wash hands before entering and immediately after leaving public facilities (such as offices, markets, stations, shopping centers, etc.) | 0 | 0 | 8 (33.33%) | 16 (66.67%) |
| 8. Wash hands before and after visiting sick friends, family, and relatives | 0 | 1 (4.17%) | 3 (12.5%) | 20 (83.33%) |
| **Keeping physical distance** | | | | |
| 1. Avoiding physical contact (such as shaking hands) with those around you) | 0 | 5 (20.83%) | 12 (50%) | 7 (29.17%) |
| 2. Keep a physical distance of 1 meter from other people around you | 0 | 8 (33.33%) | 6 (25%) | 10 (41.67%) |
| 3. Avoid gathering activities that involve more than 10 people | 0 | 6 (25%) | 13 (54.17%) | 5 (20.83%) |
| **Avoiding the crowd** | | | | |
| 1. Stay away when there is a crowd | 0 | 5 (20.83%) | 10 (41.67%) | 9 (37.5%) |

| Item of Questions | Level of doing (n=24) | | | |
|---|---|---|---|---|
| | **Never** | **Sometimes** | **Often** | **Always** |
| 2. Avoiding activities in crowded places or activities that have the potential to cause crowds | 0 | 3 (12.5%) | 10 (41.67%) | 11 (45.83%) |
| **Limiting mobility** | | | | |
| Stay at home, except for urgent needs (work, shopping for kitchen needs, etc.) | 0 | 2 (8.33%) | 10 (41.67%) | 12 (50%) |
| **Avoid eating together** | | | | |
| Avoid eating together with people who are not at home or other people, both at home and in public places | 0 | 9 (37.5%) | 11 (45.83%) | 4 (16.67%) |
| **Avoid taking photos together** | | | | |
| Avoid taking photos together without wearing a mask | 0 | 5 (20.83%) | 11 (45.83%) | 8 (33.33%) |

## DISCUSSION

### Wearing a Mask

The results show on the questions that contain about wearing masks, the level of compliance of respondents with the "Good" category is 70.83% while the "Enough" category is 29.17%. In the aspect of wearing masks, there are seven questions posed to respondents. The question that has the highest level of compliance is the aspect of using a mask correctly (covering the nose, mouth, and chin) with the percentage who answered "Always" as many as 83.33%, while the question that has the lowest level of compliance is in the aspect is changing the mask every four hours, with the number of respondents who answered "Always" only 20.83%. These results are in line with research from (Central Bureau of Statistics, 2020) which is the level of compliance from using masks is classified “Good,” with respondents answering "Often/Always Done" as much as 91.98%. The results of this study related to the aspect of using masks that have the highest level of compliance are also in line with research from (Niruri et al., 2021) which is the same aspect has the highest percentage of the "Compliance" category, which is 94.44%. Then in the aspect of changing masks every four hours in research (Salfana and Pertiwi, 2021) the level of compliance is also still low, with the number of respondents answering "Always" only 6.4%.

The question item "Using a mask correctly (covering the nose, mouth to the chin)" is an item whose application is also based on the knowledge of the respondent. Based on research from Desty, Arumsari and Rohmah (2021), a person's behavior is significantly influenced by the knowledge possessed. Then a person's knowledge is known to be significantly influenced by a person's level of education, this has also been stated (Ekadipta et al., 2021) that education has a significant effect. The good level of compliance of this item corresponds to the education level of the respondents who are categorized as good too, with the number of respondents who have education above junior high school as many as 75%. Items that have a low level of compliance are “change masks every 4 hours.” The ability and willingness to replace these masks is not only because of the knowledge factor but also influenced by the availability of the masks they have (which of course requires money to buy them), while during the pandemic, many businesses in the private sector eventually closed, and this resulted in reduced income. The average occupation of the respondents in this study were students and private employees. Research conducted (Andini et al., 2021) found that during the pandemic the student pocket money at University X was reduced compared to before the pandemic, while for private employees and entrepreneurs their income was also reduced due to layoffs and

also decreased sales levels. According to (Parhusip and Amril, 2021) the average income during the pandemic decreased by 30-50%, this is in line with the results of this study which found that there were nine respondents who were still students, two entrepreneurs, and seven private employees, which if added up to 75 % of the total respondents.

**Washing Hands**

Based on the results of this study, the aspect of hand washing has been carried out by respondents with the "Good" category of 79.17%. In this aspect, washing hands after visiting sick friends, family or relatives is the item that has the highest level of compliance with the number of respondents who answered "Always" as many as 20 people or 83.33%. Another item that has the lowest level of compliance is washing hands before and after using a mask, with respondents who answered "Always" only 29.17%. The results in this aspect are in accordance with the research conducted by Istiarini et al. (2021), where the level of hand washing compliance has been included in the good category with compliance respondents reaching 96%. Questions that have a low level of compliance, namely "washing hands before and after wearing masks" are also in line with research conducted by Maulydia(2021) which also found that respondents' compliance levels were still low, namely the number of answers "Always" in washing hands before using a mask only 17.6%.

**Keeping Physical Distance**

Based on the results of this study, the aspect of maintaining physical distance has been carried out by respondents with the "Good" category as much as 45.83%. The number of questions asked in this aspect amounted to three questions. The question with answer "always" in a question "Keep a physical distance of 1 meter from other people around you" as much as 41.67%. These results are known to be in line with research conducted by Yuliza and Alam (2021) which also found that the number of respondents who answered "Always" in the application of aspects of maintaining physical distance was still below 50%, which was only 48.8%. Likewise with the research conducted Yuniarti and Hartati (2020) which showed that the application of aspects of maintaining physical distance was also still low at 49.6%. Another factor known to be the cause of the low level of compliance in maintaining distance is the motivation and support of family and peers who remind to apply the COVID-19 health protocol (Artama, Rif'atunnisa and L, 2021).

**Avoiding the Crowd**

Based on the results of this study, the aspect of avoiding crowds has been carried out by respondents with the "Good" category as much as 50%. Of the two questions posed, both of them still had the number of answers "Always" which was still below 50%. These results are in accordance with research conducted by Devihapsari, Sudarsana and Adiputra (2021) with the number of answers "Always" on the question "avoiding events that gather a lot of people" which is only 13.7%. The low implementation of this aspect of the protocol cannot be separated from the culture of the community before the pandemic, which carried out many joint activities. Then, in a study conducted by Sari and Sutisna (2021), it was found that the statement "Do not travel and gather with many people, unless it is important" also has a percentage of "always" answers which is only 26%.

**Limited Mobility**

Based on the results of this study, the aspect of mobility restrictions has been carried out by respondents with the "Good" category as much as 50%. The questions asked in this aspect only amounted to one, containing a statement about "Stay at home

if there is no urgent need". The results in this aspect are in line with research conducted by Adhyka and Aisyiah (2021) which also found the level of compliance in the application of mobility restrictions in the "compliance" category was carried out by more than half of the respondents, as much as 56%. The good level of compliance from respondents is also inseparable from the existence of Large-Scale Social Restrictions (PSBB) in several regions in Indonesia. The existence of PSBB also helps limit community mobility so that the possibility of being exposed to COVID-19 will decrease (Adhyka and Aisyiah, 2021). A person's level of compliance with the COVID-19 health protocol is known to be influenced by various factors, including the psychological pressure faced when the situation suddenly changes drastically due to the pandemic. Other influencing factors include age and education level. Adolescents are an age group that is easy to adapt to and more able to cope with various kinds of psychological stress during a pandemic. Then the higher a person's education level, the more information that can be absorbed, thus influencing the decision to continue to comply with the COVID-19 health protocol (Megatsari et al., 2020).

**Avoid Eating Together**

Based on the results of this study, the aspect of avoiding eating together was carried out by respondents with the "GOOD" category as much as 16.67%. The number of questions asked was only one about eating together with other people who did not live in the same household. It is known that the results of this study are inversely proportional to the results of research from Mutiarani et al. (2020), where as many as 97.03% of respondents in the study were known to wrap food to avoid transmission of COVID-19 during a pandemic. In that research, it is also known that respondents prefer not to eat together with other people who are not housemates or strangers. This is one of the efforts to break the chain of transmission of COVID-19 when eating out of the house.

**Avoid Taking Photos Together**

Based on the results of this study, the aspect of avoiding taking pictures together has been carried out by respondents in the "Good" category with 33,33%. The number of questions asked is one question. The relatively low results in this study are in line with research from Yunida (2021) which found that group photos were one of the causes of the high number of positive cases of COVID-19. This is because group photos while maintaining a distance and wearing masks will eventually cause crowding. The research also found that only 5% of adolescents in village X comply to wear masks when outside the house.

## CONCLUSIONS

In general, the implementation of the COVID-19 health protocol has been good, especially in the aspects of "Using Masks," "Washing Hands," "Avoiding Crowds" and "Limiting Mobility." The implementation of health protocols in daily life must still be improved in order to reduce the transmission rate of COVID-19. Especially on aspects that have not reached the "Good" category such as aspects of "Keeping physical distance," "Avoiding eating together," and "Avoiding group photos."

The main implication of this research is the existence of policies related to the implementation of large-scale social restrictions in Malang Raya, including in Pandanlandung Village which are not strictly enforced, thus causing the possibility of violating health protocols. Another implication is that the Karang Taruna functions as an organization that plays a role in preventing social problems and also affects the existence of several health protocol items that are implemented very well. Therefore, the local government provides strict sanctions and needs to

encourage Karang Taruna to be a role model in setting an example for the community to obey health protocols.

The strength of this research is that the description of COVID-19 health protocol is explained by describing each health protocol item, namely wearing masks, washing hands, keeping physical distance, limiting mobility, avoiding crowds, avoiding eating together, and avoiding taking photos together. The weakness of this research is that the number of samples studied has not met the target population, because only 24 of the 40 members of Karang Taruna met the inclusion criteria. In addition, the results of this study cannot be generalized to describe the level of compliance with COVID-19 health protocols broadly in the Karang Taruna organization, due to the limited number of respondents so that the results can be different if the number of respondents also increases.

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Original Research

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# FLASHCARD-BASED ONLINE EDUCATIONAL GAME FOR IMPROVING HIV-AIDS KNOWLEDGE AND STIGMA

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**ABSTRACT**

**Introduction:** The burden of HIV-AIDS cases in Indonesia remains high, while HIV-AIDS promotion programs targeting students remain low. Game-based learning has not been investigated as an alternative method for improving HIV-AIDS awareness among students. **Aims:** this study quantifies the impact of the flashcard-based educational game invented by YARSI HIV-AIDS Care on high school students in Jakarta. **Method:** A simple randomized controlled study was conducted among 112 SMA 27 Jakarta students (intervention, n=56; control, n= 56). The HIV-AIDS knowledge and attitude scores before and after the educational game were evaluated using a validated questionnaire. An intervention using a flashcard-based game is conducted online. Univariate and Bivariate analyses of the pre-and post-scores for both groups were performed. **Result:** Following the game, there was a considerable improvement in the HIV-AIDS comprehensive knowledge scores (pre-test vs. post-test, 65 vs. 90, $p<0.01$), while the control score remained unchanged. The intervention group also had higher knowledge and attitude scores than did the control group ($p<0.01$). **Conclusion:** Flashcard-based education games significantly increased comprehensive HIV-AIDS knowledge and positive attitudes toward HIV-AIDS. Thus, this method could be implemented in HIV-AIDS promotion programs that target students.

**Keywords:** HIV-AIDS, Educative Games, Students, Health Promotion, Game-based learning

## INTRODUCTION

The number of new HIV-positive cases in Indonesia has been increasing annually. The age groups with the largest percentage of HIV-positive cases were 25-49 years (70.4%) and 15-24 years (18.2%) (Ministry of Health Indonesia, 2019). DKI Jakarta is one of the most prevalent HIV cases in Indonesia, with 51.981 cases in 2017, 58.877 cases in 2018, and 65.578 cases in 2019 (Directorate General of Disease Prevention and Control, 2018, 2019, 2020). A total of 282 university students in Indonesia were diagnosed with AIDS in 2018. Thus, it has increased by 1.3 times compared to 2017 (Directorate General of Disease Prevention and Control, 2018, 2019). These data follow the increasing number of HIV cases in the 15-19 year age group, rising yearly (Directorate General of Disease Prevention and Control, 2018). However, there is no available data regarding HIV cases among students in DKI Jakarta.

Although knowledge is crucial in determining one's actions, a lack of understanding of HIV transmission and prevention contributes to a high number of new HIV-positive cases (Hong et al., 2012; Swenson et al., 2010). Knowledge-based behavior is preferable to unknowledge-based behavior. Because a person's attitude is related to his knowledge, if he lacks knowledge about how to prevent HIV-AIDS transmission, he will likely be unable to do so (Shewarega et al., 2022; Swenson et al., 2010). In addition, ignorance increases the likelihood of believing in HIV-AIDS hoaxes and myths, which contributes to the stigmatization of People Living with HIV (PLHIV) (Sallam et al., 2022; Sen et al., 2021; Yang et al., 2006).

According to the 2012 Indonesia Demographic and Health Survey, approximately 61.8.2% of women and 55.8% of married men between the ages of

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15 and 24 years were unaware of how to avoid HIV transmission. Overall, 11% of women and 12% of married men between the ages of 15 and 49 years have a thorough understanding of AIDS. This knowledge decreases with younger age, lower level of education, and lower income (Ministry of Health Indonesia, 2013). The level of knowledge of the Indonesian population regarding HIV-AIDS is low, and has not yet reached the national target of 95%. The current state of reproductive health in Indonesia is still not as developed as in other ASEAN countries, according to an analysis of the report from the Directorate General of Public Health of the Ministry of Health and Social Welfare of the Republic of Indonesia. (Ministry of Health Indonesia, 2013).

A person's knowledge of HIV-AIDS correlates with the stigma against HIV-AIDS. A high degree of understanding of HIV-AIDS is attributed to an increase in favorable attitudes (lowering stigma) towards people with HIV-AIDS, as claimed by several research findings from Indonesia and other countries (Alemi & Stempel, 2019; Harapan et al., 2013; James & Ryan, 2018; Kusuma et al., 2020; Shah et al., 2020; Youssef et al., 2021). Consequently, one of the efforts to reduce stigma discrimination to achieve zero stigma discrimination in 2030, according to the government's target, is to increase knowledge in the community, especially among adolescents, who are at risk of contracting HIV-AIDS. This further emphasizes the importance of socializing comprehensive HIV-AIDS knowledge as early as possible. This is particularly true for adolescents whose reproductive functions have matured both anatomically and physiologically.

Owing to several factors, the reported number of adolescents living with HIV is lower than the actual number. First, the age range of adolescents is often included in the window period, which still shows negative HIV test results. Second, there is a lack of awareness about taking HIV screening tests because of insufficient knowledge. Therefore, health promotion and prevention efforts regarding HIV-AIDS must be increasingly encouraged among students in large cities, especially in DKI Jakarta, the province with the most HIV-AIDS cases in Indonesia.

Despite numerous campaigns promoting and preventing HIV-AIDS transmission among high-risk populations, few programs are aimed at adolescents. The methods used to educate students often use conventional methods, such as lectures or counselor training. However, due to the limited number of HIV-AIDS experts and counselors, time, and other resources, HIV-AIDS promotion and education programs among high school students are not running continuously.

Learning media that can be accessed at any time and location could promote and educate more students continuously and cover more areas, including remote regions, where health experts and counselors are not always available. The use of gamification as a learning method for adolescents has been shown to be effective in enhancing knowledge. Most educational games use board games as educational media. No educational flashcard-based games are available. This study aims to analyze and measure the impact of a flashcard-based educational game on players' HIV/AIDS knowledge and attitudes.

## METHODS

This study used a population of class XI students at SMA Negeri 27 Jakarta and a quasi-experimental pretest-posttest approach. Class XI students were selected because they were already 15 years old, which was the inclusion criterion for the questionnaire (National Institute of Health Research and Development, 2010). Class XII was not selected because of the emphasis on final exam preparation.

A total of 112 students from class XI were chosen from the seven classes to participate in this study. The students were

randomly selected by their class teachers to participate in the study. The inclusion criteria were age ≥ 15 years, Internet access and communication devices supporting zoom meetings, and consent to participate in this study. The exclusion criteria were unhealthy conditions and inability to attend the Zoom Meeting.

All students received explanations and provided their consent before participating in the study. This study was also approved by the Research Ethics Committee of Yarsi University (No:297/KEP-UY/BIA/VIII/2021). The data collection for this study was conducted from September to October 2020. The 112 students were then divided into two groups. Table 1 summarizes the two groups: the intervention group (n = 56) and the control group (n = 56).

The dependent variable was students' HIV/AIDS-related knowledge and attitudes. The independent variable was intervention using an online flashcard-based educational game, YARSI HIV-AIDS Care Smart Card, which had received copyright with no. EC00202049818, with an application date of November 16, 2020. The researcher developed this educational media, consisting of 20 cards containing True and False information about HIV-AIDS, to increase adolescent knowledge about the transmission, prevention, symptoms, and treatment of HIV-AIDS.

Students' knowledge and attitudes were measured using an online questionnaire before and after the game's intervention. The questionnaire used in this study consisted of 25 questions assessing HIV-AIDS knowledge (20 items, possible range 0-100) and attitudes (5 items, possible range 4-20). The questions were adapted from a questionnaire used in RISKESDA 2010 (National Institute of Health Research and Development, 2010) and Saputra study (Saputra, 2008). The final questionnaire used in this study was tested for validity and reliability using SPSS 25.

Large-scale social restrictions were implemented during the COVID-19 Pandemic in Jakarta, large-scale social restrictions (PSBB) were implemented. As a result, the YARSI HIV-AIDS Care Smart Card game intervention had to be carried out online using the zoom meeting platform. Students were divided into groups of seven, with each group guided by a health expert mentor. The Smart Cards were read and displayed, and the students were asked to answer simultaneously by giving a "true" (thumbs up) or "false" (wave) reaction. The mentor then explains whether the statement is true or false using the information written on the Smart Card. The intervention was held for 40 min in each group for one session only. After the virtual educational game sessions were completed, the intervention and control groups were asked to fill out the post-test questionnaire, despite the control group not receiving any intervention or education.

Statistical analyses were performed using univariate and bivariate analyses Using Microsoft Excel 2019 and SPSS 25. The Kolmogorov-Smirnov test was used to determine normalcy levels. Due to the non-normal distribution of the data, the Wilcoxon signed-rank test was employed to compare the students' knowledge and attitude scores before and after the game interference in each group. The Mann-Whitney test was performed to investigate whether the post-test results of the intervention and control groups differed. McNemar's test was used to assess the proportion of correct responses in each group before and after running the educational game, while Fisher's Exact Test was used to compare the two groups.

## RESULTS

Table 1. displays the participant characteristics for this investigation. There was not significantly different between the proportion of female (63 percent) and male students (37 percent) in this study. The students' ages ranged from 15 to 18 years, with a median age of 16. Furthermore, there was no difference between the intervention

and control groups in terms of baseline knowledge and attitude scores.

HIV-AIDS knowledge scores before and after the educational game are presented in Table 2. The reliability score of the questionnaire used to measure HIV-AIDS knowledge was calculated using Cronbach's alpha, and the score was 0.829. As shown in Table 2, HIV-AIDS knowledge scores were compared before and after the educational game, and between the intervention and control groups. After playing the educational game, the intervention group's total score increased by 1.4 times, while the control group's score remained unchanged ($p$<0.01 vs $p$=0.35, respectively).

Subsequent analysis revealed that the final total score of the first group was considerably higher than that of the second group ($p$<0.01). The total score represents the sum of HIV-AIDS transmission, prevention, appearance of HIV-positive people, and cure for HIV-AIDS scores. The intervention group showed a higher final score in all subtopic scores than did the previous and control groups. Furthermore, the first group achieved an almost full mark (90-100) regarding HIV-AIDS transmission, prevention, appearance, and cure after playing the YARSI HIV-AIDS Care Smart Card game.

The detailed items answered by students in this study are listed in Table 3. This table also displays the proportion and comparison of students' correct answers before and after the game. Regarding HIV transmission questions, most students in both groups already knew that HIV is transmitted through sexual interaction. After the educational game session, more students in the intervention group answered correctly than those in the control group. In addition, the proportion of correct answers in the intervention group increased significantly for all questions pertaining to HIV transmission, except for mother-to-child transmission during pregnancy. There was a 1.3-fold increase in the proportion of correct responses regarding transmission from mother to child during pregnancy, with a *p value* close to 0.05 ($p$=0.06). Meanwhile, most of the correct answers in the control group decreased significantly in the post-test despite not receiving any intervention.

Concerning the prevention of HIV-AIDS, most students in the intervention group answered all questions correctly after the educational game (>80%–100%). In contrast, students' answers in the control group were not significantly changed, except for one question regarding condom use as HIV prevention, which showed a significant decline in percentage. In addition, the proportion of correct responses in the first group indicated a significant increase in the number of people with HIV and HIV-AIDS cure-related issues. In contrast, the replies of the pupils in the second group were unaffected by the educational game.

Given attitudes toward HIV-AIDS, the score before and after the educative game is provided in Table 4. Cronbach's alpha reliability test used to measure attitudes and stigma related to HIV-AIDS was 0.704. As shown in Table 4, there was a significant increase in the total attitude scores in the intervention group, while the score of the control group remained the same ($p < 0.01$ vs $p = 0.4$). Further analysis suggests distinct transformations toward positive attitudes toward HIV among students, such as students with HIV continuing their studies, remaining friends despite their HIV status, and people with HIV not being isolated ($p < 0.05$).

Although not statistically significant, the scores in terms of friends with HIV should not be avoided and the perception that HIV-AIDS is not a curse is higher than before the intervention ($p = 0.06$ and $p = 0.17$, respectively). However, the attitudes of the control group remained identical, except for assertions that students with HIV can continue to study, which increases significantly, and that friends with HIV should not be avoided, which decreases dramatically.

**Table 1.** Characteristics of Participant

| | **Intervention Group N = 56** | **Control Group N = 56** | **Statistics** |
|---|---|---|---|
| **Gender** | **Frequency (%)** | | |
| Male | 21 (37.5%) | 20 (35.7%) | 1[a] |
| Female | 35 (62.5%) | 36 (64.3%) | |
| **Age** | **Median (range)** | | |
| | 16 (15-18) | 16 (15-18) | 0.68[b] |
| **Pretest Knowledge Score** | **Median (range)** | | |
| | 65 (25-100) | 65 (30-90) | 0.89[b] |
| **Pretest Attitude Score** | | | |
| | 17 (15-18) | 17 (15-19) | 0.98[b] |

[a]Fisher's exact test was used, significant if $p<0.05$

[b]Mann Whitney Test was used, significant if $p<0.05$

**Table 2.** Comparison of HIV-AIDS Knowledge Score Before and After Educative Game

| | **Intervention Group (n=56)** | | | **Control Group (n=56)** | | | $p^3$ |
|---|---|---|---|---|---|---|---|
| | Median Score ($25^{th}$-$75^{th}$) | | | Median Score ($25^{th}$-$75^{th}$) | | | |
| | Before | After | $p^1$ | Before | After | $p^2$ | |
| **Total Score** | 65 (55-75) | 90 (85-95) | <0.01* | 65 (55-70) | 65 (55-70) | 0.35 | <0.01* |
| Knowledge of HIV Transmission | 63.6 (54.5-81.8) | 90.9 (81.8-100) | <0.01* | 63.6 (54.5-72.7) | 63.6 (54.5-72.7) | 0.15 | <0.01* |
| Knowledge of HIV Prevention | 66.7 (50-83.3) | 100 (83-100) | <0.01* | 66.7 (50-83.3) | 66.7 (50-83.3) | 0.96 | <0.01* |
| Knowledge of the Appearance of people with HIV | 50 (50-100) | 100 (100-100) | <0.01* | 50 (50-100) | 50 (50-100) | 0.84 | <0.01* |
| Knowledge of HIV-AIDS Cure | 50 (0-100) | 100 (100-100) | <0.01* | 50 (0-100) | 100 (0-100) | 0.41 | <0.01* |

$p^1$ and $p^2$ were calculated using Wilcoxon Signed Rank Test, significant if $p<0.05$

$p^3$ was calculated using Mann Whitney Test, significant if $p<0.05$

**Table 3.** Percentage and Comparison of Students' Correct Answer Before and After Educative Game

| HIV-AIDS Comprehensive Knowledge (α=0.829) | Percentage of Correct Answer | | | | | | $p^3$ |
|---|---|---|---|---|---|---|---|
| | Intervention Group N=56 | | | Control Group N=56 | | | |
| | Before | After | $p^1$ | Before | After | $p^2$ | |
| **Transmission of HIV** | | | | | | | |
| 1. HIV is transmitted through sexual intercourse | 100% | 100% | NA | 98.2% | 100% | 1 | NA |
| 2. HIV is transmitted through shared needle use | 89.3% | 100% | 0.03* | 87.5% | 94.6% | 0.29 | <0.01* |
| 3. HIV is transmitted through blood transfusion | 83.9% | 98.2% | 0.02* | 83.9% | 83.9% | 1 | 0.016* |
| 4. HIV is transmitted from mother to child during labor | 48.2% | 75% | <0.01* | 37.5% | 37.5% | 1 | <0.01* |
| 5. HIV is transmitted from mother to child during breastfeeding | 55.4% | 92.9% | <0.01* | 44.6% | 39.3% | 0.55 | <0.01* |
| 6. HIV is transmitted from mother to child during pregnancy | 51.8% | 69.6% | 0.06 | 39.3% | 33.9% | 0.45 | <0.01* |
| 7. HIV is transmitted through buying food from HIV (+) person | 64.3% | 94.6% | <0.01* | 64.3% | 60.7% | 0.75 | <0.01* |
| 8. HIV is transmitted through eating one plate with HIV (+) person | 39.3% | 64.3% | <0.01* | 42.9% | 39.3% | 0.69 | 0.014 |
| 9. HIV is transmitted through eating food prepared by HIV (+) person | 62.5% | 96.4% | <0.01* | 50% | 55.45 | 0.51 | <0.01* |
| 10. HIV is transmitted through mosquito | 51.8% | 80.4% | <0.01* | 62.5% | 44.6% | 0.03* | <0.01* |
| 11. HIV is transmitted through hugging and holding hand | 67.9% | 96.4% | <0.01* | 75% | 69.6% | 0.45 | <0.01* |
| **Prevention of HIV-AIDS** | | | | | | | |
| 12. HIV-AIDS can be prevented by having one sexual partner only | 71.4% | 92.9% | <0.01* | 64.3% | 69.6% | 0.55 | 0.003* |
| 13. HIV-AIDS can be prevented by having sexual relationship with husband or wife only | 78.6% | 91.1% | 0.06 | 67.9% | 71.4% | 0.69 | 0.014* |
| 14. HIV- AIDS can be prevented by abstinence | 57.1% | 80.4% | <0.01* | 69.6% | 66.1% | 0.79 | 0.135 |
| 15. HIV-AIDS can be prevented by using condom during sexual intercourse | 53.6% | 100% | <0.01* | 62.5% | 42.9% | 0.01* | <0.01* |
| 16. HIV-AIDS can be prevented by not sharing needle | 91.1% | 98.2% | 0.22* | 83.9% | 91.1% | 0.34 | 0.206 |
| 17. HIV-AIDS can be prevented by having male-circumcision | 28.6% | 89.3% | <0.01* | 30.4% | 41.1% | 0.07 | <0.01* |
| **The appearance of People with HIV** | | | | | | | |
| 18. People with HIV can be without symptoms | 48.2% | 87.5% | <0.01* | 50% | 48.2% | 1 | <0.01* |

| HIV-AIDS Comprehensive Knowledge (α=0.829) | Percentage of Correct Answer | | | | | | $p^3$ |
|---|---|---|---|---|---|---|---|
| | Intervention Group N=56 | | | Control Group N=56 | | | |
| | Before | After | $p^1$ | Before | After | $p^2$ | |
| 19. People with HIV can transmit despite being fit and without symptoms | 78.6% | 92.9% | 0.04* | 80.4% | 80.45 | 1 | 0.094 |
| **Existence of HIV-AIDS cure** | | | | | | | |
| 20. There is a cure for HIV-AIDS | 50% | 98.2% | <0.01* | 60.7% | 64.3% | 0.69 | <0.01* |

$p^1$ and $p^2$ were calculated using McNemar Test, significant if $p<0.05$

$p^3$ calculated using Fisher's Exact Test, significant if $p<0.05$

**Table 4.** Comparison of Attitudes toward HIV-AIDS Before and After Educative Game

| | Intervention Group (n=56) | | | Control Group (n=56) | | | $p^3$ |
|---|---|---|---|---|---|---|---|
| | Mean Score (SD) | | | Mean Score (SD) | | | |
| | Before | After | $p^1$ | Before | After | $p^2$ | |
| **Total Attitude's Score (α=0.704)** | 16.27 (2.83) | 17.84 (2.66) | <0.01* | 16.36 (2.69) | 16.62 (2.70) | 0.40 | <0.01* |
| Positive attitudes that students with HIV can continue their study | 3.09 (0.94) | 3.66 (0.74) | <0.01* | 3.05 (0.90) | 3.32 (0.69) | 0.01* | <0.01* |
| Positive attitudes that friends with HIV should not be avoided | 3.70 (0.60) | 3.84 (0.53) | 0.06 | 3.77 (0.54) | 3.64 (0.62) | 0.04* | 0.014 |
| Positive perception that HIV-AIDS is not curse | 3.52 (0.71) | 3.64 (0.72) | 0.17 | 3.50 (0.79) | 3.48 (0.76) | 0.78 | 0.14 |
| Positive attitudes to stay being friends despite HIV status | 3.29 (0.73) | 3.52 (0.76) | 0.01* | 3.38 (0.73) | 3.46 (0.74) | 0.40 | 0.60 |
| Positive perception that people with HIV should not be isolated/ quarantined | 2.68 (1.05) | 3.18 (0.97) | <0.01* | 2.66 (0.99) | 2.71 (0.93) | 0.68 | <0.01* |

$p^1$ and $p^2$ were calculated using Wilcoxon Signed Rank Test, significant if $p<0.05$

$p^3$ was calculated using Mann Whitney Test, significant if $p<0.05$

## DISCUSSION

The use of gamification in health promotion and education is less frequent in Indonesia. However, few game-based learning studies have been conducted in Indonesia before (Edi & Taufik, 2019; Siregar et al., 2018; Yasmin et al., 2020; Zaen et al., 2017). Using board games as an educational method was much more effective in increasing knowledge about HIV and STIs than the lecture method (Wanyama et al., 2012). Another study reported that board games effectively increased participants' knowledge, cognitive function, interpersonal interactions, and motivation (Gauthier et al., 2018; Noda et al., 2019). Therefore, using game-based learning as a health-promoting program targeting adolescent students is an effective and promising approach to be widely implemented to raise awareness of health issues, specifically HIV-AIDS.

This study evaluated game-based learning using the YARSI HIV-AIDS Care Smart Card to determine whether it increased high school students' HIV-related knowledge and positive attitudes toward people living with HIV (reduction of HIV-related stigma). First, the YARSI HIV-AIDS Care Smart Card educational game was found to significantly enhance HIV-related knowledge, which follows previous findings that game-based learning can be used as a health-promotion tool (Siregar et al., 2018; Wanyama et al., 2012; Yasmin et al., 2020; Zaen et al., 2017). Second, the YARSI HIV-AIDS Care Smart Card educational game is the first "True or False" flashcard game in Indonesia, with every card explaining HIV transmission, prevention, cure, myths, and stigma. Therefore, we cannot compare its effects with those of similar studies.

Initially, the YARSI HIV-AIDS Care Smart Card educational game was planned to be played directly by the students. However, owing to the COVID-19 pandemic, data collection and educational games were conducted online. Despite being conducted online and its limitations, the intervention showed significant improvement in HIV-related knowledge and positive attitudes among students before and after the educational game. It was also superior to that of the control group, which did not receive any intervention. However, this study did not evaluate the effect of the educational game method compared to conventional methods, such as lectures or counseling. Therefore, whether the YARSI HIV-AIDS Care Smart Card educational game is more effective than the conventional method for educating students needs to be further determined.

Before the COVID-19 pandemic, most HIV education programs in schools used conventional methods such as lectures or counseling. Despite its effectiveness, its implementation significantly depends on the availability and accessibility of health experts, educators, counselors, and other supporting resources. Therefore, only a few HIV education programs have been implemented in high schools.

Several reproductive health (including HIV-AIDS) promotion programs are organized by the district health office or primary health care and the National Population and Family Planning Agency (Badan Kependudukan dan Keluarga Berencana Nasional, BKKBN). However, their implementation is often unsustainable because of the lack of human resources, time, and funding. Teacher representatives from high schools also regularly receive training to become counselors and receive education on adolescent health and HIV-AIDS. However, in reality, without educational media, these teachers find it difficult to implement training and provide education on reproductive health and HIV-AIDS to their students.

The YARSI HIV-AIDS Care Smart Card as a health promotion medium is a solution because the students (and the newly enrolled students) can always play the game and gain insight. The game can be played independently or guided by other students who have played it before.

Teachers can also use media to educate their students regarding HIV-AIDS transmission, prevention, cure, myths, and stigma in an interactive and engaging approach that shows more significant positive effects than traditional methods (Ding et al., 2017; Liao et al., 2010; Rice et al., 2018).

In addition to increasing knowledge, this game-based learning method also improved students' positive attitudes (reducing stigma) toward people living with HIV. Furthermore, because no similar game-based education method has been used previously, the comparison between our study and other related studies could not be determined per se. However, one meta-analysis revealed that board-game-based education had little to moderate effect on attitude or behavior changes (Gauthier et al., 2018). In contrast, another study by Mak et al.(2017) demonstrated that intervention using an interactive method, such as gamification or roleplay, was not significant in improving attitudes or stigma reduction toward people living with HIV. However, the relatively small sample sizes may account for these nonsignificant findings (Mak WW, Cheng SS, Law RW, Cheng WW, 2015).

Even if increasing knowledge and attitude scores of HIV-AIDS do not necessarily relate to the actual prevention of HIV-AIDS practices, some studies have found a correlation between HIV-AIDS knowledge and behavior change. (Hong et al., 2012; Kesumawati, 2019; Nwokolo et al., 2011; Shewarega et al., 2022; Swenson et al., 2010). With increased knowledge of HIV-AIDS, students were expected to avoid high-risk behaviors related to HIV transmission.

Additionally, there is evidence of knowledge improvement and delay in sexual activity among students after completing the computer game-based sexual health education program in the United States of America (Peskin et al., 2015; Rohrbach et al., 2019). Another report by Mwale and Muula (2017) and Lazarus et al. (2010) found that peer education as an intervention was the most effective method to facilitate HIV risk reduction, which showed great potential if all these methods were used in combination. This combined method could optimize the effectiveness of HIV prevention programs among adolescents; however, this requires further investigation.

Additionally, a greater understanding of HIV-AIDS is associated with a decline in stigma against people with HIV. The findings of our study indicate that an increase in knowledge is accompanied by an increase in positive attitudes (reduced stigma) towards HIV/AIDS. This result confirms the findings of previous research that the level of HIV-AIDS knowledge correlates with stigmatization (Sallam et al., 2022; Sen et al., 2021; Yang et al., 2006). Knowledge reduces the stigma associated with HIV/AIDS (Alemi & Stempel, 2019; Harapan et al., 2013; James & Ryan, 2018; Kusuma et al., 2020; Shah et al., 2020; Youssef et al., 2021).

The drawback of this study was that the sample size was not large enough to generalize the student and non-student adolescent populations. Additionally, there has been no comparison with conventional methods. The intervention was administered only once. Lastly, there was no follow-up test to determine the duration of knowledge and its effects on behavioral changes related to HIV risk due to limited research funding. However, this study served as a pioneer flashcard-game-based education program that needs further development and can be combined with other proven health promotion methods such as peer and online game-based education. With this flashcard-based educational media, the HIV-AIDS promotion program will not be limited to the availability and accessibility of health experts or counselors.

In addition, a transformation from conventional health promotion using face-to-face methods to an online game-based health promotion approach using web or

software development should be initiated in Indonesia. Therefore, HIV-AIDS prevention programs could be implemented in every district and school in Indonesia so that adolescents can learn about HIV-AIDS and other health-related issues more efficiently.

The key to the success of HIV-AIDS prevention programs are continuous and long-term strategies (Kyrychenko et al., 2006; Ungan & Yaman, 2003), which can be achieved using interactive game-based learning media. Both digital and non-digital media, such as flashcard games, board games, computer-based games, and software-based education, should be encouraged to educate students and adolescents regarding HIV-AIDS and other health-related issues. The availability of these learning media to educate adolescents (students) in every high school is expected to help them understand how HIV is transmitted, prevented, and cured; without health experts or HIV-AIDS, counselors must educate them directly. Hence, this learning media could be continuously used by students, generations, and generations, so the long-term goal of the HIV-AIDS promotion program can be achieved more effectively and efficiently.

## CONCLUSIONS

This study concludes that employing flashcard-based online educational games to improve HIV-AIDS-related knowledge and reduce stigma against people living with HIV is effective and useful. This gamification method may be more effective in raising awareness and reducing HIV risk behavior if implemented using a peer education approach, upgrading into online or software-based educational games, and long-term strategies.

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Original Research

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# HOSPITAL UTILIZATION IN MALUKU PROVINCE, INDONESIA

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**ABSTRACT**

**Introduction:** Maluku is a region characterized by an archipelago with approximately 1,340 islands and an area of 712,479.69 km2. Most of the site is water (92.4%), while the land area is only around 7.6%. **Aims:** This study aimed to analyze the determinant of hospital utilization in Maluku Province, Indonesia. **Methods:** This cross-sectional study surveyed 788 respondents. The variables examined included hospital utilization, age group, gender, education level, work type, marital status, health insurance, transportation cost, and time travel. The author used binary logistic regression in the final stage. **Results:** The results show that the 30-39 age group was 2.293 times more likely than the ≥ 50 age group to utilize the hospital (OR 2.293; 95% CI 1.177 – 4.466). Married people were more likely to use the hospital 1.764 times than those with the never-married category (OR 1.764; 95% CI 1.074 – 2.898). Christians were 1.599 times more likely than Muslims to utilize the hospital (OR 1.599; 95% CI 1.146 – 2.231). **Conclusion:** The study concluded that three variables are determinants of hospital utilization among people in Maluku Province, Indonesia. The three were age group, marital status, and religion. The study's results were significant for local policymakers to provide specific directions to accelerate the increase in hospital utility in Maluku Province in Indonesia.

**Keywords:** social determinant, hospital utilization, access pattern, public health.

## INTRODUCTION

A hospital is a setting that provides complete medical services for individuals, such as inpatient, outpatient, and emergency treatment. The hospital utilization was the respondent's recognition of their access to hospitals. The hospital is part of a tiered healthcare system that requires significant funds, professional medical personnel, adequate medical equipment, and good patient safety management. So today's hospitals are synonymous with labor-intensive, capital-intensive, and technology-intensive organizations (Padula et al., 2019).

A hospital is a specialized referral health service requiring higher quality and patient safety. The government built the services on human values, ethics, professionalism, benefits, justice, equality, anti-discrimination, equity, patient protection, security, and social functions. Policymakers must guarantee equal access for everyone according to their needs (Thitithamawat et al., 2018).

We can see hospital performance from several indicators, including 1) The percentage of hospital accreditation assessment elements that meet accreditation standards; 2) The percentage of Minimum Service Standard (MSS) indicators that reach the target; 3) Bed Occupancy Rate (BOR); 4) Average Length of Stay (ALOS); 5) Net Death Rate (NDR); and 6) Community Satisfaction Index (CSI). Patient safety is a global issue that is an essential parameter in hospital services (Wulandari et al., 2019; Wåhlin et al., 2020).

Previous studies report several factors related to hospital utilization. Among them are age, gender, education level, and type of work. Moreover, other factors are marital status, socioeconomic, transportation cost, and health insurance ownership (Wulandari, Laksono, Nantabah, et al., 2022; Laksono et al., 2023; Wulandari

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et al., 2023). In addition to the considerations based on these individual assessments, certain other factors influence hospital utilization, notably the disparity in hospital utilization between urban and rural areas, travel cost and time, and geographical disparities between regions are another barrier to hospital access in Indonesia (Li et al., 2018; Dankwah et al., 2019; Mahmudiono and Laksono, 2021; Laksono et al., 2023).

Like many other nations, Indonesia faces the issue of geographical islands, which function as a natural obstacle to providing equitable healthcare to its people. The United Nations Group of Experts on Geographical Names has confirmed that at least 16,056 islands belong to Indonesia. This is out of 17,504 islands (UNGEGN) from the United Nations at the 11th United Nations Conference on the Standardization of Geographical Names in New York 2017 (United Nations Group of Experts on Geographical Names, 2017). Besides the geographical and geological barriers, Indonesia has a diverse tribe of people who speak their language. At least 1,300 people have spread from Aceh to Papua New Guinea (Central Bureau of Statistics of Indonesia, 2011). This situation heightens the Indonesian government's difficulties in ensuring equal access for the population.

The geographic gap in remote and remote areas in Indonesia with more developed regions (Java in particular) is wide (Suharmiati, Laksono and Astuti, 2013). One of them can be seen from the geographical condition of Maluku Province, which consists of a cluster of islands that poses a challenge to the accessibility of health services in the region. Particular interventions are needed so that health services are felt equally by all Maluku residents (Maryani et al., 2020).

Maluku is a region characterized by an archipelago with approximately 1,340 islands and an area of 712,479.69 $km^2$. Most of the site is water (92.4%), while the land area is only around 7.6%. Meanwhile, another fact shows that from the total population in 2018 of approximately 1,749,529 people, it is known that most of them live on small islands. It seems that the objective conditions of the Maluku region are still not supported by the availability of adequate transportation and communication infrastructure (Statistics Indonesia/Badan Pusat Statistik, 2020; Ipa, Laksono and Wulandari, 2023).

By the end of 2021, there will be 30 hospitals in Maluku Province, and a third, ten hospitals, will be in the provincial capital (Central Bureau of Statistics of Maluku Province, 2022). The distribution is unfavorable for the region dubbed the province of a thousand islands. Previously, based on the 2020 Maluku Provincial Health Statistics, 8.52% of people utilized government hospitals, while 2.06% of private hospitals used private hospitals. Access to health facilities, the availability of health workers, and good health services have not been pulled factors for the population in treating health complaints. The report informs that some residents still choose not to seek outpatient treatment. The main reason is that some sick people feel it is enough to self-medicate (62.8%). They self-medicate without going through a doctor's prescription, etc. Some residents of Maluku consider that there is no need for medical treatment (32.66%) (Wulandari et al., 2019; Central Bureau of Statistics of Maluku Province, 2020). According to the background, what factors influence hospital utilization in Maluku Province? The study analyzed the determinants of hospital utilization in Maluku Province society. The study's results are essential for providing specific information for local policymakers to accelerate hospital utilization in all communities in Maluku Province in Indonesia.

## METHODS

### Data Source and Study Design

The study was cross-sectional research. The author used a rapid online survey method using the internet was used to reach people living in all areas of Maluku

Province, Indonesia (n = 788). The study used Google Forms to collect data for one week (6–12 June 2020). We shared the form on social media (Facebook and WhatsApp) and the local Health Service mailing list. The study uses a rapid online survey method to provide local politicians with information quickly and affordably to make immediate corrective actions (Megatsari et al., 2021).

## Variables

The study employed hospital utilization as a dependent variable. The hospital utilization was the respondent's recognition of their access to hospitals in Maluku Province, both government-run and private-run hospitals, outpatient (last year) and inpatient (previous five years). Hospital utilization consists of two categories, namely, not utilized and utilized.

The predictor variables examined in the study were age, gender, education level, work type, marital status, health insurance, transportation cost, and time travel. The predictors adopt variables that are known from previous studies (Mahmudiono and Laksono, 2021; Laksono et al., 2023). Age is the respondent's admission of the most recent birthday, which has already passed. Gender comprises male and female. Meanwhile, education includes primary education and under, secondary education, and higher education. Work type was the respondent's recognition of the kind of work. Moreover, marital status comprises unmarried, married, and widowed/divorced.

Health insurance is the respondent's recognition of insurance that covers their health. Health insurance consists of three categories: no insurance, government-run insurance, and private-run insurance. Meanwhile, transportation cost is the respondent's acknowledgment of the cost incurred to visit the nearest hospital. Transportation cost consists of two categories, namely ≤ 15,000 IDR (amount to 1 US $) and > 15,000 IDR. Travel time is the respondent's acknowledgment of the time it takes to visit the nearest host. Travel time consists of two categories, namely ≤ 30 minutes and > 30 minutes.

## Data Analysis

In the first step, the author used a co-linearity test to ensure no strong relationship between the independent variables. Then, the Chi-Square test was employed to test the association between hospital utilization and the independent variables. In the last step, we conducted the multivariate test using binary logistic regression to determine factors related to hospital utilization.

Moreover, the research used ArcGIS 10.3 (ESRI Inc., Redlands, CA, USA) to create a distribution map of the hospital utilization by regency/city in Maluku Province, Indonesia. The Indonesian Bureau of Statistics provided a shapefile of administrative border polygons for the study.

## Ethical Approval

The national ethics commission's ethics committee gave the study its seal of approval (Reference Number: RK.04/KEPK/STIK/V/2020). The dataset for the study removed all respondents' names. Respondents have given their written consent to participate in the study.

# RESULTS

The result informs that the proportion of people who use hospitals is 43.0%. The lowest hospital utilization was in South Buru Regency at 25.0%; meanwhile, the province with the highest hospital utilization was Tual City at 68.4%. Moreover, based on the distribution spatially, as shown in Figure 1, there is no visible tendency for the pattern of hospital utilization in Maluku Province.

Table 1 shows the collinearity test results between the independent variables. The results of the analysis inform that there is no co-linearity between variables. The tolerance value for all variables is more than

0.10, while the variance inflation factor (VIF) value for all variables is less than 10.00. It means there is no strong relationship among independent variables in the regression model.

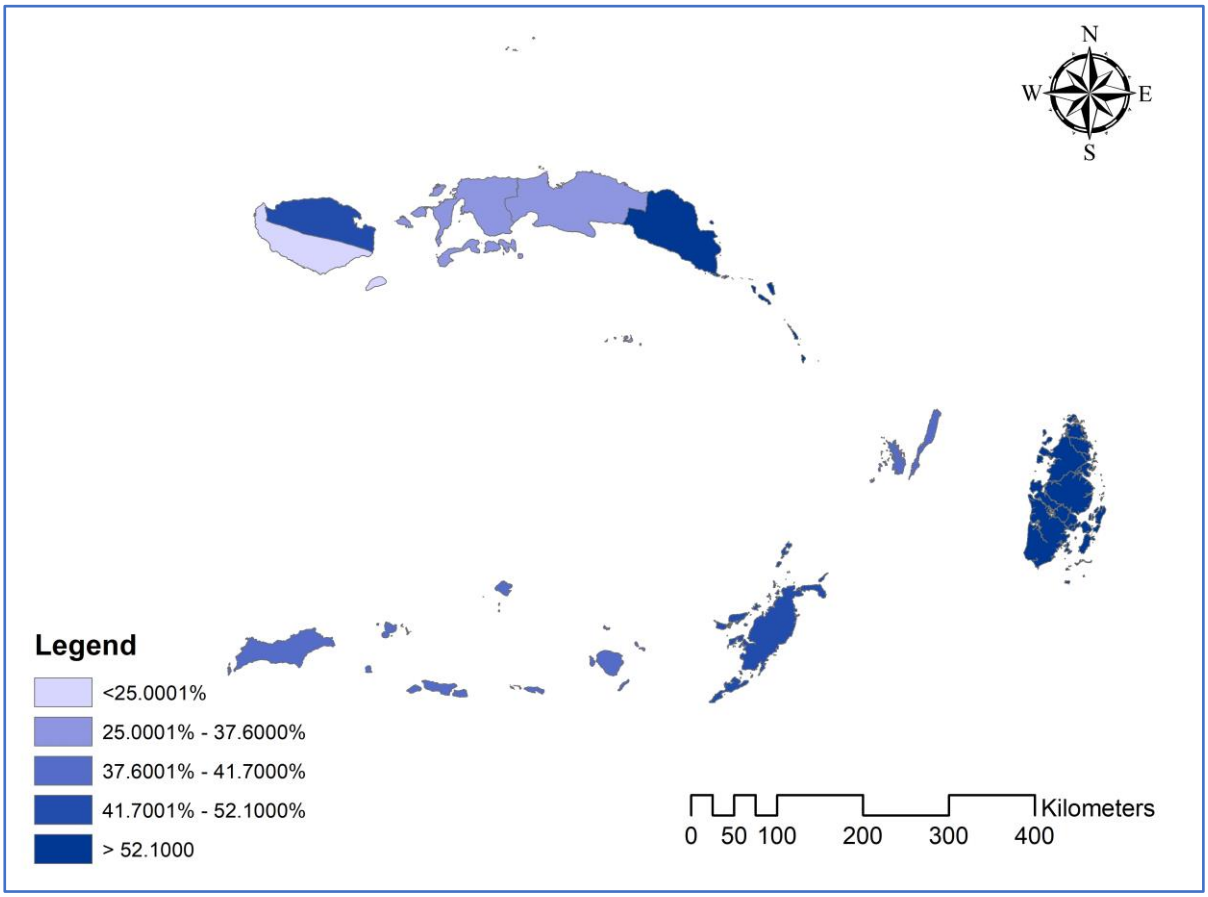


**Figure 1.** Distribution Map of the Hospital Utilization by Regency/City in Maluku Province, Indonesia (n=788)

**Table 1.** Results for The Co-Linearity Test of Hospital Utilization among people in Maluku Province Indonesia, 2020 (n=788)

| Variables | Collinearity Statistics | |
|---|---|---|
| | Tolerance | VIF |
| Age group | 0.405 | 2.471 |
| Gender | 0.889 | 1.125 |
| Marital status | 0.456 | 2.195 |
| Education level | 0.761 | 1.313 |
| Work type | 0.854 | 1.171 |
| Religion | 0.934 | 1.071 |
| Health insurance | 0.753 | 1.328 |
| Transportation cost | 0.549 | 1.821 |
| Travel time | 0.545 | 1.834 |

Dependent Variable: Hospital utilization

Table 2 shows the descriptive statistics of hospital utilization and the respondents' socio-demographics. Regarding the age group, the study shows the utilized categories are led by the 20-29 and 30-39. Based on gender, females dominated the two types of hospital utilization.

**Table 2.** Descriptive Statistics of Hospital Utilization in Maluku Province, Indonesia (n=788)

| Variables | Hospital Utilization | | p-value |
|---|---|---|---|
| | Not utilized (n=449) | Utilized (n=339) | |
| Age group | | | ***< 0.001 |
| • ≤19 | 14.9% | 9.4% | |
| • 20-29 | 43.2% | 35.1% | |
| • 30-39 | 21.4% | 35.1% | |
| • 40-49 | 14.5% | 14.5% | |
| • ≥ 50 | 6.0% | 5.9% | |
| Gender | | | 0.253 |
| • Male | 37.0% | 33.0% | |
| • Female | 63.0% | 67.0% | |
| Marital status | | | ***< 0.001 |
| • Never married | 59.7% | 44.2% | |
| • Married | 38.5% | 53.1% | |
| • Divorced/Widowed | 1.8% | 2.7% | |
| Education Level | | | *0.029 |
| • Primary and under | 3.3% | 1.5% | |
| • Secondary | 35.0% | 28.6% | |
| • Higher | 61.7% | 69.9% | |
| Work type | | | 0.090 |
| • Not work | 47.4% | 38.3% | |
| • Public servant | 38.5% | 41.9% | |
| • Army/Police | 1.3% | 1.8% | |
| • Entrepreneur | 3.8% | 6.8% | |
| • Employee | 8.0% | 10.6% | |
| • Farmer/Fisher/Labor | 0.9% | 0.6% | |
| Religion | | | **0.006 |
| • Muslim | 74.6% | 64.3% | |
| • Christian | 23.8% | 34.2% | |
| • Catholic | 1.6% | 1.5% | |
| Health insurance | | | *0.011 |
| • Uninsured | 34.7% | 24.8% | |
| • Government-run insurance | 62.8% | 72.3% | |
| • Private-run insurance | 2.4% | 2.9% | |
| Transportation cost | | | *0.032 |
| • ≤ 15,000 IDR | 54.3% | 61.9% | |
| • > 15,000 IDR | 45.7% | 38.1% | |
| Time travel | | | **0.009 |
| • ≤ 10 minutes | 57.5% | 66.7% | |
| • > 10 minutes | 42.5% | 33.3% | |

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2 shows that married people dominate the utilized category regarding marital status. According to education level, people with higher education led in the two types of hospital utilization.

Table 2 informs that respondents occupy the not utilized categories with the

work type based on the work type, not the work category. In contrast, the public servant dominated the hospital-utilized group. Based on religion, Muslim respondents dominated the two categories of hospital utilization.

Meanwhile, regarding health insurance, the two categories of hospital utilization were dominated by uninsured respondents. Based on transportation costs, respondents with a transportation cost ≤ of 15,000 IDR led both classes of hospital utilization. Respondents with travel time ≤ 10 minutes dominated the two categories of hospital utilization based on travel time.

The analysis results presented in Table 2 show that seven variables proved significant, and we included them in the last analysis. The seven variables are age group, marital status, education level, religion, health insurance, transportation cost, and time travel.

**Table 3.** The result of Binary Logistic Regression of Hospital Utilization among people in Maluku Province, Indonesia (n=788)

| Predictor | Hospital Utilization | | | |
|---|---|---|---|---|
| | p-value | OR | 95% CI | |
| | | | Lower Bound | Upper Bound |
| Age group: ≤19 | 0.244 | 1.721 | 0.690 | 4.290 |
| Age group: 20-29 | 0.104 | 1.916 | 0.875 | 4.194 |
| Age group: 30-39 | *0.015 | 2.293 | 1.177 | 4.466 |
| Age group: 40-49 | 0.567 | 1.228 | 0.607 | 2.485 |
| Age group: ≥ 50 (ref.) | - | - | - | - |
| Marital status: Never married (ref.) | - | - | - | - |
| Marital status: Married | *0.025 | 1.764 | 1.074 | 2.898 |
| Marital status: Divorced/Widowed | 0.178 | 2.146 | 0.707 | 6.512 |
| Education Level: Primary and under (ref.) | - | - | - | - |
| Education Level: Secondary | 0.400 | 1.590 | 0.539 | 4.689 |
| Education Level: Higher | 0.333 | 1.716 | 0.575 | 5.122 |
| Religion: Muslim (ref.) | - | - | - | - |
| Religion: Christian | **0.006 | 1.599 | 1.146 | 2.231 |
| Religion: Catholic | 0.925 | 0.944 | 0.285 | 3.127 |
| Health insurance: Uninsured (ref.) | - | - | - | - |
| Health insurance: Gov-run insurance | 0.520 | 1.132 | 0.775 | 1.653 |
| Health insurance: Private-run insurance | 0.567 | 1.312 | 0.517 | 3.326 |
| Transportation cost: ≤ 15,000 IDR | 0.785 | 1.057 | 0.712 | 1.567 |
| Transportation cost: > 15,000 IDR (ref.) | - | - | - | - |
| Time travel: ≤ 10 minutes | 0.148 | 1.346 | 0.899 | 2.016 |
| Time travel: > 10 minutes (ref.) | - | - | - | - |

Note: 95% Confidence Interval; *p < 0.05; **p < 0.01; ***p < 0.001

Table 3 shows the result of the binary logistic regression of hospital utilization among people in Maluku Province, Indonesia. Based on the age group, Table 3 displays that 30-39 were 2.293 times more chance than ≥ 50 to utilize the hospital (OR 2.293; 95% CI 1.177 – 4.466). Meanwhile, other age groups did not show any difference compared to the age group ≥ 50 in using the hospital. Table 3 shows that married people could use the hospital 1.764 times more than never-married (OR 1.764; 95% CI 1.074 – 2.898). Meanwhile, respondents with marital status

in the divorced/widowed category did not compare respondents with a never-married group utilizing the hospital in Maluku Province.

Table 3 shows that Christian respondents were 1.599 times more chance than Muslim respondents to utilize the hospital (OR 1.599; 95% CI 1.146 – 2.231). Meanwhile, respondents in the Religion category of Catholics did not show any difference compared to respondents in the Religion category of Muslims in using the hospital. Table 3 also informs that four other variables included in the multivariate test did not prove significant as a determinant of hospital use among people in Maluku Province, Indonesia. The four variables are education, health insurance, transportation costs, and time travel.

## DISCUSSION

The results show that the age group determines hospital utilization among people in Maluku Province, Indonesia. Age is a strong predictor of illness, and the core conditions prevail primarily concerning degenerative diseases in humans (Laksono, Nantabah and Wulandari, 2018; Lee et al., 2021; Rukmini et al., 2022). Different age levels in the aging population have seen significant changes over time around the world. Human life expectancy doubled from the nineteenth to the twentieth centuries, reaching 80 years in the twenty-first century. These circumstances mean economic difficulties and an increase in such health problems. In different facets of life, old age is linked to expanded medical needs (Lee et al., 2021; Wuakua et al., 2021; Yang, Wang and Dai, 2021; Rukmini et al., 2022). The findings confirm some of the results of previous studies in Ghana and China, including Indonesia (Laksono and Wulandari, 2020; Lu et al., 2020; Okai, Abekah-Nkrumah and Asuming, 2020).

The analysis in this study found that marital status is a determinant of hospital utilization among people in Maluku Province, Indonesia. This information is similar to previous studies. Marital status is closely related to the social or psychosocial burden that will affect a person's endurance. Having a partner is one of the protective factors for better health status (Megatsari et al., 2020; Wulandari, Laksono and Nantabah, 2020). Similar to the study results, several surveys informed that marital status is one-factor influencing healthcare facility use (Laksono and Wulandari, 2020; Bitew Workie et al., 2021; Suesse et al., 2021).

The study found that religion is one of the determinants of hospital utilization among people in Maluku Province, Indonesia. Christians proved to have a greater chance of using the hospital than Muslims. Religion as a determinant of hospital utilization is related to health beliefs, which cannot be separated from the background of the adopted religion, including the cultural environment that has influenced religion (Laksono, Wulandari, Nantaba*h, et al.,* 2020). The previous study indicates religious experience also shapes the adherents' concept of illness, taboo, health belief, and treatment-seeking behavior (Laksono, Wulandari, Soedirham, et al., 2020; Masruroh, Yusuf and Laksono, 2021). Including the patient's coping mechanism affects hospital utilization (Masruroh, Yusuf and Laksono, 2021).

The study discovered that health insurance, transportation expenses, and time travel did not influence hospital utilization in Maluku Province, Indonesia. This finding can occur because most respondents believe the degree of ease or challenge of using the hospital is relatively the same, so there is no substantial variation between groups on these variables. The results differ from previous studies that analyzed data at the national level, which informed that health insurance, transportation costs, and time travel were determinants of the utilization of health service facilities (Wulandari and Laksono, 2019; Wong et al., 2020; Laksono, Sillehu and Megatsari, 2021).

Even though Maluku Province is an archipelago, public hospital access is relatively even. Policymakers should instead focus more on social determinants in age, marital status, and religion, which are proven to affect people's hospital access.

### Study Limitation

The authors conducted the study using a quantitative approach, so the research results tended to be superficial. The study results cannot capture the reasons behind every phenomenon found, especially those related to local values, for example, regarding the disparity of hospital utilization associated with a religious background (Parikh-Patel, Morris and Kizer, 2017; Wei et al., 2018; Masruroh, Yusuf and Laksono, 2021; Wulandari, Laksono, Prasetyo, et al., 2022). For this reason, we need further studies with a qualitative approach to guide more local-specific interventions.

Moreover, the study's constraints prohibit it from investigating the possibility that people are healthier. They don't need hospital care, as demonstrated by a previous study that looked at self-reported health. (SRH) (Wu et al., 2013).

## CONCLUSIONS

The analysis results concluded three variables proven as determinants of hospital utilization in Maluku Province, Indonesia. The three were age group, marital status, and religion.

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# PHYSICAL ACTIVITY PROFILE BASED ON GLOBAL PHYSICAL ACTIVITY QUESTIONNAIRE (GPAQ) FOR MINING WORKERS

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**ABSTRACT**

**Introduction:** Physical activity has several related factors, which are age, gender, educational level, and type of occupation. It is known that 1 in 4 adults in the world do not meet the minimum physical activity. Physical inactivity is one of the main factors causing non-communicable disease (NCD) as well as obesity, heart disease, and cancer. In Indonesia, 26.1% of the population is included in the category of less physical activity. **Aims:** to find out the physical activity profile of mining workers based on age, gender, educational level, and type of occupation. **Methods:** This study uses a descriptive design study with a cross-sectional approach that included 124 workers at PT. Borneo Indobara 2020. The measure was used in this research is the Global Physical Activity Questionnaire (GPAQ). The total level of physical activity is divided into three categories in MET-minutes/week, which are high (≥ 3.000 MET), moderate (≥ 600 or < 3.000 MET), and low (< 600 MET). **Result:** The workers who have a higher percentage of low physical activity are workers of middle age, female, highly educated, and have a position as leader/officer which is 75% compared to each category. **Conclusion:** The majority of mining workers at PT. Borneo Indobara has low physical activity. This research can be used as feedback or consideration for evaluating and motivating mining workers at PT. Borneo Indobara and the wider community to increase physical activity.

**Keywords**: GPAQ, Mining Workers, Physical Activity

## INTRODUCTION

Physical fitness is needed to support the performance of mining workers such as workers at PT. Borneo Indobara. If physical fitness is not able to support their work, this will cause a sense of fatigue that can threaten occupational health and safety. Many factors affect the level of physical fitness or fatigue, such as food intake, medical disorders, sleep disorders, adequate body composition and physical activity. Physical activity is all body movements that require energy expenditure assisted by skeletal muscles. Doing physical activity is important for improving health and reducing the risk of premature death and chronic disease (Kohl, Murray and Salvo, 2009; World Health Organisation, 2018). Regular physical activity has been associated with a reduced risk of premature death and a lower risk of more than 25 chronic medical conditions (Warburton et al., 2016). Physical activity can provide many benefits. This is associated with improving physical health, mental health, work productivity, and economic prosperity (World Health Organization, 2018).

Regular physical activity has an important role in the main prevention and treatment of NCD. It also contributes to the prevention of conditions such as hypertension, overweight, and obesity. In addition, it is also associated with improved mental health, slower onset of dementia, and improved quality of life and well-being (World Health Organization, 2018).

Health benefits can appear after doing sports or other regular physical activities (Piercy et al., 2018). In short, physical activity is very beneficial and has a positive impact even from small

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activities carried out (Piercy et al., 2018; Nobles et al., 2020). Several types of physical activity can be done and are divided based on function and MET-minutes/week calculations. Based on its function, physical activity is divided into five categories: aerobic, muscle strengthening, bone strengthening, balance, and multi-component activities (Piercy et al., 2018; World Health Organization, 2018; National Cancer Prevention Committee, 2019).

Aerobic activity is also known as endurance or cardio activity. The large muscles move rhythmically for extended periods. This serves to increase heart rate and respiratory rate. Aerobic activity is influenced by three components. These components are intensity, frequency, and duration. (Piercy et al., 2018; World Health Organization, 2018; National Cancer Prevention Committee, 2019).

Muscle-strengthening activities include resistance training and lifting weights that are influenced by the body's muscles working or holding a predetermined force or weight. Lifting weights is usually relatively heavy and is done several times to strengthen various muscles. It can also use assistive devices such as elastic bands or lifting weights for resistance. The effects of muscle-strengthening activities have limitations on the muscles being worked. In this case, it is important to do all the major muscle groups in the body such as the muscles of the arms, waist, back, abdomen, chest, shoulders, and hands (Piercy et al., 2018; World Health Organization, 2018).

Bone strengthening activities can increase bone growth and strength. Bone strengthening activities can also include aerobics and muscle strengthening. Meanwhile, in balance, activities to improve balance by strengthening the back, abdominal, and leg muscles. In a multicomponent physical activity program including a combination of balance, muscle-strengthening physical activity, and aerobics. In other types of activity, based on the MET-minutes/week calculation, physical activity is divided into high, moderate, and low (World Health Organization, 2019).

In carrying out activities, there are important components in the implementation, namely the frequency, duration, and intensity of physical activity. Frequency describes how often a person performs an activity. The duration component describes how long a person performs an activity in one session (World Health Organization, 2018). Meanwhile, intensity is an illustration of how hard a person performs an activity. The intensity scale itself is divided into two, which are absolute and relative (Piercy et al., 2018).

Absolute intensity is the amount of energy expended during activity regardless of a person's cardiorespiratory fitness or aerobic capacity. Absolute intensity is expressed in metabolic equivalent units (MET). One MET is equivalent to resting metabolic rate or energy expenditure when getting up and sitting quietly. The moderate-intensity activity had a MET value of 3 to 5.9 MET. Meanwhile, the vigorous-intensity activity had a MET value of 6 or greater (Piercy et al., 2018).

In contrast to absolute intensity, relative intensity is the level of effort required to perform an activity that compares with personal abilities. Relative intensity can be estimated on a scale of 0 to 10. Sitting is 0 and the highest level of effort is 10. On this scale, moderate-intensity activity is 5 or 6. Meanwhile, vigorous activity begins at level 7 or 8 (Piercy et al., 2018).

There are several factors related to physical activity: age, gender, educational level, and type of occupation ( Liang et al., 2016; Cheah et al., 2017). Liang et al. (2016) showed a difference in work intensity for mining workers. Mining workers are divided into four: underground, underground auxiliary, ground, and office workers. They also mentioned that underground and underground auxiliary mining workers had

a higher intensity of physical activity than ground and office workers (Liang et al., 2016).

Physical inactivity is defined as the level of activity that does not reach the minimum limit recommended by the WHO. To the adult age group, the WHO recommendation is doing 150 minutes of physical activity per week with moderate-intensity activities or vigorous activity for 75 minutes a week. In addition, doing a combination of moderate and vigorous activity reaching a minimum of 600 MET-minutes/week is also recommended in adults ( World Health Organization, 2010; Tcymbal et al., 2020). Based on WHO data, it can be seen that 1 in 4 adults in the world do not meet the minimum physical activity (World Health Organization, 2018). In Indonesia, 26.1% of the population is included in the category of less physical activity with Jakarta as the highest province with a population of 44.2% still less doing physical activity (Abadini and Wuryaningsih, 2018).

Several studies state that physical inactivity has an important contribution and is one of the main factors causing non-communicable disease (NCD) as well as obesity, heart disease, and cancer (World Health Organization, 2014). In addition, NCD can be caused by several main factors, such as an unhealthy diet and less physical activity (Sudhir and Delma, 2018). Both contribute to causing obesity that affects a group of changes called metabolic syndrome. This is characterized by abnormalities of glucose and lipid metabolism accompanied by hypertension ( Kumar, Abbas and Aster, 2013; Hall, 2016).

Rodriguez-Fernandez et al, (2015) conducted a study on mining workers in Papua, Indonesia with a 5-year follow-up. The data showed that miners experienced a 26% increase in cholesterol at follow-up in the third year, blood glucose increased by 33% in the third year, a persistent 62% increase, hypertension by 16%, and overweight and obesity increased by 14% at the start of the study (Rodriguez-Fernandez et al., 2015). In several other countries, a cohort study conducted research on miners in Mongolia. This study showed that the prevalence of factors that predispose to NCDs were hypertension 12.9%, obesity 64.1%, alcohol use 22.1%, and smoking 38.8% (McCarthy and Damiran, 2019). Research conducted by Casey et al. (2017) also found that 87% of coal miners in several US cities were overweight and obese .

GPAQ, an instrument developed by the WHO, can be used to measure adults' physical activity. This instrument has a questionnaire with 16 questions. The results after measurement through GPAQ will be divided into three categories: high, moderate, and low. This division is based on MET calculation. (World Health Organization, 2019).

Based on direct observation in the field, the busiest areas are mining sites by operators. However, they operate the machine in the cabin. Therefore, it is necessary to ascertain whether the operator is active based on the calculation of GPAQ. As presume that many adults even in mining workers still do not do physical activity as high as expected. (Abadini and Wuryaningsih, 2018; World Health Organization, 2018). The risk of NCD in mining workers in several countries, including Indonesia, shows a high number (Rodriguez-Fernandez et al., 2015; Casey et al., 2017; McCarthy and Damiran, 2019). In addition, researchers have not found research on the physical activity profile of mining workers in Indonesia. The GPAQ can assist in measuring physical activity to be studied. In addition, this study aims to determine the physical activity profile of mining workers based on age, gender, educational level, and type of occupation using GPAQ.

## METHODS

This study uses a descriptive design study with a cross-sectional approach. The

source of the data used is secondary data in the company PT. Borneo Indobara in 2020. The data used are a population sample of 124 mining workers. The inclusion criteria in this study were that the respondents are permanent mining workers at PT. Borneo Indobara and length of work at PT. Borneo Indobara ≥ 1 year. The exclusion criterion of this study was the data of respondents who filled out the GPAQ questionnaire incompletely.

Global Physical Activity Questionnaire is an instrument developed by the WHO. It is used to measure adults' physical activity. This questionnaire needs to collect information about three domains: activities at work, transportation and activities during leisure time, and sedentary behavior. The instrument has a total of 16 questions (World Health Organization, 2019).

Based on these intensities and domains, these 16 questions are divided into six sub-domains: vigorous activity at work, moderate activity at work, travel to and from places, vigorous activity recreational, moderate activity recreational, and sedentary behavior. Determining vigorous or moderate-intensity, respondents fill out a questionnaire with the help of the existing showcard as an example of their activity. The activity with vigorous intensity is an activity that requires a high effort in doing something and causes an increase in breathing and a fairly high heart rate. Meanwhile, moderate-intensity activities are those that require moderate effort and increase breathing and heart rate as well but less than vigorous-intensity activities (World Health Organization, 2019).

To show the intensity of physical activity and analyze GPAQ data, the MET calculation is generally used. MET is the relative ratio of the metabolic rate when a person is working to the metabolic rate at rest. The energy expended at rest is one MET and is equivalent to a calorie consumption of 1 kcal/kg/hour. So, with using GPAQ data, to calculate moderate activity uses 4 MET and vigorous activity uses 8 MET (World Health Organization, 2013; World Health Organization, 2019). This measurement is categorized into three levels of physical activity in MET-minutes/week which are high, moderate, and low (World Health Organization, 2019).

Doing a vigorous activity for at least three days with a total physical activity reaching a minimum of 1,500 MET-minutes per week can be categorized as high physical activity. The same as doing a combination of moderate and vigorous activity within seven days reaching 3,000 MET-minutes per week. Based on the sub-domain of vigorous activity at work, it can be done with several activities. For example, vigorous activity can be done by logging, chopping wood, carrying heavy wood, mining sand, and several other jobs that require more effort. Vigorous activities during leisure time or recreation can also be done by sports activities. Sports such as playing football, tennis, high-impact aerobics, fast swimming, and other types of sports cause an increase in heart and breathing rates (World Health Organization, 2019).

Furthermore, moderate physical activity can be achieved by doing vigorous activity for ≥ 60 minutes within three days or moderate activity for 150 minutes within five days. The same as doing a combination of total moderate and vigorous physical activity achieving 600 MET-minutes per week. Activities that can be carried out in the sub-domain of moderate activity while working include cleaning the house, either sweeping, mopping, cleaning dust, washing clothes by hand, and so on. Other professions that do work such as gardening, digging soil with a shovel, carpentry, carrying loads on the head, and other activities are also moderate activities at work. Meanwhile, some activities that can be done with moderate activity during leisure or recreation include cycling, jogging, dancing, yoga, low-impact aerobics, and

others that cause an increase in breathing that is harder than usual (World Health Organization, 2019).

Activities that do not reach the criteria for a high or moderate level of physical activity are categorized as low physical activity. This is only reached < 600 MET-minutes per week. Sedentary behavior and sitting for long periods are low-level activities (World Health Organization, 2019). Each category of physical activity will be grouped based on age, gender, educational level, and type of occupation.

The age listed is the age written by the respondents. It will be grouped based on age classification. Dyussenbayev's age classification is divided into three categories: youth (13-24 years), young age (25-44 years), and middle age (44-60 years) (Dyussenbayev, 2017). Each respondent has a different position in working at PT. Indobara Borneo. Each job category also has different roles and tasks in carrying out their work.

The type of occupation is divided into leader/officer, supervisor, operator, and mechanic. Leader/officer workers have a role in doing work as office employees. They are assigned to work indoors. The supervisor part has a role in monitoring matters relating to the activities of other mining workers such as operators and mechanics. This is done during working hours and providing reports to the management section.

The main activity of operator is related to the use of machines. They operate heavy and light equipment needed. Both operators and mechanics are working outdoors. Meanwhile, workers as mechanics have a role in maintaining machines. Furthermore, they make repairs to the tools used when experiencing problems.

Data were collected using secondary data obtained from the results of filling out the GPAQ questionnaire on mining workers at PT. Indobara Borneo. The data obtained were used as a sample. Furthermore, these will be collected and recorded on a table of the level of physical activity of mining workers. Finally, data will be grouped based on age, gender, educational level, and type of occupation to record the data needed according to the variables studied. In this study, from the results of the data obtained, data analysis will be carried out using software in Microsoft Excel and analyzed descriptively and shown in tables. This study got approval from the Health Research Ethics of Universitas Padjadjaran with ethical number 853/UN6.KEP/EC/2021.

## RESULT

This section shows the physical activity of mining workers at PT. Borneo Indobara in 2020. The distribution of mining workers is grouped by age, gender, educational level, and type of occupation.

**Table 1.** Frequency distribution of mining workers based on age, gender, educational level, and types of occupation

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| 21 - 24 | 28 | 22.58% |
| 25 - 43 | 88 | 70.97% |
| 44 - 60 | 8 | 6.45% |
| **Gender** | | |
| Male | 120 | 96.77% |
| Female | 4 | 3.23% |
| **Educational Level** | | |
| Elementary-High School | 116 | 93.55% |

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Bachelor | 8 | 6.45% |
| **Types of Occupation** | | |
| Leader/officer | 8 | 6.45% |
| Supervisor | 13 | 10.48% |
| Operator | 85 | 68.55% |
| Mechanical | 18 | 14.52% |

Table 1 shows the characteristics of mining workers at PT. Borneo Indobara. The mining workers are dominated by young age 70.97% (88 people). It also found that almost all mining workers were male by 120 of 124 people. For education level, this is dominated in elementary-high school 93.55% (116 people). In the category of type of occupation, it is dominated by workers as operators (85 people).

**Table 2.** Distribution of mining workers based on GPAQ

| GPAQ Category | n | % |
|---|---|---|
| High | 22 | 17.74% |
| Moderate | 22 | 17.74% |
| Low | 80 | 64.52% |
| **Total** | **124** | **100.00%** |

Table 2 presents the GPAQ category with a total calculation of MET-minutes/week. For example, to calculate the percentage of the high category. From all workers, will be counted workers who have vigorous activities or activities up to 3,000 MET-minutes/week. It was found that 22 people were included in the high category. Then, in calculating the percentage of the category, the total number of workers in the high category is 17.74% after being compared to the total of all workers.

Table 2 shows the level of physical activity of mining workers. It is found that out of 124 workers, mining workers were dominated by low physical activity. Most of the mining workers have less than 600 MET-minutes/week. The result of calculating shows the percentage of low activity reaches 64.52%. Besides that, mining workers who perform high and moderate physical activity have the same result.

**Table 3.** Mining worker physical activity level by age, gender, education, and types of occupation

| Variable | Physical Activity Level | | | | | |
|---|---|---|---|---|---|---|
| | High (≥ 3.000 MET-minutes/week) | | Moderate (< 3.000 or ≥ 600 MET-minutes/week) | | Low (≤ 600 MET-minutes/week) | |
| | n | %* | n | %* | n | %* |
| **Age (years)** | | | | | | |
| 21 – 24 | 5 | 17.86% | 6 | 21.43% | 17 | 60.71% |
| 25 – 43 | 16 | 18.18% | 15 | 17.05% | 57 | 64.77% |
| 44 – 60 | 1 | 12.50% | 1 | 12.50% | 6 | 75.00% |
| **Gender** | | | | | | |
| Male | 22 | 18.33% | 21 | 17.50% | 77 | 64.17% |
| Female | 0 | 0.00% | 1 | 25.00% | 3 | 75.00% |

| Variable | Physical Activity Level | | | | | |
|---|---|---|---|---|---|---|
| | High (≥ 3.000 MET-minutes/week) | | Moderate (< 3.000 or ≥ 600 MET-minutes/week) | | Low (≤ 600 MET-minutes/week) | |
| | n | %* | n | %* | n | %* |
| **Educational Level** | | | | | | |
| Elementary-High School | 22 | 18.97% | 20 | 17.24% | 74 | 63.79% |
| Bachelor | 0 | 0.00% | 2 | 25.00% | 6 | 75.00% |
| **Type of Occupation** | | | | | | |
| Leader/officer | 0 | 0.00% | 2 | 25.00% | 6 | 75.00% |
| Supervisor | 3 | 23.08% | 3 | 23.08% | 7 | 53.85% |
| Operator | 12 | 14.12% | 13 | 15.29% | 60 | 70.59% |
| Mechanical | 7 | 38.89% | 4 | 22.22% | 7 | 38.89% |

*Notes: the percentage in the table using the segmental calculation.
For example, from age ranges, the percentage of youth (21-24 years) who have high physical activity is calculated by:
$\frac{\text{number of youth age who having high physical activity}}{\text{all youth respondents}} \times 100\%$ so, the calculation becomes
$\frac{5}{28} \times 100\% = 17.86\%$. This also applied to the category of each variable.

Table 3 shows the respondents who are adequate or less (< 600 MET-minutes/week) doing physical activity, each category is adjusted to the level of physical activity carried out by mining workers. It has been found that the majority included low physical activity in each age range. Differences in physical activity between age ranges, the youth have a higher percentage of high and moderate physical activity. This is because youth are placed more in jobs that require muscle strength, while middle age is more likely to be placed in jobs that involve more sedentary behavior. Meanwhile, middle-age have a higher percentage of low physical activity compared to physical activity in other age ranges.

In addition, Table 3 also shows that many males and females have low physical activity. However, of each gender, 3 out of 4 female workers did a low physical activity. This is because female workers have more sedentary behavior. They do less vigorous or moderate physical activity, resulting in their total physical activity being low. So, females have a higher percentage of low physical activity compared to males.

In terms of the level of education from Table 3, it is also found that many elementary-high school or bachelor graduates have low physical activity. However, the elementary-high school level showed a higher percentage of high and moderate physical activity. This is because workers with the elementary-high school are more placed in jobs that require more muscle strength. Meanwhile, bachelor graduates mostly have jobs that have a sedentary behavior. So, their physical activity showed a higher percentage of low physical activity compared to other educational levels of physical activity.

Table 3 presents the types of occupations that have differences in physical activity between leader/officer, supervisor, and operator with mechanical. The mechanical part has more sufficient physical activity than the others. This is because of the nature of their work which uses more muscle strength compared to the leader/officer who performs more sedentary behavior and many workers

drive to work by motorized vehicle. Likewise, supervisors and operators have low activity in the nature of their work. It can be seen that mechanics have a higher percentage of high and moderate physical activity. Besides that, the leader/officer has a higher percentage of low physical activity compared to another type of occupation of physical activity.

## DISCUSSION

This study presents information about the physical activity profile of mining workers at PT. Borneo Indobara in 2020. Mining worker profiles are differentiated based on age, gender, educational level, and type of occupation. In general, there are still many mining workers who do low physical activity. Almost all categories show that the level of physical activity of workers is still dominated by workers with low activity.

Based on the percentage of age categories, young people are more active than old people. This result is slightly different from Tcymbal et al.'s (2020) study conducted a study on the adult population in Armenia with an age range of 18-69 years., This study shows that the more active is the 30-44 years age group. This is because it is known that in this age group they do more work-related activities and other physical activities with heavy intensity. In addition, many people belonging to this age group achieve a high physical activity in terms of MET-minutes/week and less in sitting activity (Tcymbal et al., 2020).

This result is consistent with Sahebkar et al.(2018), The research shows that the 55-64 year age group had a substantially lower probability of physical activity (44%) higher than the 15-24 year age group (Sahebkar et al., 2018). In addition, a study conducted by Sithey et al. (2021) showed that, compared to the age group of 18-24 years, the older group was more overweight or obese. This is due to a lack of awareness of the importance of nutrition, a sedentary lifestyle, and high carbohydrate and low protein diet which are some of the factors that cause overweight and obesity (Sithey et al., 2021).

Hall et al. (2016) said that, with aging, there are several changes in body systems. Some of the body systems that change during aging include the cardiovascular system, respiration, endocrine system, and skeletal muscles. The results obtained from this change are such as a decrease in ability, muscle mass, and muscle strength to carry out activities (Hall, 2016). During aging, cardiovascular changes occur in the form of heart valves and stiffness, the ability to pump blood including decreased contraction and volume, decreased vascular resistance and peripheral vascular resistance and decreased maximal cardiac output ( Loue and Sajatovic, 2008; Maryam et al., 2008; Hall, 2016). Along with increasing age, there is also a significant decrease in maximal cardiac output which decreases by as much as 50% between the ages of 18 and 80 years (Hall, 2016).

In the respiratory system, the changes that occur are decreased strength of the respiratory muscles and they become stiff. In addition, the elasticity of the lungs also becomes stiffer and the residual capacity increases, which makes it harder to breathe. The alveoli are dilated and their numbers are reduced. The ability to cough also decreases and bronchial constriction occurs. Decreased maximal breathing capacity is accompanied by reduced skeletal muscle mass, the maximum muscle strength that can be achieved in old age is also greatly reduced (Loue and Sajatovic, 2008;Maryam et al., 2008; Hall, 2016).

Hormone production, one of which is Growth Hormone (GH), changes the aging process. GH secretion and serum GH concentrations decrease in old age which is thought to contribute to decreased body mass and muscle strength, thinning of skin and bones, and increased fat in the elderly (

Loue and Sajatovic, 2008; Maryam et al., 2008). Muscle mass and strength will also decrease with age (Loue and Sajatovic, 2008). Jamil et al. (2015) also said that older people have difficulty in carrying out physical activities. This is due to their being related to body limitations and experiencing more health problems than younger people (Jamil et al., 2015).

Based on the percentage of gender categories, males are more physically active than females. This result is consistent with a study conducted by Cheah et al. (2017) which said that males are 2.9% less to participate in physical activity but spend 25.3% more time than females. The results of the study conducted by Tcymbal et al.(2020) also found that males were more physically active compared to females. Based on this study, it was shown that although males did longer sitting activities, males did significantly more vigorous physical activity than females. Vigorous activities carried out by males can even reach three times than of females (Tcymbal et al., 2020).

Similarly, Sahebkar et al. (2018) showed that the prevalence of physical activity in females was lower than males (56.7% vs. 33.3%) ). According to Celis et al. (2016), the total level of physical activity of males was significantly higher than that of females. It was found, males had a significant difference in the physical activity they did. Males also have significantly higher total physical activity, work and recreation MVPA, and higher active-commuting than females (Celis-Morales et al., 2016). In addition, a study conducted by Sithey et al. (2021) showed that the prevalence of overweight or obese females is higher than males because it is associated with physical inactivity.

Hall et al. (2016) said that males can secrete the hormone testosterone. This hormone has a strong anabolic effect in causing an increase in protein storage, especially in muscles that can increase the ability to perform physical activity. Estrogen also has a role although not as much as testosterone, that is estrogen can increase fat accumulation in women, especially in the breast, pelvis, and subcutaneous tissue (Hall et al., 2016). Molanorouzi, Khoo and Morris, (2015) and Rosenfield et al. (2017) said that males tend to have higher intrinsic motivators. The motivation is to improve health, prevent NCD, improving body shape, and feeling more competitive.

Furthermore, based on the percentage of education levels, physical activity in someone with low education is more active than in high education. This is consistent with a study conducted by Celis-Morales et al. (2016) which found that participants with higher education levels spent an average of 33% less time on MVPA at work.Likewise, research by Tcymbal et al. (2020) states that people with low education are more active than highly educated. This is because in their research it was found that people with low education did more physical activity with vigorous intensity. Highly educated people also have high physical activity and can reach the minimum WHO recommendations. However, when compared between people with low education and high education, the level of physical activity is much higher than those with higher education (Tcymbal et al., 2020).

Finally, based on the percentage type of occupation, blue-collar are more active than white-collar. Based on the results, mechanical workers are more active than other types of occupations such as leader/officer, supervisor, and operator. According to Sung et al. (2021), the types of work are white-collar (e.g., managers and office workers) and blue-collar (e.g., crafts and related trade workers, machine operators, and assemblers) (Sung et al., 2021). So, in this study, the leader/office acts as the white-collar while the supervisor, operator, and mechanic act as the blue-collar. This division is important because the type of work determines the

assessment of work performance for each individual (Grimani, Aboagye and Kwak, 2019). Fukushima et al. (2018) show that during working hours and the whole day, white-collar significantly spend more time in sedentary behavior and less time in light physical activity than blue-collar workers.

## CONCLUSIONS

It can be concluded that the mining workers at PT. Borneo Indobara in 2020, based on the GPAQ, most of the mining workers have low physical activity, which is less than 600 MET-minutes/week. Based on MET calculation, it was found that all groups did less physical activity except the type of occupation as a mechanic. For this reason, this research can be used as feedback or consideration for evaluating and motivating mining workers at PT. Borneo Indobara and the wider community to increase physical activity.

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# SOCIAL SUPPORT IN ACCESSING ADOLESCENTS MENTAL HEALTH SERVICES

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**ABSTRACT**

**Introduction:** The survey reported that adolescents experienced severe depression (15.6%) and extreme stress (6.3%) in Warungboto, Yogyakarta, Indonesia. In fact, with this condition, they are reluctant to access mental health services. Adolescents' skills still lacking in problem-solving and inadequate social support are thought to be the triggering factors for low access to health services. **Aims:** to determine the social support for adolescents in accessing mental health services. **Methods:** This type of research is quantitative research with a cross-sectional approach. The unit of analysis is adolescents (15-24 years) who are identified as having stress and depression based on the results of early detection of mental health. The sample size is 36 teenagers, with a total sampling technique. The variables are family support, peer support, mental health status, problem-solving, and self-control measured in the questionnaire. Meanwhile, mental health status was assessed using DASS-21 and PSS-10. **Results:** There was a significant relationship between social support from family (p-value 0.001, 95% CI 1.581-76.551) and peers (p-value 0.018, 95% CI 1.108 – 2.608) with adolescent mental health status. Adolescents with depression and stress are very few who get good social support from their families in accessing mental health services. This study proves that family social support is a significant factor in accessing mental health services. **Conclusion:** Family involvement in overcoming adolescent mental health problems is crucial. However, health providers can also provide community-based mental health services with a peer approach.

**Keywords**: Mental health, Adolescents, Social support, Stress, Depression

## INTRODUCTION

Nowadays, teenagers only focus on improving the physical without paying attention to the non-physical. In contrast, non-physical factors are also a determining factor for the success of adolescents in the future. Adolescent mental and emotional factors that are not considered cause adolescents to be physically healthy but psychologically vulnerable to stress and life pressures (Jakarta Health Polytechnic I Ministry of Health Republic of Indonesia, 2010). Disruption of mental health in adolescents will be associated with adverse educational, health and social outcomes (Nielsen et al., 2017). Globally, mental health has become one of the burdens of disease that has disturbed the health of adolescents in recent years. It is estimated that one in seven adolescents will experience a mental health disorder in 2019. The number can exceed 150 million adolescent boys and girls. This figure rose to nearly 4 million cases in 2000 (UNICEF, 2021a). A quick survey conducted around September 2021 provides an overview of how teenagers feel from the beginning of the pandemic until now. The data reported that 27% of adolescents felt stressed, and 15% felt depressed in the last seven days. Economic factors are thought to be the main factors that influence emotional conditions; this is recognized by 30% of adolescents. Meanwhile, 46% of adolescents reported being less interested in doing their hobbies and 36% less enthusiastic about doing routine work, such as school and homework. This situation is very

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influential on the way teenagers view the future. Other data report that girls (43%) are more pessimistic about the future than boys (31%) (UNICEF, 2021b).

Based on World Health Organization (2010), the prevalence of suicide reaches 1.6 to 1.8% per 100,000 people in Indonesia. The Basic Health Research data in 2018 reports that out of a thousand households, seven households have family members with schizophrenia/ psychosis. Meanwhile, people aged 15 years and over are at high risk of developing mental and emotional disorders (19 million cases) and are estimated to have depression (12 million cases). (Ministry of Health Republic of Indonesia, 2018). Ages 15 years and over can be classified as teenagers. In addition, 2.39% of adolescents in Indonesia have attempted suicide once, 2.59% for boys and 2.20% for girls.

Meanwhile, adolescents who have attempted suicide more than once were 1.80% boys and 1.16% girls (Center for research and development of public health efforts, 2015). Teenagers feel very stressed during the pandemic, triggered by limited access and gathering with peers. Friends access only through social media. Teenagers consider social media negatively impacting and tend to emphasize virtual social. He feels that many falsehoods are shown on social media, which makes teenagers stressed (UNICEF Indonesia, n.d.).

There has been an increase in the prevalence of severe mental disorders (schizophrenia/psychosis) in the Special Region of Yogyakarta. In 2013, the number of cases was still at 2.3 per mile, but in 2018 there was an increase of 10 per mile. In every 1000 population, there is one person with a severe mental disorder. The Special Region of Yogyakarta ranks second with the highest prevalence of severe mental disorders (schizophrenia/ psychosis) after Bali (Health Office of Special Region of Yogyakarta, 2018). A preliminary survey conducted by researchers with several representatives of teenagers from Warungboto Village, Umbulharjo District, Yogyakarta City, found four cases of severe mental disorders. Screening of mental health status among adolescents in Warungboto shows 15.6% indicated severe depression. In addition, 6.3% indicated extreme stress.

If mild mental health disorders are not treated immediately, they will lead to more severe problems, such as severe mental disorders (Ayuningtyas, Misnaniarti and Rayhani, 2018). In Indonesia, the issues faced are still around the poor behavior of adolescents in seeking legal assistance or mental health services. The results of The Basic Health Research data in 2018 showed that depression sufferers who take medication or undergo medical treatment are still deficient, only 9%. In addition, 68.3% of adolescents have never had experience with psychologists or mental health services (Rasyida, 2019). People assume that the religious approach is believed to provide support in overcoming the stress and mental disorders they experience. Social support from the immediate environment is very influential in taking individual action to prevent mental health disorders (Novianty and Hadjam, 2017).

Social support is predicted as a protective factor against stressors. The previous studies state a strong correlation between social support and the treatment of depression risk in adolescents (Mirdad, 2018). Social consent is obtained from two sources, namely from the informal environment (family, friends, co-workers, and superiors) and the formal assistance environment (health workers and humanitarian services workers) (Glanz, Rimer and Viswanath, 2008). In addition to social support from family, adolescents also receive social support from peers. Adolescents are closer to peers and spend more time with peers, so peers can help reduce the risk of emotional problems (Sulaiman and Mansoer, 2019). Another study states that it is necessary to

strengthen the support system for adolescents to overcome mental health problems. Adolescents must also have skills in dealing with and solving a problem (Sulistiowati et al., 2019).

This study aimed to analyze social support in accessing mental health services for adolescents. In particular, this research aims to look at the form of social support and the impact of social support for adolescents in preventing mental health disorders, especially during the COVID-19 pandemic. This study examines social support in accessing adolescent mental services from the point of view of social support theory and the results of early detection of adolescent mental health. Early detection of mental health is categorized into stress and depression using the standard instrument Perceived Stress Scale (PSS-10) and Depression Anxiety Stress Scale (DASS-21).

## METHODS

### Research Design

This study is quantitative with a cross-sectional approach. It was conducted in September 2020 in the Warungboto Village, Umbulharjo District, Yogyakarta, Indonesia.

### Data Sources

This study uses non-probability sampling with total sampling to explain the conclusions (Figure 1). The sample of this study was adolescents who met the inclusion criteria, namely adolescents aged 15-24 years, domiciled in Warungboto Village, Umbulharjo District, Yogyakarta City, for a minimum of six months. Then, it filled out an early detection survey of adolescents and was included in the category of stress and depression.

The instruments used for early detection of adolescent mental health are DASS-21 and PSS-10. Of the total 64 teenagers who have filled out the mental health early detection survey, only 36 teenagers were able to become participants in this study, who has categories of stress and depression.

### Questionnaire

Primary data collection through interviews using a several questionnaire below:

First, Interpersonal Support Evaluation List (ISEL) on social support variables in accessing adolescent mental health services.

Second, Perceived Stress Scale (PSS-10). Classic stress assessment instrument to determine the level of stressor on the respondent. consists of ten question items, and has four answer choices with a score range of 0-4. A score of 0 means never, a score of 1 almost never; score 2 means sometimes, score 3 means often, and score 4 means very often. These scores are reversed to answer positive questions, so a score of 0 = 4, a score of 1 = 3, a score of 2 = 2 and so on. Positive questions in this questionnaire are in question numbers 4, 5, 7 and 8. The total score of 13 shows the average value or is still said to be within normal limits. A score of 20 or more indicates a high level of stress.

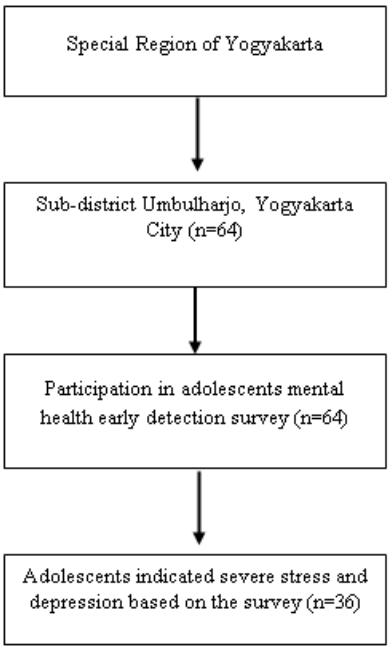


**Figure 1.** Procedure for selection of respondent

Third, Depression Anxiety and Stress Scale (DASS-21), is a questionnaire to assess depression, anxiety and stress. It consists of 21 short question items, with four possible answers: never, sometimes, often, and very often. Each question is assigned a score of 0 to 3, then scores in each category are summed and carried out normal, mild, moderate, severe and very heavy interpretation. However, in this study only respondents with depressed and non-depressed (normal) results were selected. This category was selected based on the highest number of results that emerged after the DASS-21 data analysis

Fourth, The variables of problem-solving ability and self-control of adolescents in overcoming health problems have developed a questionnaire based on the literature review results.

## Data Analysis

Social support in accessing health services means the support provided by the surrounding environment to adolescents accessing mental health services. Environment circles come from family, friends, and health workers. Meanwhile, the forms of social support studied in this study include emotional, informational, instrumental, and assessment support.

The independent variables studied included the ability of adolescents to solve problems, self-control in solving issues, stress levels of adolescents, and mental health status based on previous surveys.

All variables analyzed were dichotomous, so the chi-square test was conducted to see a relationship between social support for adolescents accessing mental health services in Yogyakarta. Data analysis was carried out in two ways: univariate and bivariate. Univariate to see the frequency distribution of all the variables studied. Then, bivariate analysis (cross-tabulation) was performed to see the correlation among variables ($p$-value < 0.25). The whole process of data analysis is assisted by SPSS version 22.0.

There are four variables in this study. First, Problem Solving Ability is an adolescent's effort to overcome problems by seeking social support and accessing mental health services. Second, adolescent control in solving problems, which means the ability of adolescents to control their thoughts and behaviour in solving problems. Measurements were made using a Likert scale of four alternative answer choices along with their scores. Answer never = 0, sometimes = 1, often = 2, and always = 3. The categorized based on the median value because the data are not normally distributed. The median value for the problem-solving ability variable is 8, and 7 for the second variable. Categories are divided into two types, namely, good and bad. Good category if the average value is equal to the median value and vice versa.

The third variable, the stressor, is a factor that influences the stress level of the respondents. The stressor assessment is based on the Perceived Stress Scale (PSS-10) results. Respondents are considered to have a mild stressor if the PSS-10 results show a number less than equal to 20, and vice versa for the high stressor category. Meanwhile, the mental health status variable refers to symptoms or state of mind to detect the respondent's mental health within the past week. This condition is based on the results of the Depression Anxiety Stress Scale (DASS-21). Respondents are categorized as not experiencing mental health disorders or depression if the assessment results are less than equal to number 9.

The dependent variable is the social support that comes from family, peers, and health workers. The definition of social support in this study is providing support to respondents, such as emotional support, namely giving attention, and concrete support, namely being willing to take them to mental health services. Then, informational support provides information about mental health services, and assessment support offers helpful

information for self-evaluation. Question items refer to the Interpersonal Support Evaluation List (ISEL)(Cohen and Hoberman, 2020). Measurement and scoring are the same as the variables of problem solving ability, and self-control. The categorization depends on the median value; that is, there is family support if the median value is more than equal to 9. There is peer support if the median value is more than equal to 7, and the median value is more than equal to 1.5 if there is support from health workers.

In addition to the four main variables, this study also provides data on the characteristics of the respondents, including age, gender, level of formal education, daily activities and participation in community activities. are all closed questions. Age was categorized into two based on the mean value as the cut of point. Education level is only categorized into two; secondary education and higher education. This categorization refers to Law Number 12 of 2012 concerning higher education. Higher Education is the level of education after secondary education which includes programs diploma, bachelor program, master program, doctoral programs, and professional programs, as well as programs specialists, organized by the college based on Indonesian culture (Law of the Republic of Indonesia Number 12/2012 concerning Higher Education). So that the level of education below it is categorized as middle, especially based on the results of the questionnaire there were no respondents who had basic education, namely elementary school. Then, the respondent's participation in community activities is divided into two answers, yes and no. Likewise for daily activities differentiated based on workers or students.

## Ethical Statement

The Research Ethics Committee of Ahmad Dahlan University approved this protocol, Number: 012107048, on September 28, 2021. Participants received an explanation of the study and made written consent before taking the study data.

## RESULT

Figure 1 shows the flow of participants. Of 64 adolescents in Warungboto Village, sub-district Umbulharjo, and The City of Yogyakarta, only 36 met the study's inclusion criteria. This number represents the total sampling of adolescents indicated to have mental health disorders when the early detection survey was conducted.

## Socio-demographics of respondents

Table 1 shows the characteristics of the participants. Factors of respondents include age, gender, level of education, occupation, and the community followed. Meanwhile, the variables studied included problem-solving abilities, self-control in overcoming problems, stressors, and mental health status. In addition, other variables are studied, namely family support, peer support, and support from health workers in accessing mental health services.

Social support is one of the critical factors in adolescent mental health. Table 1 shows that only half of the respondents feel they get social support from family, peers, and health workers. The rest of the respondents think they do not get social help to access mental health services. On the other hand, adolescents have good problem-solving skills. Adolescents who do not get social support tend to have poor problem-solving skills. However, Table 2 explains that there was no relationship between social support in accessing adolescent mental health services and problem-solving abilities.

Meanwhile, found an excellent ability to control themselves when facing problems in nineteen respondents. Similar to problem-solving skills, adolescents who feel there is social support in accessing mental health services tend to have the

ability to control themselves well. Family is the type of social support most expected of teenagers. To minimize bias in the research results, we assessed adolescent mental health disorders' triggering factors (Table 4).

**Table 1.** Characteristics of participants

| Variable | Responses | Freq. | Per cent. |
|---|---|---|---|
| Age | 15-18 years old | 12 | 33 |
| | 19-24 years old | 24 | 67 |
| Sex | Male | 19 | 53 |
| | Female | 17 | 47 |
| Education level | Basic (Elementary – Senior High School) | 18 | 50 |
| | High (Diploma - graduate) | 18 | 50 |
| Daily activity | Worker | 12 | 33.3 |
| | Student | 24 | 66.7 |
| Participation in community | Yes | 16 | 44 |
| | No | 20 | 56 |
| Problem-solving ability | Bad | 16 | 44.4 |
| | Good | 20 | 55.6 |
| Self-control in problem-solving | Bad | 17 | 47 |
| | Good | 19 | 53 |
| Stressor | Moderate | 24 | 67 |
| | Mild | 12 | 33 |
| Mental health status | Depression | 27 | 75 |
| | No Depression | 9 | 25 |
| Families support | No | 17 | 47 |
| | Yes | 19 | 53 |
| Peer support | No | 18 | 50 |
| | Yes | 18 | 50 |
| Health provider support | No | 18 | 50 |
| | Yes | 18 | 50 |

**Social Support in Accessing Mental Health among Adolescents**

**Table 2.** Bivariate analysis between problem-solving ability, self-control, level of stressor, mental health status, and social support in accessing mental health among adolescents

| Variable | Social support in accessing mental health services | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Families | | | Peers | | | Health providers | | |
| | PR | 95% CI | Sign. | PR | 95% CI | Sign. | PR | 95% CI | Sign. |
| **Problem-solving ability**<br>Bad<br>Good | **1.863** | [0.861-4.032] | 0.101 | 1.286 | [0.613-2.697] | 0.502 | 1.286 | [0.613-2.697] | 0.502 |
| **Self-control**<br>Bad<br>Good | **2.682** | [1.190-6.045] | **0.008** | 1.833 | [0.866-3.882] | 0.095 | 0.889 | [0.445-1.777] | 0.738 |

| Variable | Social support in accessing mental health services | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Families | | | Peers | | | Health providers | | |
| | PR | 95% CI | Sign. | PR | 95% CI | Sign. | PR | 95% CI | Sign. |
| **Level of stressor** Moderate Mild | **1.863** | [1.124-3.086] | **0.009** | 1.400 | [0.865-2.266] | 0.157 | 1.182 | [0.741-1.885] | 0.480 |
| **Mental health status** Depression No Depression | **1.900** | [1.240-2.911] | **0.001** | 1.700 | [1.108-2.608] | **0.018** | 1.250 | [0.849-1.840] | 0.443 |

*statistically significant (p>0.05)

This study explains that depression is more common in adolescents who do not feel social support from family, friends, and health workers. Table 2 presents a relationship between family's social support (*p*-value 0.001, 95 % CI 1.240 – 2.911) and peers (*p*-value 0.018, 95% CI 1.108 – 2.608) with adolescent mental health status. Teenagers admit that their stressful condition is due to pressure from their parents. Their parents always compare their children's conditions with other teenagers, both in terms of academics and behaviour (Table 3). Adolescents with depression and stress are very few found in adolescents with social support from the family.

**Table 3.** Stress Triggers

| Stress Triggers | Per cent. (%) |
|---|---|
| Parents who always compare with other people | 41 |
| Parents always demand their own accord regardless of the child's abilities | 37 |
| Teens are not confident because their peers often bully them | 22 |
| Teens feel that they often hurt by their loved ones or close friends | 16 |

## DISCUSSION

This study assessed the type of social support perceived by adolescents in accessing mental health services. In particular, we evaluated social support from the immediate environment of adolescents regarding problem-solving abilities, self-control in problem-solving, and frequency of exposure to stressors. Furthermore, this study also aims to determine the relationship between various types of social support in accessing health services and the mental health status of adolescents. It obtained an assessment of stressors and mental health status from previous studies. The categorization of stressors is divided into two, namely, moderate stress and mild stress, obtained from an assessment using the standard instrument of the Perceived Stress Scale (PSS-10) questionnaire. The PSS-10 contains ten questions to assess the stress perception scale developed by Cohen, Kamark and Mermelstein. This questionnaire is a self-evaluation measure widely used to determine the scale or level of an individual's life to be called experiencing stress. Measurements are made by recalling events during the past month so that various events can be seen as unpredictable, uncontrollable, or living overload (Cohen, Kamarck and Mermelstein, 1983; Cohen and Williamson, 1988).

Meanwhile, mental health status in adolescents was obtained from an assessment using the standard instrument Depression Anxiety Stress Scale (DASS-21). Lovibond and Lovibond developed

DASS. It is used to assess complaints of depression and anxiety in individuals subjectively. Besides, it evaluates the severity of the individual's perceived depression, anxiety, and stress (Lovibond, n.d.; Lovibond and Lovibond, 1995). The two instruments are used to describe the mental health status of adolescents on the social support provided by the surrounding environment. Optimal mental health is influenced by social support (Cheng et al., 2014).

The type of social support studied in this study is support from family, friends, and health workers, which refers to the theory of social support and social networks. The idea says that social support is divided into supportive behavior or actions: emotional support, instrumental support, information support, and self-assessment support. It was further explained, including emotional support in the form of empathy, sympathy, concern, and trust (Heaney and Israel, 2002). Emotional support from families to adolescents is shown through family attitudes that help solve problems (36.1%) and always care about the psychological condition of adolescents (30.6%). However, most teenagers' families rarely motivate or advise them to access mental health services (80.6%). Then, it reported similar emotional support from peers and health workers.

Nevertheless, respondents admitted that they often get attention from close friends regarding their mental condition (44.4%). Another form of support is instrumental support. The form of this support is to provide tangible assistance that others can access in need (Heaney and Israel, 2002). The youth acknowledges this type of support that they never get from family, friends, or health workers. In addition to emotional support and instrumental support, adolescents are entitled to informational support. This support provides advice, suggestions, and helpful information for others to overcome their problems (Heaney and Israel, 2002). The study found that most adolescents never received this type of support from family, friends, and health workers to access mental health services when facing problems.

The informational support included receiving education or counselling on mental health issues, suggestions for visiting mental health services and understanding that Primary Health Care is the right place to access mental health services. The purpose of providing such information is for self-evaluation, or in other words, constructive feedback, which is included in the type of assessment support (Heaney and Israel, 2002). The form of assessment support examined in this study is giving appreciation to adolescents for accessing health services. Adolescents who have accessed mental health services admit that they sometimes get this support from family, friends, and health workers. However, there are only a few (13.9 - 25%). Family and friends' confidence shows the same result, and health workers in adolescents regularly visit mental health services if they are in a mental condition requiring professional assistance (22.2%).

The study reports that adolescents' problem-solving abilities are better when they get social support from the surrounding environment, namely family, friends, and health workers. Although statistically, the relationship does not show significance. However, it can see from the value of the prevalence ratio (Table 2) that social support in accessing mental health services is a risk factor that can affect adolescent skills in solving a problem that is being faced. Often asking for advice from close friends when facing problems compared to parents is one of the abilities shown by teenagers in solving problems. The attitude of ignoring the problem and not going to a psychologist or professional health worker is chosen by teenagers to deal with problems. Another study reported that teenagers need problem-solving skills, which are essential in life.

These skills can be started from the parenting style at home through reasoning, and logical thinking carried out between parents and adolescents (Kaur and Gera, 2016). Another study explains that these skills will arise when getting support from the family, for example, in the form of comfort, affection, and positive interactions between parents and adolescents (Leme, Del Prette and Coimbra, 2015).

Most teenagers do not always tell their parents about their problems and are less comfortable discussing their issues with their parents. In contrast, parents prefer to provide social support in the form of motivation when talking about their children's problems. Moreover, sharing it on social media is typical of teenagers in today's digital era. Whereas social support in the form of assessments from friends can affect the psychological condition of adolescents. One source of emotional support for adolescents is peers. They usually share experiences and feelings and face conflicts together. (Leme, Del Prette and Coimbra, 2015). Respondents in this study have understood that social media is not a way to get social support. Social media use, activity, and addiction to social media are closely related to adolescent mental health statuses, such as depression and other psychological disorders (Keles, McCrae and Grealish, 2020). Although social media can provide social support, it is only temporary. Social permission obtained from social media is only limited to coping with stress. Studies report that social media negatively affects self-control in dealing with adolescent problems (Kim, 2014).

Another finding from this study is that teenagers never consider going to a mental health professional when facing a problem. Various factors can cause adolescents not to access mental health services, including poor knowledge about mental health and learning about adolescent mental health services. In addition, there is a strong stigma regarding someone who accesses mental health services in the community. Other factors are concerns about the fees paid when accessing mental health services and youth's distrust of health workers who are considered new people and cannot understand the problems faced by adolescents (Radez et al., 2021). This statement is agreed with the findings of other studies.

Facilitators or health workers must take an approach to eliminate adolescents' stigma and negative perceptions about mental health services. Systems can include education on mental health, providing peer counselling training, and education on using mental health early detection instruments (Aguirre Velasco et al., 2020). Friends can be a stressor if they are in a toxic relationship and vice versa.

The study results stated that while they were involved in social interactions in friendship relationships, respondents admitted that they had never received threats or bullying. Lack of self-confidence also sometimes still appears in friendships under certain conditions. Bad companies are predicted to trigger psychological stress that can affect mental health (Cleary, Lees and Sayers, 2018). Although problems are found in the social interactions of adolescents, it does not necessarily make them go to mental health services for help. Stigma is strongly suspected as a factor inhibiting adolescents from accessing mental health services (Oke, 2019). Furthermore, in dating relationships, it was acknowledged by 26 respondents that they had never received adverse treatment that triggered mental health disorders.

An unexpected finding (Table 3), parents are a stressor because they often compare themselves with others, especially in achievement. Then, teenagers also acknowledged that they often feel pressured because their parents demand a lot to be good children in all things. Adolescents admitted that they often feel happy at home because of the social support provided by their parents. The

results of the bivariate analysis support these results. Table 2 shows a relationship between the family's social support and stress exposure in adolescents with a proportion of 1,863 (*p*-value 0.009, 95 % CI 1.124 – 3.086). The social support from peers and health workers is not statistically significant, but it does not exceed one when viewed from the prevalence ratio value. This variable is a risk factor for the level of exposure to the stress felt by adolescents. Adolescents with low social support are more prone to depression (Qi et al., 2020). All forms of support are intended to assist others in solving problems, not to provide non-constructive criticism (Heaney and Israel, 2002). Social support can increase self-confidence, eliminate negative stigma, and foster a sense of belonging in accessing mental health services in adolescents (Sheridan et al., 2018). Health policy support is urgently needed to approach and create youth-friendly mental health services (Luz et al., 2018).

The weaknesses of this research include not exploring the causes of adolescents feeling stressed and depressed and not getting support from family, friends and health workers. Future studies can examine from the perspective of parents and health workers related to access to adolescent mental health services.

## CONCLUSIONS

In short, social support is needed by adolescents to access mental health services. The forms of permission required by adolescents include emotional support, concrete or instrumental support, informational support, and assessment support. However, study findings report that adolescents do not get instrumental help. Adolescents have never obtained genuine assistance accessing adolescent mental health services from family, friends, and health workers. In addition, adolescents have good skills and self-control when solving problems at hand. Meanwhile, respondents who experienced moderate stress and depression were more common in adolescents who did not get social support. Policy support is needed to create youth-friendly mental health services.

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Literature Review

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# THE EFFECTIVE METHODS AND MEDIAS USED IN HEALTH PROMOTION ABOUT ADOLESCENT HEALTH PRODUCTION

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**ABSTRACT**

**Introduction:** Adolescence is a period that determines the pattern of formation of later health status in adulthood. The phase toward the final adolescent will require a lot of effort to be more maximal. It's because when starting adolescence, someone psyche becomes unstable, so it's need for assistance. Risk behavior generally starts in this period. **Aims:** To summarize the scattered research on adolescent health to gain a more complete and varies illustration of the methods and media that have been used in adolescent health promotion and its effectiveness. **Methods:** The method used in writing this article is the literature review. The articles includes several books, journals, and health profile books issued by the agency. **Results:** The methods and media used to carry out health promotion in adolescents must be based on analysis of the situation. In addition, it also looks at the age patterns of target so that they can be interested. The method of deliver greatly influences the target's response to information. A more effective method is a method which combines many human senses. It also necessary to insert an atmosphere breaker for methods that can make boredom if done over a long time and monotonous. **Conclusion:** Social media is suitable to be used as an intermediary for delivering information in accordance with the frequency of teenagers accessing social media on a daily basis. Peer education and the involvement of education on reproductive health in the curriculum is a method that can improve adolescent understanding of reproductive health.

**Keywords**: methods, media, health promotion, adolescent health reproduction

## INTRODUCTION

Adolescence is a phase when a person experiences significant changes and becomes a transition period from childhood to adulthood. According to the World Health Organization (WHO) classification, adolescence is in the age range from 10 to 19 years. Changes that occur in a person over time indicate growth. The changes that occur include hormonal, physical, psychological and social changes. Change occurs quickly and often without realizing it. One of the important events during adolescence is the start of functioning of the reproductive organs, which begins with menstruation in girls and wet dreams in boys. This increasingly mature mindset needs to be given an understanding so that it becomes more focused (Batubara, 2010).

Problems often arise during early adolescence because they experience unstable mental changes, feel that they can be separated from their parents, sometimes act rudely, have a tendency to act childishly, and are easily influenced by friends their age regarding their preferences, habits and way of dressing. But on the bright side, he will try to find close friends/friends and other people they care about besides their parents. As time goes by, in the final stages of puberty psychosocial changes occur such as becoming stronger in one's identity, discovering one's talents and interests, being able to commit, being able to think about ideas, respecting others more, being proud of the results achieved, and being more emotionally stable (Soeroso, 2001). So character formation has a big role in adolescence.

The main causes of the high teenage death rate recently are drug abuse, sexual activity and use of motorized vehicles. The close relationship between

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alcohol consumption and unintentional accidents has become the main cause of death in late adolescence. Drug abuse is associated with early onset of sexual behavior. In women, smoking often leads to abuse of other drugs. In general, using an anesthetic once will result in the entry of other anesthetics more easily, resulting in a cumulative effect of all the anesthetics in the body. Psychological dysfunction is often reported as a result of drug use.

Apart from drugs, sexual activity has also become a problem among teenagers. The sexual activity of teenagers, especially those carried out by changing partners, will have an impact on the rapid and widespread spread of disease (Indonesian Health Profile, 2017). One of the most common is HIV and AIDS. The total number of new cases of HIV (Human Immunodeficiency Virus) according to provinces in Indonesia in 2015 - 2017 was 30,935 in 2015, 41,250 in 2016, and 33,660 in 2017. In addition, there were 109 new cases of AIDS (Acquired Immunodeficiency Syndrome) in IDUs from 4,555 total new AIDS cases (Indonesian Health Profile, 2017). The discovery of HIV/AIDS cases aged <4 years indicates that there is still perinatal transmission of HIV. However, the largest number is still in those of productive age (15-49 years), it is possible that the spread occurs during adolescence (Indonesian Health Profile, 2018). The number of cases reported up to December 2016 was 17,394 AIDS sufferers, and 36,881 HIV sufferers. As many as 3,679 of them were reported to have died. The very rapid increase in the number of HIV/AIDS sufferers, the majority of whom come from Jember Regency, Pasuruan Regency, Gresik Regency, Malang Regency and Surabaya City. How AIDS is transmitted based on surveillance reports shows that the highest risk factor is heterosexual at 83.4%, then 8.2% due to injection drug use (IDUs) and 4.8% by perinatal (East Java Province Health Profile, 2017).

Apart from HIV/AIDS, diseases that need to be considered are breast cancer and cervical cancer. These two diseases can only be recognized when they start to reach the final stage. So there is a need for prevention efforts through early detection of diseases that have a long incubation period like this. Detection of breast cancer by means of Clinical Breast Examination (CBE) functions to find abnormal lumps in the breast which are an indication of breast cancer. In 2016, women in East Java Province were examined and lumps were found in 911 women. Meanwhile, 88,135 women aged 30 - 50 years in East Java were examined by IVA (Visual Inspection with Acetic Acid).

Undirected teenage curiosity will lead to bad actions. Azinar's (2013) research stated that 12.1% of students had premarital sex which had a risk of unwanted pregnancy (KTD). Variables related to premarital sexual behavior include attitudes, access and contact with pornographic media, religiosity, attitudes and sexual behavior of close friends. Even though just one of these factors is not impossible it will have a significant impact.

Free sexual activity also occurs in Aceh. One of them is risky sexual practices found in Lhokseumawe involving up to 70% of students. The negative effects of risky sex include contracting sexually transmitted diseases, HIV/AIDS, untimely pregnancy, and other social and psychological aspects. Displays of media containing pornography (VCDs and DVDs for example) which are easily available and affordable, lack of parental control, weak faith, choosing the wrong friends, as well as lack of sexual and reproductive education also contribute to an increase in risky sexual behavior. Therefore, there is a need for a movement to instill positive values that are in harmony with the culture and social roots of the nation for teenagers. Preventive efforts for risky sexual behavior in young people that can be carried out are

religious and moral education, sex and reproductive education, encouragement of young people in positive and creative activities, and ongoing parental guidance (Kasim, 2014).

Another reproductive health problem is the rise of early marriage. Teenagers marrying when they are still young can be due to no longer going to school, being pregnant before marriage, or the existence of inherent customs and culture that match ethnic groups together to maintain wealth for generations. Based on data from a report from UNICEF, Indonesia is the seventh country with the highest number of child marriages in the world with 457.6 thousand girls married before the age of fifteen. Meanwhile, in Indonesia itself, the percentage of girls aged 10-17 years who were married before the age of 15 was 39.17% (Profile of Indonesian Children, 2018).

Some teenagers think that premarital sexual behavior is normal even though they admit that it is not true and is also prohibited by religion. The majority of teenagers already know how to avoid pregnancy with contraception and then end it using traditional methods. Many teenage boys admit that they often have sexual relations with >1 woman just to seek pleasure (Hidayangsih, 2014).

If unhealthy behavior is carried out continuously, it will also become an unhealthy lifestyle. Cleopatra's research (2015) shows the influence of lifestyle on mathematics achievement. This is because achievements can increase when lifestyle increases. If the lifestyle is unhealthy, student achievement at school can also decrease.

The things a person knows will influence his actions. The knowledge of teenagers at SMA Pasundan 1 Bandung regarding sex education is closely related to premarital sexual behavior. So institutions need to prepare positive activities, for example socialization regarding sex education (Pratama, 2014).

Teenagers need to be equipped with optimal knowledge about health. Sufficient understanding will make it easier to form awareness of the importance of changing behavior so that it always leads to healthy behavior. So health promotion is very important to change all domains of adolescent behavior, starting from knowledge, attitudes and actions.

Based on the Ottawa Charter (Ottawa Charter, 1986), health promotion is an effort so that people are willing and able to maintain and improve their health by creating an environment and behavior that is conducive to health. One of them concerns controlling health factors through learning from, by, for and with the community, as well as developing community resource activities according to local social culture. Health promotion needs policy support that provides opportunities to improve public health.

According to Notoatmodjo (2010)there are several methods and media for health education and promotion that are often used. First, individual education methods, namely individual methods, for example counseling, guidance, or interviews. Second, group education methods with population size need to be considered and can be large groups, small groups or mass groups. Furthermore, there are three types of media used according to Notoatmodjo (2010). First, visual media, divided into two, namely those that are projected (for example films, film strips, slides, etc.) and those that are not projected (for example books, maps, leaflet charts, etc.). Second, audio media, for example vinyl records, radio, sound tapes. Third, audio visual media, for example video cassettes, television, and so on.

In the Big Indonesian Dictionary (KBBI) on the Network, "media" is a means of communication, such as magazines, newspapers, banners, posters, radio, film, television, and those between two parties (people, groups, and so on). Meanwhile, "social" is something related to society. Social media is a collective

online communication channel for input, sharing information, interaction and community-based collaboration. Its effectiveness as an information and promotional media was mapped by Gracia (2011) in the "Social Media Integration Theory Model." The one-to-many integration model will work optimally when we carefully examine communication channels or the implementation of online marketing and media marketing, leading to rapid adoption (Gracia, 2011).

The exposure, engagement, feedback, and exchange that social media provides makes a huge difference to the traditional understanding of communication. Social media integration is an interactive process that allows the exchange of information at the same level, creates a long-lasting communication process, and allows the sender of the message to achieve a total involvement approach from the recipient (Gracia, 2011).

One part of health promotion is health education, which will build a person's knowledge. The level of knowledge of students at SMA Muhammadiyah 4 Kartasura regarding reproductive health increased after education about health (Saputro, 2015). Apart from that, there is a need for media that will contribute to changing adolescent behavior. Posters and Facebook social media to raise awareness about driving safety, especially about driving license ownership, can change teenagers' behavior (Yosendha, 2016).

Khoirani et al. (2012) also found that media in the form of games would increase knowledge, attitudes and actions among students at SMA Negeri 1 Bagan Sinembah regarding balanced nutrition. However, it has not improved the nutritional status of students because the results are seen in a short period of time. The drug snakes and ladders intervention by Aditya (2013) can also be used as a feasible and highly qualified health promotion method.

The strategy for selecting promotional media regarding HIV/AIDS in Garut Regency is carried out through fact finding or situation analysis. This effort was carried out based on what was seen in the field. After seeing that when health promotion is only through seminars, it will more quickly lead to boredom for the target (Komala, 2014).

Various media and methods in health promotion are applied with the aim that the information provided is always remembered and can be implemented on a daily basis. Based on the background written above, the author is interested in discussing "Effective Methods and Media in Health Promotion regarding Adolescent Reproduction."

## METHODS

The method for writing this article is a literature review of several related articles that support the use of various effective methods and media in health promotion in adolescents. The articles cover several books and journals. The review involves the stages of literature search, article selection, data extraction, data analysis/synthesis, and assessment of the articles.

The articles used are about methods and media that have been researched by other people before this article was written in the last 10 years. Secondary data were obtained from related agencies, namely data from the health profile of the East Java Provincial Health Service and the Ministry of Health of the Republic of Indonesia.

## RESULT

After selecting the literature, the data were compiled. Next, a critical analysis of the research articles related to the title was carried out. The critical

analysis in this literature review is outlined in Table 1.

**Table 1.** *Critical Appraisal*

| Title | Researcher, Year | Sampling, Design Approach | Instrument | Findings |
|---|---|---|---|---|
| The Effect of Health Promotion Through Brainstorming Methods on Increasing Adolescents' Knowledge About HIV/AIDS | Iwan Ardian and Maulianna Tsaqafanisa 2015 | consecutive sampling technique, non-equivalent control group | questionnaire | There was an increase in students' HIV/AIDS knowledge from before, after the intervention in the form of brainstorming and lectures for the control group and treatment group (p = 0.002). |
| Effective Media for Genital Organ Health Education for Junior High School Students | Suwarno, Zahroh Shaluhiyah, Priyadi Nugraha Prabamurti, 2017 | purposive sampling, non-equivalent control group design | questionnaire | Shows the effectiveness of flipcharts (p=0.022) and leaflets (p=0.000) in increasing knowledge and attitudes about toilet use education and genital health. |
| The Effect of Health Promotion Using Videos in Increasing Teenagers' Knowledge and Attitudes About Early Marriage at SMP Negeri 2 Sanden Bantul Yogyakarta | Fitatul Islamiyah, 2017 | consensus sampling, non-equivalent control group design | questionnaire | There is an influence of providing health promotion between video media and leaflets (p value for both is 0.000). There was a significant increase in adolescent knowledge and attitudes in both groups, but the increase in video was higher than leaflets, so video media was considered more effective. |
| Facebook Messenger as a Media for Promotion of Adolescent Reproductive Health. Study at Muhammadiyah Middle School, Depok, Sleman, Yogyakarta | Harpeni Siswatibudi, Ira Paramastri, Luthfan Lazuardi, 2016 | purposive sampling, nonequivalent control group design | questionnaire | There is a difference in adolescent reproductive health knowledge after being given health messages via Facebook Messenger. |

| Title | Researcher, Year | Sampling, Design Approach | Instrument | Findings |
|---|---|---|---|---|
| "Shart Journey" Game in Increasing Knowledge of Hiv/Aids in Adolescents in Resocialization Environments | Asni Afifah and Muhammad Azinar, 2016 | purposive sampling, pretest-posttest with control group | questionnaire | knowledge between the control and experimental groups was different (p=0.001) indicating that SHART JOURNEY media was considered more effective in increasing knowledge about HIV/AIDS than PowerPoint. |
| Utilization of Adolescent Health Books and Adolescent Health Information Books in Bondowoso Regency | Tri Yuni Kuswandari, Antono Suryoputro, Priyadi Nugraha, 2014 | systematic random sampling, explanatory research, | interview and questionnaire | 52.1% of the utilization of Adolescent Health Books and Adolescent Health Information Books was good. Perception of the role of UKS teachers (OR=18.517) and perception of the socialization of these books showed an influence (OR=5.622). |
| Effectiveness of Peer Education on Knowledge and Attitudes of High School Students in Preventing HIV/AIDS | Laras Cyntia Kasih, 2016 | purposive sampling, quasi-experimental | observation and questionnaire | increased knowledge of experimental group students to 100% good knowledge while the control group had 84.2% good knowledge. The peer education method in this case is more effective. |
| Implementation of Adolescent Reproductive Health Education in the Physical Education, Sports and Health Curriculum in Palu City High Schools | Hermiyanty, Hasanah, Hendra Setiawan, 2016 | purposive sampling, qualitative method | *Interview* | Understanding of PJOK's competency standards and basic competencies regarding adolescent reproductive health, characteristics of policy actors, human resources as well as facilities for implementation, communication in policy implementation is still not optimal, but the attitude of the informants regarding the policy is very supportive. |

Based on the selected literature, interventions are carried out using various media and methods to find better results. Methods and media that have been tested previously become references, so that future researchers can come up with innovations so that their research results are more optimal.

This method starts from the form of lectures/counseling, combining ice

breaking, PowerPoint, and brainstorming or discussions. The media used is in visual and audiovisual form. Media can have a big or small influence depending on various things, starting from packaging, content, color, suitability, etc. Meanwhile, regarding methods, things that are created creatively such as games, peer education, and inclusion in the curriculum will maximize the influence of the method on respondents. In this way, respondents become easier to understand the information provided. It is hoped that this method and media will have an impact on improving the health status of adolescents in Indonesia.

## DISCUSSION

The various media and methods used to influence teenagers are an effort so that health promotion goals can be achieved optimally. Increasing the information possessed by teenagers will slowly have an impact on changing their attitudes. Each method and media has advantages and provides different impacts. After implementing reproductive health education, the average score of 25 student members of PIK M UHAMKA increased to 82.56, where the majority of respondents scored in the high category (Asiah, 2016). Health education can increase teenagers' knowledge so they can try to improve their thinking patterns. These results are supported by research by Srikuning (2015), namely that counseling influences knowledge about the health of young women regarding reproduction in Soma Village, Temanggung Regency. Reproductive health education not only influences knowledge, but also attitudes regarding efforts to prevent HIV/AIDS (ABCDE) at SMK Negeri 3 Banjarmasin (Amelia et al, 2016). Promotion carried out through counseling is one method that we often encounter, because it is only said directly.

Counseling is not only carried out through ordinary lectures, such as research conducted by Kurniadi (2015) which shows that there is a significant influence between counseling through lectures and slide media on the knowledge and attitudes of students at SMAN 1 Sepauk regarding HIV and AIDS. This is also confirmed by research by Ganiajri (2012) which found that providing material through lectures using PowerPoint accompanied by ice breaking will increase the knowledge of students at SMP Negeri 3 Turi, Sleman Regency. Ice breaking is an alternative solution to make the atmosphere more comfortable and less tense.

Apart from that, adding discussions is also an effective method because knowledge about reproductive health for junior high school students will increase (Syatiawati et al., 2017). This could be because brainstorming will create openness to the target. Methods that allow for face-to-face contact and direct feedback will make it easier to find out respondents' responses directly.

Media is a means that can make it easier to convey information. Suwarno et al. (2017) stated that female students' knowledge and attitudes in using the toilet and health of their genital organs increased after treatment. This increase was obtained from higher levels of communication, information and education about adolescent reproduction through leaflets rather than flipcharts. This can be influenced by the target's comfort with these two visual media. However, media that combines audio and visuals will produce a better impact. The mean of the knowledge variable regarding HIV and AIDS increased after the leaflets and videos were available (Tarigan, 2016).

Nadeak et al. (2010) conducted health promotions regarding HIV and AIDS using audiovisual media and were considered effective in increasing student knowledge about HIV and AIDS at Tri Bhakti Pekanbaru High School. Video media influences knowledge about HIV and AIDS (Handayani, 2017) and also knowledge about preventing early

marriage (Kurniasari, 2017). Apart from knowledge, videos can also influence junior high school students' attitudes about early marriage by increasing it (Islamiyah, 2017). The animated film Aku Bangga Aku Tahu accompanied by group discussions conducted by Ifroh et al. (2018) increased knowledge about HIV and AIDS at SMAN 1 and SMAN 3 Samarinda. The potential of this media is due to teenagers' interest in everything that causes movement. By combining media in the form of videos and demonstration methods, it has been proven to increase teenagers' knowledge about Breast Self-Examination (Aeni et al., 2018). Activities related to quite a lot of methods require direct practice. So demonstration helps provide clear implementation direction.

Apart from being influenced by the form of media, access to this information also needs to be considered. Health information regarding reproductive health (especially casual sex) and the dangers of drug use is really needed by teenagers and it is recommended that it be conveyed intensively, using the internet, especially through social media. Health promotion using Facebook has an influence on knowledge about the dangers of smoking in 8th semester PSIK students at Muhammadiyah University, Yogyakarta (Ardina, 2017). In addition, research by Siswatibudi et al.(2016) stated that knowledge regarding adolescent reproductive health at SMP Muhammadiyah 1 Depok and SMP Muhammadiyah 2 Depok experienced an increase in scores after being given adolescent reproductive health messages via Facebook messenger. This is in line with research by Nugrohoi (2013) which shows an increase in knowledge after intervention via Facebook groups.

The attitudes of young women who were given counseling by Sulistyoningtyas et al. (2016) regarding reproductive organ care were better than those who were not provided, even though access to social media for health information was both equally high. However, the attitudes of young women who were given counseling were also better than those who were not given even though social media access for the group that was given counseling was low. This illustrates that equal access to social media will lead to better results when counseling is given compared to when it is not.

Games are one method that can increase respondents' interest because they involve mutual involvement. Afifah's counseling (2016) using the game 'SHART JOURNEY' which is an abbreviation for Stop HIV/AIDS I'm a Tough Teenager, namely an innovation of the monopoly game, has a greater influence than through PowerPoint on teenagers living in the Argorejo resocialization environment in generating knowledge about HIV. /AIDS is increasing. This is because the game will create interaction between individuals. Apart from that, it also involves many of the respondents' senses.

A lot of information requires media that can be easily used and practical. Research by Kuswandari et al. (2014) stated that more than half of the targets made good use of the Adolescent Health Book and Adolescent Health Information Book. Things that influence teenagers in Bondowoso Regency are perceptions regarding the role of UKS teachers and regarding the socialization of these two books so that they tend to be used optimally. This book is easy to use because there is no need to have difficulty searching again because it is in the form of a handout.

Communication with people of the same age will facilitate interaction. Kasih's research (2016) shows that peer education is more effective when used as a method of education in health. In this way, the information provided will be more acceptable and actionable.

Research by Hermiyanty et al. (2016) states that the application of KRR education in the Basic Competency and Competency Standards (SKKD) for

Physical Education and Health Sports (PJOK) through the concept of implementing Van Meter and Van Horn has not been implemented optimally. There are still many things lacking in implementation, namely targets and standards that are not yet optimal, due to a lack of understanding regarding the PJOK SKKD, especially which contains material about Adolescent Reproductive Health (KRR). In terms of human resources, it has not been optimal in terms of both quantity and quality of implementation. The characteristics are also still not optimal because the implementers are not consistent and comply with the provisions which require them to provide KRR material to students. Communication is still not optimal in providing information regarding this policy. In the attitude variable, there was great support when the KRR material was integrated into PJOK lessons.

The use of promotional media such as leaflets, banners, banners, pocket books and online media complete with audiovisuals is felt to be more effective than just outreach in the form of seminars or Training of Trainers (TOT) alone (Komala et al., 2006). This overall combination will make it easier for respondents to remember things they have seen or heard. When they are doing something, they will easily find this information.

Films are one of the media that teenagers really like. Research by Ramadhani et al. (2014) which used the Korean films 'Naughty Kiss' and 'Protect The Boss' as media showing that teenagers learned how to date and have sexual activities when dating through Korean films. Only kissing is done and belief is that sex is only done after marriage like in the film. However, you also have to be wary if there is an ease in kissing and sleeping together and there is no idea about the health impacts of having free sex. There needs to be a space for discussion to criticize the meaning, implications of the scene and the various impacts it causes.

Teenagers today carry out actions that have a risk of negative impacts on health in the coming decades. This will have many impacts and may not only affect one sector. This risky behavior is closely related to psychological factors. The status of the population needs to be improved through preventive efforts on risky behavior through a client-centered approach method with an understanding of the characteristics of adolescents, can encourage adolescents to take actions that support their health, and modify behavior for adolescents with early phase non-communicable diseases (Isfandari, 2014).

## CONCLUSION

The methods and media used for adolescents must be based on appropriate background or situation analysis. Apart from that, we also look at the age pattern of the respondents so that they are interested. A more effective method is a method that is considered not boring for teenagers. Apart from that, it is also necessary to include an interesting icebreaker for methods that involve direct meetings. With innovations that require responses from respondents, the impact of providing information will be more tangible, for example through short questions.

The combination of media that involves many human senses can generate high enthusiasm in teenagers. Likewise, game innovations that create a more relaxed atmosphere have a positive influence on respondents' reception of information. The use of social media can more easily help promote health, seeing the high use of social media among teenagers today. So teenagers often reach out to information related to health.

Peer education will be very helpful because communication with someone who is not much different in age will be easier to understand. Schools also need to

include education about reproductive health in the PJOK curriculum. In addition, a client-centered approach by understanding the characteristics of teenagers will help them behave healthily.

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Original Research

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# THE ASSOCIATION BETWEEN INDIVIDUAL, PHYSICAL, AND PSYCHOSOCIAL RISK FACTORS AND OCCUPATIONAL FATIGUE AMONG COMMUTER LINE TRAIN WORKERS

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**ABSTRACT**

**Introduction:** Occupational fatigue affects workers in various industries including transportation. Commuter train drivers and office workers are subjected to high levels of physical and psychosocial stress, which can lead to occupational fatigue. **Aims:** to examine the relationship between individual, physical, and psychosocial risk factors and occupational fatigue in commuter train workers in Jakarta, Bogor, Tangerang, and Bekasi. **Methods:** Individual (i.e., age, gender, marital status, type of work, duration of work, and smoking status), psychosocial (i.e., effort, reward, overcommitment, monotonous work, social support, job satisfaction, and work stress) factors, and occupational fatigue were investigated in 78 commuter line train workers (both drivers and officers). Observing workers' activities yielded physical factors (awkward posture, repetitive work, prolonged work, and material manual handling activities). The association between each risk factor and occupational fatigue was investigated using a logistic regression model. **Results:** Commuter line officers (OR 4.96, 95% CI 1.77 – 13.85), those with high overcommitment (OR 3.16, 95% CI 1.25 – 8.00), and those with high work stress (OR 1.54, 95% CI 1.19 – 2.00) were more likely to report occupational fatigue than train drivers, who reported low overcommitment and low work stress, respectively. When compared to those who reported low job satisfaction, those who reported high job satisfaction were less likely to report occupational fatigue (OR 0.19, 95% CI 0.07 – 0.52). **Conclusion:** Job position, overcommitment, and work stress were associated with occupational fatigue.

**Keywords**: fatigue, stress, shift work, psychosocial

## INTRODUCTION

Fatigue is a state of feeling tired and sleepy because of prolonged mental and physical work, continued anxiety, work environment factors, and loss of sleep (Sadeghniiat-Haghighi and Yazdi, 2015). Fatigue is the result of prolonged mental or physical work and can affect performance and interfere with alertness, resulting in errors (Health and Safety Executive, UK, 2006). Occupational fatigue refers to fatigue conditions related to workload. Occupational fatigue affects workers in various industries including transportation. More than 32% of workers experience sleep disorders that may be linked to occupational fatigue (Choobineh, Javadpour et al., 2018). A previous research among a total sample of 206 commuter rail driver and rail traffic officers, more than half reported experience of fatigue during night shifts (Harma, Sallinen et al., 2002). In addition, the two-week prevalence of fatigue among the US workforce (Ricci, Chee et al., 2007). The prevalence of fatigue, assessed using a critical flicker fusion analyzer, was 32.32% among chemical transportation drivers (Phatrabuddha, Yingratanasuk et al., 2018).

Occupational fatigue has become a major concern as a risk factor for accidents and absences from work. (Lerman, Eskin et al., 2012, Widanarko and Modjo, 2017). A Canadian investigation of 18 accidents found that the fatigue of freight railway operating employees contributed to the occurrence of accidents (Rudin-Brown, Harris et al., 2019). Additionally, fatigue has been reported to be associated with short-term cognitive and physical

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deprivation, which may cause errors or injuries (Techera, Hallowell et al., 2016). Occupational fatigue also impacts the economy. In the United States, healthcare costs due to occupational fatigue total $136.4 billion (Ricci, Chee et al., 2007). A study in the US involving 28,902 adults showed that fatigue was associated with health-related lost productive time (Ricci, Chee et al., 2007).

Occupational fatigue involves various risk factors, including individual, physical, psychosocial, environmental, and work organizations (Widanarko and Modjo, 2017). Individual factors include age, length of service, sex, body mass index (BMI), and smoking habits (Bazazan, Rasoulzadeh et al., 2014, WSH Council, 2010). Physical factors related to fatigue include awkward posture, static muscle work, long duration of work, manual handling of loads, and repetitive movements (Sadeghniiat-Haghighi and Yazdi, 2015, Widanarko and Modjo, 2017). Psychosocial and organizational factors related to fatigue include poor shift work arrangements, long working hours, overcommitment, high work demands, low job control, low social support, dissatisfaction with work, monotonous work, and job stress (Harma, Sallinen et al., 2002, Sadeghniiat-Haghighi and Yazdi, 2015, Widanarko and Modjo, 2017). Noise, vibration, lighting, humidity, and temperature have been found to be associated with occupational fatigue as environmental factors (Sadeghniiat-Haghighi and Yazdi, 2015, Techera, Hallowell et al., 2016, Widanarko and Modjo, 2017).

A systematic review and meta-analysis found that workers with sleep problems have a higher risk of injury than those without sleep problems (Uehli, Mehta et al., 2014). Employees of freight rail companies reported not getting enough sleep due to shift schedules, which may also contribute to sleep-related fatigue by limiting sleep opportunities (Rudin-Brown, Harris et al., 2019). Several accident reports have also indicated that fatigue and poor shift schedules are major contributors to serious rail accidents (Harma, Sallinen et al., 2002). Based on data from the Ministry of Transportation of the Republic of Indonesia in 2015-2019 on the trend of train accidents in Indonesia in, 2015 there were 55 train accidents; in 2016 and 2017, the number of train accidents decreased to 15 and 11 accidents in 2019, respectively (Directorate General of Railways Ministry of Transportation, 2020). Incident investigations showed that 33% of railway accidents in Indonesia between 2010 and 2016 were due to human factors (National Transportation Safey Committee, 2016).

Although many studies have investigated the risk factors for occupational fatigue, less is known about the association between work-related risk factors and occupational fatigue in developing countries, particularly in the transportation industry. As a result, the purpose of this study is to look into the relationship between individual, physical, and psychosocial risk factors and occupational fatigue among commuter train workers in Jakarta, Bogor, Tangerang, and Bekasi.

## METHODS

The present study was conducted at a commuter line train company in Jakarta in 2018. Seventy-eight commuter line train workers (49 drivers and 29 officers based on their job title) participated in the present study. They were then randomly selected. This study employed a cross-sectional research design using a quantitative approach. Information on individual (i.e., age, gender, marital status, type of work, duration of work, and smoking status) and psychosocial factors such as effort (Siegrist, Wege et al., 2008), reward (Siegrist, Wege et al., 2008), overcommitment (Siegrist, Wege et al., 2008), monotonous work (Karasek, Choi et al., 2007), social support from supervisors, co-workers, and families (Karasek, Choi et al., 2007), job satisfaction

(NIOSH, 2002), and work stress (NIOSH, 2002) were gathered using a set of validated self-administered questionnaires. The Swedish Occupational Fatigue Inventory (SOFI) was used to examine occupational fatigue (Lundh Hagelin, Wengström et al., 2009). The SOFI was developed to measure five subjective dimensions of work-related fatigue: lack of energy, physical exertion, physical discomfort, lack of motivation, and sleepiness (Lundh Hagelin, Wengström et al., 2009). All psychosocial factors and fatigue questions had answer alternatives of strongly agree (scored as 1), agree (scored as 2), disagree (scored as 3), and strongly disagree (scored as 4). The average score for each psychosocial factor and fatigue was used as the final score. The median score was used as a cut-off point to determine low or high psychosocial exposure or fatigue. All questions were valid ( r-count>r-table) and reliable ( internal consistency was good, with Cronbach's alpha coefficients > 0.7).

Physical factor data (awkward posture, repetitive work, prolonged work, and material manual handling activities) were collected by observing the workers' activities while using the Quick Exposure Check form (David, Woods et al., 2008) to determine the level of musculoskeletal disorder risk (low/medium/high) in particular body regions, that is, the back, shoulder/arm, wrist, and neck. The association between each risk factor (individual, physical, and psychosocial) and occupational fatigue was investigated using bivariate logistic regression analysis. Odds ratios and 95% confidence intervals (CI were used to assess the strength of the relationship between risk factors and occupational fatigue. Odds ratios (and their 95 percent confidence intervals) greater than one were considered risk factors, whereas odds ratios less than one were considered protective factors. Ethics approval for the present study was obtained from the Faculty of Public Health, Universitas Indonesia (No. 147/UN2. F10/PPM.00.02/2018).

## RESULT

This study included 78 commuter line train workers (49 drivers, 29 officers). Of 78 commuter line train workers, 52% reported occupational fatigue. In detail, 39% of the drivers reported occupational fatigue, whereas 76% reported occupational fatigue. The distribution of the participants based on individual, physical, and psychosocial factors is shown in Table 1.

**Table 1**. Distribution of participants based on individual, physical, and psychosocial factors

| Risk factors | n | % |
|---|---|---|
| **Individual factors** | | |
| Age | | |
| <27 | 36 | 46 |
| ≥27 | 42 | 54 |
| Gender | | |
| Woman | 7 | 9 |
| Man | 71 | 91 |
| Marital status | | |
| Single | 31 | 60 |
| Married | 47 | 40 |
| Type of work | | |
| Driver | 49 | 63 |
| Officer | 29 | 37 |
| Years of work | | |
| <5 years | 39 | 50 |
| ≥5 years | 39 | 50 |
| Sleep duration | | |
| ≥ 6 hours | 40 | 51 |
| < 6 hours | 38 | 49 |
| Shift work | | |
| Morning | 53 | 68 |
| Day | 14 | 18 |
| Night | 11 | 14 |
| Smoking status | | |
| No | 59 | 76 |
| Ex-Smoker | 4 | 5 |
| Yes | 15 | 19 |
| **Physical factors** | | |
| Back | | |
| Low risk | 24 | 30 |
| Medium risk | 43 | 55 |

| **Risk factors** | **n** | **%** |
|---|---|---|
| High risk | 11 | 14 |
| Shoulder/Arm | | |
| Low risk | 26 | 34 |
| Medium risk | 24 | 30 |
| High risk | 28 | 36 |
| Wrist | | |
| Low risk | 26 | 34 |
| Medium risk | 52 | 66 |
| High risk | 0 | 0 |
| Neck | | |
| Low risk | 0 | 0 |
| Medium risk | 24 | 30 |
| High risk | 54 | 70 |
| **Psychosocial factors** | | |
| Effort | | |
| Low | 38 | 49 |
| High | 40 | 51 |
| Reward | | |
| Low | 22 | 28 |
| High | 56 | 72 |
| Overcommitment | | |
| Low | 37 | 47 |
| High | 41 | 53 |
| Monotonous work | | |
| Low | 16 | 21 |
| High | 62 | 79 |
| Co-worker support | | |
| Low | 16 | 21 |
| High | 62 | 79 |
| Supervisor support | | |
| Low | 11 | 14 |
| High | 67 | 86 |
| Family support | | |
| Low | 35 | 45 |
| High | 43 | 55 |
| Job satisfaction | | |
| Low | 37 | 47 |
| High | 41 | 53 |
| Work stress level | | |
| Low | 37 | 47 |
| High | 41 | 53 |

Details of the distribution of physical and psychosocial risk factors by type of work (commuter line train drivers and officers) are shown in Tables 2 and 3, respectively.

**Table 2**. Distribution of physical risk factors by type of work (drivers and officers)

| **Physical factors** | **Drivers** | | | | | | **Officers** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Low** | | **Medium** | | **High** | | **Low** | | **Medium** | | **High** | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Back | 12 | 24 | 28 | 57 | 9 | 18 | 12 | 41 | 15 | 52 | 2 | 7 |
| Shoulder/ Arm | 13 | 26 | 15 | 31 | 21 | 43 | 13 | 45 | 9 | 31 | 7 | 24 |
| Wrist | 13 | 26 | 36 | 73 | 0 | 0 | 13 | 45 | 16 | 55 | 0 | 0 |
| Neck | 0 | 0 | 12 | 24 | 37 | 75 | 0 | 0 | 12 | 41 | 17 | 59 |

**Table 3**. Distribution of psychosocial risk factors by type of work (drivers and officers)

| **Psychosocial factors** | **Drivers** | | | | **Officers** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Low** | | **High** | | **Low** | | **High** | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| Effort | 31 | 63 | 18 | 37 | 7 | 24 | 22 | 76 |
| Reward | 15 | 31 | 34 | 69 | 7 | 24 | 22 | 76 |
| Overcommitment | 30 | 61 | 19 | 39 | 7 | 24 | 22 | 76 |
| Monotonous work | 5 | 10 | 44 | 90 | 11 | 38 | 18 | 62 |
| Co-worker support | 9 | 18 | 40 | 82 | 7 | 24 | 22 | 76 |

| Psychosocial factors | Drivers | | | | Officers | | | |
|---|---|---|---|---|---|---|---|---|
| | Low | | High | | Low | | High | |
| | n | % | n | % | n | % | n | % |
| Supervisor support | 4 | 8 | 45 | 92 | 7 | 24 | 22 | 76 |
| Family support | 21 | 43 | 28 | 57 | 14 | 48 | 15 | 52 |
| Job satisfaction | 29 | 59 | 20 | 41 | 8 | 28 | 21 | 72 |

## Individual, physical, and psychosocial risk factors

Almost half of the participants were aged <27 years, 91% were male, and 60% were single. Most participants were train drivers (60%). In terms of years of work, half of the participants had worked for more than 5 years. In addition, 68% were morning shift workers, and 51% reported that the average duration of sleep was ≥ 6 h every night. Most participants (76%) were nonsmokers (Table 1).

The results of the observation for physical factors showed that, in general, 14%, 36%, and 70% of participants had a high risk in the back, shoulder/arm, and neck regions, respectively. Whereas 66% of participants had medium risk in the wrist region, approximately 51%, 53%, and 79% of participants reported high effort, overcommitment, and monotonous work, respectively. In contrast, 72% of the participants reported high rewards, and 79% and 86% reported high co-worker support and supervisor support, respectively. More than half of the participants reported high levels of work-related stress (Table 1).

Commuter line train drivers had a higher proportion of those who had a high risk in the back (18% *vs* 7%), shoulder/arm (43% *vs* 24%), and neck regions (75% *vs* 59%) than officers (Table 2). Commuter line train officers seemed to be more exposed to psychosocial risk factors than commuter line train drivers. The findings were particularly for effort (76% *vs* 37%) and overcommitment (76% *vs* 39%). In addition, although 90% of commuter line train drivers reported highly monotonous work, more than 80% reported high support from co-workers and supervisors. In contrast, more commuter line train officers reported that their job was satisfied (72%) than commuter line train drivers (41%) (Table 3).

## The association between individual, physical, and psychosocial factors, and occupational fatigue

The results of the bivariate logistic regression (Table 4) showed that only individual (i.e., type of work) and psychosocial (i.e., overcommitment, job satisfaction, and work stress) factors were associated with occupational fatigue. None of the physical factors was associated with occupational fatigue. Commuter line train officers were more likely than commuter line train drivers to report occupational fatigue (OR 4.96, 95 percent CI 1.77 – 13.85). Furthermore, those with high over-commitment (OR 3.16, 95 percent CI 1.25–8.00) and high work stress (OR 1.54, 95 percent CI 1.19–2.00) were more likely to report occupational fatigue than those with low over-commitment and low work stress. In contrast, those who reported their job to be highly satisfied were less likely (OR 0.19, 95% CI 0.07 – 0.52) to report occupational fatigue than those who reported their job to be less satisfied. Although ex-smokers (OR 15.00, 95% CI 1.83 – 122.45) were more likely to report occupational fatigue than non-smokers, the wide confidence interval showed the possibility of bias due to the small number of patients in this group. Hence, this risk factor was not significantly associated with occupational fatigue.

**Table 4.** The association between individual, physical, and psychosocial factors and occupational fatigue

| Risk factors | n | Occupational fatigue | | | |
|---|---|---|---|---|---|
| | | no of cases | % | OR | (95% CI) |
| **Individual factors** | | | | | |
| Age | | | | | |
| <27 | 36 | 19 | 53 | 1.00 | |
| ≥27 | 42 | 22 | 52 | 0.98 | 0.40 – 2.40 |
| Gender | | | | | |
| Woman | 7 | 6 | 86 | 1.00 | |
| Man | 71 | 35 | 49 | 0.16 | 0.01 – 1.41 |
| Marital status | | | | | |
| Single | 31 | 17 | 55 | 1.00 | |
| Married | 47 | 24 | 51 | 0.85 | 0.34 – 2.13 |
| Type of work | | | | | |
| Driver | 49 | 19 | 39 | 1.00 | |
| Officer | 29 | 22 | 76 | **4.96** | **1.77 – 13.85** |
| Years of work | | | | | |
| <5 years | 39 | 22 | 56 | 1.00 | |
| ≥5 years | 39 | 19 | 49 | 0.73 | 0.30 – 1.79 |
| Sleep duration | | | | | |
| ≥ 6 hours | 40 | 17 | 42 | 1.00 | |
| < 6 hours | 38 | 24 | 63 | 2.31 | 0.93 – 5.76 |
| Shift work | | | | | |
| Morning | 53 | 30 | 57 | 1.00 | |
| Day | 14 | 7 | 50 | 0.76 | 0.23 – 2.49 |
| Night | 11 | 4 | 36 | 0.43 | 0.11 – 1.67 |
| Smoking status | | | | | |
| No | 59 | 27 | 46 | 1.00 | |
| Ex-Smoker | 4 | 1 | 25 | 15.00 | 1.83 – 122.45 |
| Yes | 15 | 13 | 87 | N/A | N/A |
| **Physical factors (level of musculoskeletal disorders risk at particular body part)** | | | | | |
| Back | | | | | |
| Low | 24 | 10 | 42 | 1.00 | |
| Medium | 43 | 25 | 58 | 1.94 | 0.70 – 5.35 |
| High | 11 | 6 | 54 | 1.15 | 0.39 – 7.07 |
| Shoulder/Arm | | | | | |
| Low | 26 | 11 | 42 | 1.00 | |
| Medium | 24 | 11 | 46 | 0.34 | 0.37 – 3.59 |
| High | 28 | 19 | 68 | 2.87 | 0.94 – 8.74 |
| Wrist | | | | | |
| Low | 26 | 11 | 42 | 1.00 | |
| Medium | 52 | 30 | 58 | 1.86 | 0.71 – 4.82 |
| High | 0 | 0 | | | |
| Neck | | | | | |
| Low | 0 | 0 | | | |
| Medium | 24 | 10 | 42 | 1.00 | |
| High | 54 | 31 | 57 | 1.88 | 0.71 – 5.00 |

| Risk factors | n | Occupational fatigue | | | |
|---|---|---|---|---|---|
| | | no of cases | % | OR | (95% CI) |
| **Psychosocial factors** | | | | | |
| Effort | | | | | |
| Low | 38 | 17 | 45 | 1.00 | |
| High | 40 | 24 | 60 | 1.85 | 0.75 – 4.55 |
| Reward | | | | | |
| Low | 22 | 12 | 54 | 1.00 | |
| High | 56 | 29 | 52 | 0.89 | 0.33 – 2.40 |
| Overcommitment | | | | | |
| Low | 37 | 14 | 38 | 1.00 | |
| High | 41 | 27 | 66 | **3.16** | **1.25 – 8.00** |
| Monotonous work | | | | | |
| Low | 16 | 10 | 62 | 1.00 | |
| High | 62 | 31 | 50 | 0.60 | 0.19 – 1.85 |
| Co-worker support | | | | | |
| Low | 16 | 11 | 69 | 1.00 | |
| High | 62 | 30 | 48 | 0.42 | 0.13 – 1.37 |
| Supervisor support | | | | | |
| Low | 11 | 9 | 82 | 1.00 | |
| High | 67 | 32 | 48 | 0.20 | 0.04 – 1.01 |
| Family support | | | | | |
| Low | 35 | 21 | 60 | 1.00 | |
| High | 43 | 20 | 46 | 0.58 | 0.23 – 1.43 |
| Job satisfaction | | | | | |
| Low | 37 | 12 | 32 | 1.00 | |
| High | 41 | 29 | 71 | **0.19** | **0.07 – 0.52** |
| Work stress level | | | | | |
| Low | 37 | 14 | 38 | 1.00 | |
| High | 41 | 27 | 66 | **1.54** | **1.19 – 2.00** |

95% CI = 95% Confidence Interval

## DISCUSSION

### The association between individual factors and occupational fatigue

The type of work (drivers vs. officers) was the only individual factor associated with occupational fatigue. The type of work consisted of commuter line train drivers and officers. Based on these results, the percentage of fatigue was higher in officers (76%) than in drivers (39%). The results of the bivariate logistic regression analysis using the SOFI fatigue questionnaire showed that there was a significant association between the type of work and the incidence of fatigue, as evidenced by the OR of 4.96 with 95% CI 1.77 – 13.85, from which it can be said that officers had a risk of fatigue 4.96 times higher than that of drivers. The results of the present study differ from those of a previous study (Pramasari, Widjasena et al., 2017). Pramasari's study showed that commuter line train drivers had a higher risk of fatigue. Commuter line train drivers were reported to have extended working hours (overtime), an early morning work shift, which starts at 3:00 am, the need for a high level of vigilance, and the existence of long and monotonous travel routes.

However, as occupational fatigue is multifactorial, there may be risk factors that contribute to occupational fatigue. Commuter line train drivers were more likely to be exposed to physical factors, and

none of these physical factors were significantly associated with occupational fatigue. In contrast, the present study showed that psychosocial factors, such as overcommitment, were strongly associated with occupational fatigue (odds ratio [OR] 3.16, 95% CI 1.25 – 8.00). Most commuter line train officers (76%) reported high overcommitment compared with commuter line train drivers (39%). This may explain why commuter line train officers were more likely to report occupational fatigue than commuter line train drivers.

The present study did not find an association between age and occupational fatigue. The rationale for this finding is that the cut-off point of the age group may be too low (27 years). As a result, both age groups seemed to be relatively young. Hence, occupational fatigue can quickly recover. The results of the present study were not in line with previous studies that found an association between age and occupational fatigue (Harma, Sallinen et al., 2002). A study conducted on train drivers and traffic control showed that train drivers aged <43 years experienced more fatigue during the morning shift than drivers aged >43 years (Harma, Sallinen et al., 2002).

The present study failed to find an association between gender and occupational fatigue. This may be because the sample was dominated by males (91%). Work duration was not associated with occupational fatigue. This finding is consistent with that of a previous study that examined the risk factors for work-related fatigue among Indonesian miners (Widanarko, Modjo et al., 2018). No association was found between sleep duration and occupational fatigue in the present study. This might be the cutoff point used (i.e., 6 h) to determine the low/high exposure group. A previous study among Australian rail industry workers (*n*=90) suggested that sleeping for less than 5 hours significantly increased the likelihood of work-related fatigue.

The work schedule (shift) for the commuter rail driver was adjusted according to the train schedule. The engineers' schedule is rotated every day, as is the train's travel route. The machinists' schedule lasts from 3:00 a.m. to 2:00 a.m., with a work duration ranging from to 5-7 hours per day, which is also influenced by the flow of train traffic. Although the present study failed to show an association between shift work and occupational fatigue, the percentage of occupational fatigue was higher in commuter line train workers with morning work schedules (57%) than in commuter line train workers with day and night work schedules. Similarly, previous studies have shown a significant association between work shifts and the occurrence of occupational fatigue (Harma, Sallinen et al., 2002). Harma, Sallinen et al. (2002) showed that those who worked in the morning had a higher risk of working in the afternoon, night, and day shifts.

**The association between physical factors and occupational fatigue**

The physical risk factors in this study included the risk of musculoskeletal disorders in the back, shoulders, arms, wrists, and neck. The observation results are presented as in total (commuter line train workers, (Table 1), as well as separately for commuter line train drivers and officers (Table 2) due to different work characteristics for both types of work. These differences may result in different levels of musculoskeletal risk for specific body regions. Commuter line train drivers had a higher proportion of those who had a high risk in the back (18% *vs* 7%), shoulder/arm (43% *vs* 24%), and neck regions (75% *vs* 59%) than officers (Table 2). This is because the commuter line trains drivers' activities while operating the commuter line train were exposed to physical exposure, such as back bending forward, back twisted, and neck bending forward for a long period (almost 7 h per day). However, the results of the analysis of the association between physical risk factors and occupational fatigue showed

that there was no significant association between physical risk factors related to the back, shoulders, arms, wrists, or neck and the occurrence of occupational fatigue in workers. Further studies are required to confirm this association.

**The association between psychosocial factors and occupational fatigue**

Previous studies have identified psychosocial factors as predictors of occupational fatigue. According to one study, while the relationships between psychosocial factors and fatigue vary, psychological job demands and skill discretion are strongly associated with fatigue among registered nurses (Parhizi, Steege et al., 2013). Another previous study found that work-related chronic fatigue was strongly associated with stress, trust in management, decision latitude, self-rated health, and work-family conflict (Rahman, Abdul-Mumin et al., 2016). Similarly, psychosocial factors (burnout, self-rated health, over-commitment, trust in management, and threat of violence) were also found to be associated with acute occupational fatigue.
(Rahman, Abdul-Mumin et al., 2016). Thus, the results of the present study are consistent with those of previous studies.

The descriptive results of the present study show that the proportion of occupational fatigue was higher in the high psychosocial risk group than in the low psychosocial risk group (Table 3). However, only over-commitment, job satisfaction, and work stress were significantly associated with occupational fatigue (Table 4). The proportion of people experiencing occupational fatigue was higher in the high over-commitment group than in the low over-commitment group. There was a significant association between overcommitment and the occurrence of occupational fatigue, as evidenced by an OR of 3.16, 95% CI of 1.25 – 8.00. This means that commuter line train workers with a high overcommitment to work had a risk of occupational fatigue 3,16 times higher than those with low overcommitment.

The results of this study are in accordance with those of Widanarko and Modjo (2017), who found a significant association between over-commitment and the occurrence of work-related fatigue. In the present study, a high level of overcommitment was a risk factor for work-related fatigue. Commuter line train officers were reported to have a high level of over-commitment. In contrast, 61% of the commuter line train drivers reported a low level of overcommitment. Overcommitment was also found to be associated with acute occupational fatigue in a previous study (Rahman, Abdul-Mumin et al., 2016).

Social support from coworkers, supervisors, and family members constitutes psychosocial factors of social support. The current study found that workers with low social support from coworkers, supervisors, or families experienced more occupational fatigue than those with high social support from coworkers, supervisors, or family members. However, there was no significant relationship between social support from coworkers, supervisors, or family members and occupational fatigue. In contrast, a previous study showed that supervisor support can play a role as a risk factor for occupational fatigue. Research conducted by Liu and Aungsuroch (2019) showed that social support directly influences work stress and burnout. In turn, this condition may cause occupational fatigue. Another study found that social support can act as a buffer in the association between workload and work pressure (Huynh, Xanthopoulou et al., 2013).

Job satisfaction was a significant protective factor against occupational fatigue, as demonstrated by an OR of 0.19 with a 95% CI 0.07 – of 0.52. This means that workers with high job satisfaction were protected 0.19 times more than workers with low job satisfaction. This result is consistent with previous research conducted

by Baeriswyl, Krause et al. (2016), and Rosales, Labrague et al. (2013), who found that there was a negative association between job satisfaction and the occurrence of exhaustion or burnout. In fact, a meta-analytic study discussed fatigue and job satisfaction as major determinants of safety (Nahrgang, Morgeson et al., 2011). This may indicate that job satisfaction is a buffer for poor psychosocial conditions.

Work stress was significantly associated with fatigue, as evidenced by an OR of 1.54 with 95% CI of 1.19 – 2.00. This implies that workers with high stress levels had a risk of occupational fatigue of 1.54 times higher than workers with low stress levels. These results are consistent with those of Jacobs et al. (2015), who investigated the association between work stress and occupational fatigue among office workers. Similarly, Mamusung et al. (2019) found that work stress was positively associated with occupational work-related fatigue among officers. This finding shows that interventions to reduce occupational fatigue should also address work-related stress issues in the workplace.

The strength of the present study is the use of a valid and reliable questionnaire. Hence, these results are expected to be valid. However, this study has a few limitations. First, the cross-sectional study methods were unable to draw firm conclusions on the cause–effect of the variables, only the association between variables. Second, variables that may also influence the occurrence of fatigue were not included. These are environmental factors, nutrition, and activities at home.

## CONCLUSIONS

The present study showed that approximately 52% of the commuter line workers reported occupational fatigue. In detail, 39% of the drivers reported occupational fatigue, whereas 76% reported occupational fatigue. Individual (i.e., type of work) and psychosocial (i.e., overcommitment, job satisfaction, and work stress) factors were significantly associated with occupational fatigue. Commuter line train officers were more likely to report occupational fatigue than commuter line train drivers. Furthermore, those who reported high overcommitment and work stress were more likely to report occupational fatigue than those who reported low overcommitment and work stress. Those who reported high job satisfaction were less likely to report occupational fatigue than those who reported low job satisfaction were. None of the physical factors was associated with occupational fatigue. This study implies that a fatigue management system should be developed not only for commuter line train drivers, but also for officers. The results suggest that interventions to reduce the prevalence of occupational fatigue include improving psychosocial conditions (i.e., lower overcommitment, high job satisfaction, and managing work stress) with a focus on commuter line officers. More research is needed to establish a clear link between occupational fatigue and individual, physical, and psychosocial risk factors.

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Original Research

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# THE EFFECT OF SHORT COURSE INTERVENTIONS TO IMPROVE KNOWLEDGE OF POSYANDU (INTEGRATED SERVICE POST) CADRES IN EARLY DETECTION OF STUNTING

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**ABSTRACT**

**Introduction:** Stunting is a cumulative growth and development disorder caused by inadequate nutritional intake, recurrent infectious diseases, or both. RISKESDAS data for 2018 recorded a national stunting prevalence of 30.8%, and Dilem Village, Malang Regency, is one of the loci for stunting in Indonesia in 2020. Anthropometry is a growth monitoring method for assessing children's nutritional status and one of the activities at Posyandu, is organized and led by cadres. Hence, it is important to increase the knowledge of Posyandu cadres to achieve the accuracy of children's nutritional status. **Aim:** The goal of this study was to determine the effect of short course intervention in the knowledge levels of Posyandu cadres in Dilem Village on early detection of stunting and anthropometric measurements of child**. Method:** The purpose of this study was to determine the effect of short course intervention in the knowledge levels of Posyandu cadres in Dilem Village on early detection of stunting before and after course This study was a pre-experimental study using one group of pre-posttest designs to assess the knowledge of 20 Dilem village cadres for early detection of stunting and correct anthropometric measurements before and after the intervention. **Result:** The results showed an increase of pre and posttest increase in score 16.5 points ($p<0.001$). **Conclusion:** So, it can be concluded that short course intervention can improve cadre's knowledge on early detection of stunting.

**Keywords**: Stunting; Toddler Cadre; Anthropometry; Integrated Healthcare Center

## INTRODUCTION

Stunting is a child development disorder, where the child's height is less than other children's heights at the same age in general. The diagnosis of stunting is determined based on length/height according to age which is less than -2 SD on the WHO growth curve (Ministry of Health 2020b; Ministry of Villages, Development of Disadvantaged Regions 2017). In 2017, more than half of the world's stunted toddler were from Asia (55%), while more than a third (39%) lived in Africa. Of the 83.6 million stunted children under five in Asia, South Asia had the highest proportion (58.7%) and Central Asia had the lowest proportion (0.9%) (Data and Information Center Indonesia, 2018).

Indonesia has the third-highest prevalence in the Southeast Asia/South East Asia Region (SEAR), according to the World Health Organization (WHO). Between 2005 and 2017, Indonesia's under-five population had a 36.4% average prevalence of stunting (Data and Information Center Indonesia, 2018). Stunting is nearly as common in Indonesia as it is in other Southeast Asian nations like Myanmar (35%), Vietnam (23%) and Thailand (16%). Meanwhile, according to statistics from the 2018 Basic Health Research, stunting was prevalent in 30.8 % of Indonesian children. This indicates that 8.9 million Indonesian children, or one in three Indonesian children, have suboptimal growth (Basic Health Research, 2018). Therefore, the 2019–2024 National Medium–Term Development Plan

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(RPJMN) establishes four health development targets, one of which is to reduce the prevalence of stunting in children under five from 30.8% in 2018 to 14% in 2024 (Basic Health Research, 2018; TNP2K, 2018).

Stunting develops over time as a result of insufficient nutrition intake, persistent infectious illness, or both. Stunting can take place even before birth as a result of very inadequate nutritional intake during pregnancy, very poor consume patterns, and low-quality food consistent with the frequency of infection, thus inhibiting growth. Stunting does not emerge until the child is 2 years old, despite the fact that malnutrition starts while the baby is still in the womb and in the first few days after birth (Ministry of Villages, Development of Disadvantaged Regions 2017). Stunting may lower the immune system, increase developing infection, obesity, hypertension, increase mortality, cognitive decline, delayed motor development, and imbalances in physical functioning (Febriana et al., 2020). The results of several studies also show that children born with LBW and at a less gestational age have lower IQ scores, worse speaking skills, lower reading ability, and worse school performance (Ministry of Villages, Development of Disadvantaged Regions, 2017).

One of the primary components of the nutrition improvement program, which emphasizes prevention and improvement of child nutrition, is growth monitoring. One of the monitoring of growth is the method of assessing nutritional status, in various ways one of which is anthropometry (Ministry of Health 2020a, 2012a). Anthropometry is one of the most popular methods for direct nutritional status assessment and can be applied to populations with large sample sizes. Anthropometry as an indicator of nutritional status can be carried out by measuring several parameters, while a parameter is a single measurement of the size of the human body. Anthropometry as an indicator of nutritional status can be done by measuring several parameters, one of which is height or body length. Height is an important parameter of past and present conditions (Ministry of Health,2012a, 2020b).

Height-for-age Z-Score (HAZ) is an indicator of whether a child is stunted or normal (Ministry of Health, 2020b). Height is an anthropometric measure that describes skeletal growth. Under normal circumstances, height increases with age. The height/age index describes past nutritional status and is closely related to socioeconomic status, but height growth is relatively less sensitive to short-term malnutrition. Children's height or body length can be measured using a height/ body length measuring device with 0.1 cm of accuracy (Supariasa, 2012). One of the primary components of the nutrition improvement program, which emphasizes prevention and improvement of child nutrition, is growth monitoring (Ministry of Health, 2020b).

Torlese (2016) states that one of the causes of cases of malnutrition in the community is due to inadequate access to healthcare and malfunctioning of social institutions in society such as posyandus (Integrated Health and Nutrition Service). There is association between infrastructure, childcare service, community vaccination programs and reduction in posyandu activity has resulted in neglected monitoring of the nutrition of children and pregnant women. In addition, anthropometric measurements at posyandus, which are usually carried out by cadres, show a high level of height and weight errors (Beal et al., 2018; Torlese, 2016). The results of previous research showed that the level of ability, precision and accuracy of data collected by cadres was still low, namely 90.3% of cadres were incorrect in weighing and measuring height (Beal et al., 2018)

Height measurement errors, especially in adjusting the position of the adjusting the child's position in

measurements using an infantometer/stature meter. Consequently, information on children's nutritional status has become inaccurate (Siswati et al., 2022). Posyandu (Integrated health and Nutrition service) is play important role in bridging the gap between healthcare providers and the community by providing information related to health, such as child growth and development (Utami et al., 2019). Posyandu is also a type of Community-Based Health Efforts (UKBM) that is run and organized from, by, for, and with the community in order to implement health development in order to empower the community and give the community ease in accessing essential social and medical services. Integrated Posyandu is a basic family social service activity in the aspect of keeping track on children's growth and development. In practice, it is done in a coordinative and integrative manner as well as mutually reinforcing between programs and activities for the continuity of services at Posyandu in accordance with local situations/needs which in their activities still pay attention to aspects of community empowerment (Utami et al., 2019)..

The tasks of the cadres is to recognize basic health care issues, such as nutrition, maternal and child health, family planning, immunization and prevent infectious disease. Cadres would be much easier to deliver health program because they are closer to the community (Adrian et al., 2016).

Even though a posyandu is a community-based basic health service unit located in the village/sub-district, their role is very decisive in describing the condition of mothers and children nationally. It is necessary to monitor activities in every region through Posyandu Revitalization. At the operational level (village/sub-district, district), monitoring is carried out on a monthly basis, by carrying out field visits or by studying reports submitted by posyandus in their working areas (Ministry of Health, 2012).

According to the number of primary activities carried out by the Posyandu with a 5-table service system or 5-activity steps, the minimum number of cadres for each posyandu is five individuals (Ministry of Health, 2012). Enhancing posyandu services' quality can be done from various aspects, such as improving facilities and infrastructure, human resources, and posyandu implementation activities (Ministry of Health, 2012). Increasing cadres' knowledge of various topics, such as stunting and anthropometry, is one strategy to boost the quality of human resources in order to achieve the accurate nutritional status of children.

Knowledge is one of the cadres' components to improve early detection of malnutrition or stunting in children (Siswati, 2022). Knowledge about stunting must be owned by cadres in carrying out their role at posyandus to prevent and overcome stunting in the community. Health promotion is a step the government is intensifying to prevent stunting and is accomplished through the implementation strategies of empowering, building an atmosphere and advocacy. Community empowerment is a very important part and becomes the spearhead in health promotion. In this case increasing the degree of health is by conducting counseling on increasing the knowledge of cadres on stunting prevention for children (Friska et al., 2022).

The posyandu at Dilem village is designated by the central government as one of the stunting loci in Indonesia in 2020. Dilem Village is recorded as having five posyandus, and these are situated in Kepanjen Health Center' operational region, in Malang Regency.

Based on Decree number HK.01.07/MENKES/319/2020. of the Republic of Indonesia's Minister of Health, regarding the Locus of Activities for Reducing Maternal and Infant Mortality Rates in 2021 and Decree number Kep 42/MPPN/HK/04/2020 of the Minister of National Development Planning Regarding Determination of Regency/City Expansion

of Focus Areas for Integrated Stunting Reduction Intervention in 2021.

Posyandus in Dilem Village are active and crowded. From the data obtained at the Kepanjen Health Center, the five posyandus have a high number of visits, 153 under five in 2020 and 117 under five in 2021. According to the results of a report based on the Basic Health Research (2020), the stunting rate at the Kepanjen Dilem is 21% while for 2021 it decreased to 13.8%. The goal of this study was to determine the effect of short course intervention in the knowledge levels of posyandu cadres in Dilem Village on early detection of stunting and anthropometric measurements of children.

## METHODS

A pre-experimental research design with a single group pre-post-test, this study included an intervention method to assess the level of knowledge of respondents about early detection of stunting. The method of intervention is carried out in the form of explanation presentations and skill training in the form of interactive meetings. The inclusion criteria for respondents was posyandu cadres in Dilem Village. The exclusion criteria was other staff in Posyandu Dilem Village who are not in charge of children's healthcare. Interactive skills given to cadres are in the form of teaching about stunting and the correct way to measure height, weight, head circumference, chest circumference, and upper arm circumference. Assessment of the level of knowledge is measured through pre-test and post-test scores, which are carried out by providing 10 questions related to early detection of stunting and anthropometric measurements in Indonesian language. This research was conducted on May 31, 2022, and the subjects of the research were the posyandu's health cadre community in Dilem Village. Questionnare used in this research was assisted by two public health graduates, two doctors and one nutritionist. The knowledge questionnaire on stunting prevention cadre contained ten multiple choice questions. The intervention lasted 120 minutes.

Therefore, the intervention method used a short course including health promotion method employing a didactic approach and using PowerPoint and booklets, as well as simulations through miniclass workshops by carrying out measurement simulations with the children who came. The pre-test and post-test results are compared to evaluate the program. Data from the questionnaires were stored in Microsoft Excel Worksheet format and analyzed through the IBM Statistical Package for the Social Sciences/SPSS version 23. The Wilcoxon test was used in this study's comparative analysis.

Material delivered in this short course can increase the knowledge of cadres about stunting, signs and symptoms of stunting, prevention and management of stunting as well as correct and appropriate anthropometric measurements. Materials are provided through the lecture method and using educational videos and booklets as the media. The material in this presentation was obtained from the Ministry of Health's stunting guidelines. The process of delivering the material was followed by a joint discussion which took place in two directions with a duration of 1 hour per session, so that the discussion section participants could ask questions related to stunting. After the process of delivering material and discussion, it then continued with a demonstration/simulation of efforts to prevent stunting, namely by taking anthropometric measurements. The post-test approach is used to evaluate community service activities in order to assess the program's success (questions and answers and filling out questionnaires) to extension participants (cadres). In addition, evaluating the success of the program uses post-test questionnaire. Ethical clearance number 800/214/35.07.103.104/2022.

## RESULT

It was found that there was an increase in cadres' knowledge about stunting as a result of the success of the short course. The post-test findings revealed that cadres' knowledge levels were better than they had been before receiving the course. This difference means that through extension activities the participants' knowledge of stunting can be increased. The knowledge level of cadres frequently affects how well they perform.

A total of 20 respondents participated in a series of interventions to completion. Respondents had an average score of 58 before the intervention, which increased to 74.5 (16.15) after the intervention ($p<0.001$). From a total of 20 respondents, it was found that three respondents received the same score after the intervention. As many as 17 respondents improved their scores on the post-test, and none experienced a decrease in scores.

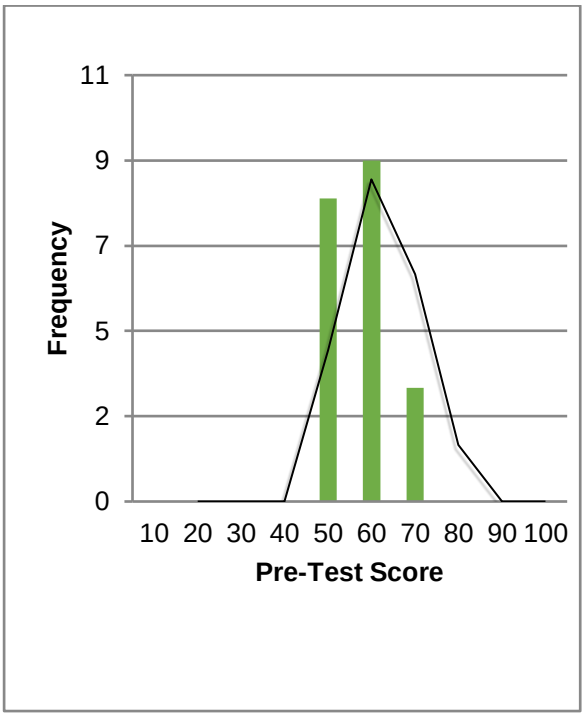


**Figure 1.** Distribution of Pre-Test Scores at Posyandu in Dilem Village.

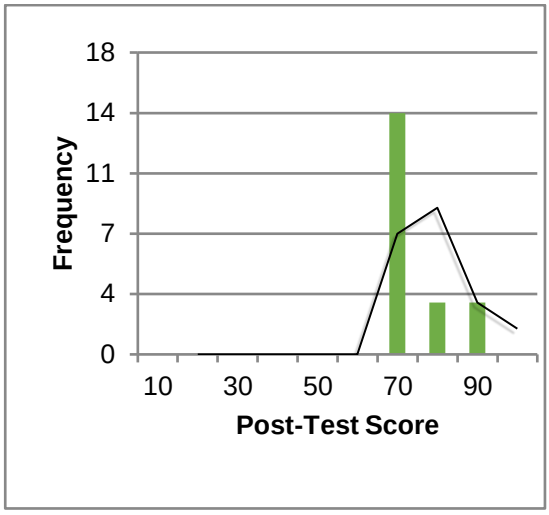


**Figure 2.** Distribution of Post-Test Scores at the Dilem Village Posyandu.

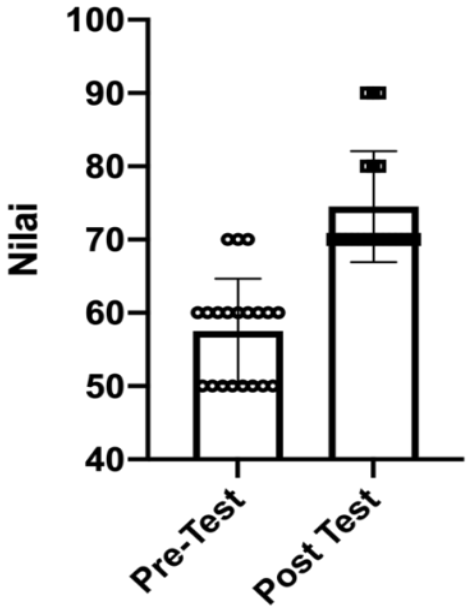


**Figure 3.** Graph of Intervention Results

Figure 3 shows the boxplot of the respondents' pre-test and post-test scores. The boxplot represents the data distribution, where the data distribution is skewed to the right in both the pre-test and post-test data. The median, 25th, and 75th percentiles of the pre-test data are 58.00, 50.00, and 75.00, respectively. The median, 25th percentile, and 75th percentile values for the post-test data are 74.50, 75.00, and 100.00, respectively.

## DISCUSSION

Stunting is responsible for 1.5 million (15%) deaths among children under the age of five worldwide, as well as 55 million Disability-Adjusted Life Years (DALYs). Stunting causes failure to thrive, disrupts brain development resulting in barriers to cognitive and motor growth, as well as suboptimal body sizes and lowered immune systems that make them more susceptible to illness. They also have a higher risk of developing diabetes, heart and blood vessel disease, cancer, stroke, and other disabilities as they age ( Ministry of Villages, Development of Disadvantaged Regions, 2017; Stewart, Iannotti, & Dewey 2013).

Stunting may result from a number of issues, such as poor parenting techniques, a lack of ANC (Antenatal Care) or health services for mothers during pregnancy, Post-Natal Care, and high-quality early learning, as well as ongoing access issues for households and families to nutritious food, clean water, and sanitary facilities (Ministry of Villages, Development of Disadvantaged Regions, 2017).

Stunting has been defined as a national priority in planning documents and the Sustainable Development Goals. Some of the planned acceleration strategies entail increasing nutrition surveillance including growth monitoring, increasing access and quality of community services and increasing the role of the community through community-based health efforts such as posyandu sand Pos PAUD (TNP2K, 2018). The assessment of nutritional status can basically be carried out using four assessment methods: anthropometric, clinical, biochemical and biophysical (Ministry of Health, 2020b).

Anthropometry is a way of assessing nutritional status related to body size that is adjusted to a person's age and nutritional level. Anthropometry is derived from the Greek words antrophos, meaning body, and metros, meaning size (Ministry of Health, 2020a). In general, anthropometry measures the dimensions and composition of a person's body, namely weight, height/length, circumference (measurement of body width, measurement of head circumference, chest circumference, waist circumference, hip circumference, upper arm circumference), and body thickness (measurement thickness of body fat) (Ministry of Health, 2020a).

The nutritional status of a child is evaluated or determined using the Children's Anthropometric Standards. By comparing the findings of measurements of body weight, and length or height with the Child Anthropometric Standards, the nutritional status of children is evaluated. The WHO Child Growth Standards for children aged 0–5 years and The WHO Reference 2007 for children aged five–18 years are referenced in the Anthropometric Standards for Children in Indonesia. Children's anthropometric measures must be taken with standardized equipment and methods (Ministry of Health, 2020a). Through the Decree of the Minister of Health Number 1995/Menkes/SK/XII/2010 about Anthropometric Standards for Assessment of Children's Nutritional Status, Indonesia decided to adopt the WHO standard as an official standard for use as an anthropometric standard for evaluating the nutritional status of children after considering various studies and expert discussions (Ministry of Health, 2020b).

Community members who volunteer to operate the public healthcare center are known as health cadres. They serve as the main pillar for enhancing public health status, particularly in the fight against stunting. Anthropometric measurement skills are one of the necessary skills for cadres to monitor the growth and nutritional status of toddlers. Cadres should also be able to invite families to bring toddlers to Posyandu to widen participation in healthcare services (Ministry of Health, 2012b; Nuari S& Nur Aini, 2020). The performance of the cadres was closely correlated with their characteristics.

In this study, the majority of participants were adults who were married, had completed high school, were housewives, had more than 10 years of experience, had previously undergone a variety of training, and had all taken the whole short course. These results are in line with earlier study, which suggests that factors influencing cadres' performance include age, marital status, knowledge, skills, education, role as housewives connected to free time in community health promotion programs, and working duration (Friska et al., 2022).

This research was same with other research that reported the highest educational level of cadres in posyandus is high school education, and most of them were married and being a housewife (Mediani et al., 2022).

This study observed the effects of providing short course were summarized in booklets distributed on knowledge about early detection of stunting and correct anthropometric measurements in the posyandu cadre community in Dilem village, Kepanjen. Based on the results of the knowledge test through the pre-test and post-test, it was found that there was an increase in scores of 16.5 points ($p < 0.001$) after giving counseling interventions and mini workshops. From a total of 20 respondents who took part in the research to the end, it was found that 17 respondents experienced an increase in value after giving the intervention video. The effectiveness of the short course use of PowerPoint and workshops as well as the booklets that are distributed in increasing the knowledge of an individual is well-known. Another research showed that the offline course consistently increased the cadre's knowledge (Siswati et al., 2022).

The existence of different learning media, namely through the presentation of educational presentations, will be able to help individuals understand the material or information more easily. After the presentation, the presenters provide feedback by asking counseling participants about the contents of the presentation, and most of them can answer quickly and precisely. This is in accordance with the findings of Hariani's (2020) research, which stated that the ability to utilize media can help clarify the information that has been provided because it is packaged in an interesting, interactive way, has no limitations of space, time and human senses. Submission of information needs to be adjusted to the characteristics of each media used so that the purpose of providing the information can be conveyed more effectively and easily understood.

There are three components that can be considered when creating educational media so that the media becomes effective in conveying information, namely cognitive load, participant engagement, and active learning. Cognitive load consists of intrinsic load, which is determined by the degree of connectivity in learning, germane load, which is the cognitive activity needed so that learning goals are met, extraneous load, cognitive activity that does not help a person achieve learning goals, such as stereotyped learning, unclear instructions, and too much information (Brame, 2016). The recommendation for the cognitive load component to be effective is to use highlights on important keywords in the media and combine auditory and visual modalities. The second component is participant engagement, which can be improved by limiting the duration of video educational media, using regular language, and speaking quickly in an enthusiastic tone. The third component is active learning, which can be generated by adding interactive questions to the video (Brame, 2016).

The concept of health promotion includes efforts to bridge behavior change as well as processes for increasing public awareness of conveying and accessing information in the health sector. Health promotion is a revival of health education from the past. By using empowerment tactics, creating a positive environment, and engaging in advocacy, health can be

promoted. Community empowerment is an important component and driving force behind health promotion. Empowerment is the process of continuously informing people, families, or groups to help clients change from knowing to being aware (knowledge component), from knowing to wanting (attitude component), and from wanting to be able to complete what the behavior teaches (client), and evaluate the client's progress (exercise component). It serves to assist clients in shifting from knowledge to awareness (knowledge aspect), from knowledge to willingness (attitude component), and from wishing to be able to perform the taught behavior.

PowerPoint presentations and workshops can effectively increase short-term knowledge and instill attitudes and will influence the behavior of these individuals to apply what is seen in the workshop, this is because workshop media and booklets can be made into repetitious refreshing media and are able to display information which is accompanied by the application (Latif et al., 2016). One way to improve the knowledge, abilities, and attitudes of cadres is through training (Dahodwala et al., 2018). These results are in accordance with research that conducts training using the BBM method (Learning Based on Problems). Lecture-based training, combined with discussions, simulations and exercises, can increase the knowledge of cadres to carry out anthropometric activities for toddlers in posyandus. This finding is also consistent with the statement by Notoatmojo (2012), that health education in the short term can make a difference and increase the knowledge of individuals, groups and communities (Notoatmodjo, 2012).

Stunting can be prevented in at-risk groups. This prevention can be done by modifying risk factors, especially knowledge about achieving good nutrition, and how to measure correct anthropometric measurements for obtaining the accurate data. Using short course, workshops and distributing materials to cadres in the form of booklets can improve compliance in justifying anthropometric measurements. Cadres are the spearhead of successful stunting prevention efforts. Cadres can provide information and education about the causes and effects and what efforts can be made to prevent stunting. With this knowledge, it is hoped that parents of toddlers want to bring their toddlers to the posyandu for growth and development monitoring.

There are limitations to the study we conducted, namely the limitation of the sample size. The sample only covers 10% of the population. One factor contributing to this limitation is the limited time available to conduct the research. The limitations of our study mean that the results of the intervention in this study are relatively unrepresentative of the impact of the intervention on the wider population. The lack of a control group and the absence of various other variables connected to cadre knowledge, such as motivation, remuneration, support system, environment, and local government concern, are further limitations of this study. Since this study concentrated on a region with a high prevalence of stunting, outcomes may vary if the study is carried out in regions with a lower prevalence of stunting.

## CONCLUSIONS

The results showed that providing intervention using PowerPoint presentations and mini skills could improve cadre's knowledge on early detection of stunting. Short course using power point, mini skill class workshops, and distribution of material booklets as educational tools could increase the knowledge level of posyandu toddler cadres in Dilem Village, Kepanjen, regarding early detection of stunting and correct anthropometric measurements.

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Original Research

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# A PILOT STUDY ON DIABETIC PATIENTS AT MALANG COMMUNITY HEALTH CENTER REGARDING THE APPLICATION OF THE T-PLATE MODEL CONCEPT

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**ABSTRACT**

**Introduction:** Diabetes mellitus is a comorbidity that is often found in Covid-19 patients with a 3.9-fold risk of death. Data from the Malang City Health Office shows an increase in the number of diabetes patients by 1.2% each year. In Indonesia, 3J (right amount, type, and eating time) has become the principle of diabetes diet therapy, but in practice, it is still challenging to apply independently. **Aims:** Investigating the T-Plate Model as a simple eating guide for people with diabetes mellitus. **Methods:** This pilot study included 18 diabetic patients at some Primary Health Care who were 50–70 years old and had a BMI more than 23 kg/m2. The participant was split into two groups, with nine people in the (C) group eating according to the T-Plate Model, and others in the (T) group eating according to the T-Plate Model after eating fruit. After a 3-month treatment period, BMI, blood pressure, carbohydrate, and fiber consumption were assessed. Mean BMI and blood pressure were examined using paired sample t-tests (p 0.05). **Results:** Both groups' BMIs fell into the category of obesity level 1 before to treatment periods: C group (26.09+3.13 kg/m2) and T group (27.15+ 4.15). We discovered significant blood pressure and BMI variations in the T group at the end of intervention periods (p 0.05). Nevertheless, systolic blood pressure was different in the C group (p 0.05). **Conclusions:** It may be inferred that using the T-Plate Model with the addition of fruit initially can lower blood pressure and BMI.

**Keywords**: T-Plate Model, fruit before meal, diabetes patients

## INTRODUCTION

The majority of cases of diabetes mellitus, or type 2 diabetes, are currently prevalent in the global community. According to WHO data (2021), at least 1.5 million deaths in 2019 were related to diabetes mellitus, putting it the ninth most common cause of death. Meanwhile, the International Diabetes Federation (IDF) said that there had been a global increase of 10.5%, where as many as 44.7% of adults experience glucose intolerance. In addition, the IDF estimates that by 2045 we can easily find 1 in 8 adults with diabetes mellitus. According to Indonesia's Basic Health Research (Riskesdas) findings, the incidence of diabetes dramatically increased from 6.9% in 2013 to 8.5% in 2018 (Indonesian Ministry of Health, n.d.). This rising tendency was observed in the 55 to 64 and 65 to 74 age groups, with an increase of 1.5 and 1.8%, respectively. Health profile data from East Java (2021) reported that Malang City was included in 10 cities with a number of >= 20,000 people with diabetes. This is consistent with the Head of the Malang City Health Office's Report in the 2021 Malang City Health Profile, which shows an increase in the number of DM sufferers during the COVID-19 pandemic from 2020 to 2021 was 1.76%, where previously there was only increased 0.7% from 2019 to 2020 (Malang Head of Health Service, n.d.).

Having diabetes in the family, being overweight or obese, living a sedentary lifestyle, exercising infrequently, consuming large amounts of sugar and fat, having high blood pressure, and sleeping irregularly can all lead to metabolic

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problems that can alter blood glucose levels (Al Mansour, 2019; Ismail, Materwala and Al Kaabi, 2021). Diabetes patients are more likely to develop significant and potentially fatal consequences, such as heart attacks, strokes, renal failure, blindness, and lower limb amputations, when their blood sugar levels are not under control. Therefore WHO, IDF, ADA (American Dietetic Association), and Perkeni (Persatuan Endokrinologi Indonesia) have recommended pillars of diabetes mellitus management to suppress the growth and development of diabetes mellitus.

The pillar focuses on lifestyle and dietary modifications, medication adherence, and participation in educational activities. Dietary modification is a critical pillar of successful diabetes therapy management. The dietary modification refers to the 3J principle which is right in amount, type and eating time. Preliminary survey in Malang City showed that 70% of diabetics received health services at the health center still have difficulty measuring food (food portion) according to their individual energy needs, have difficulty measuring food (food portion) according to their individual energy needs, have difficulty choosing groups of food ingredients, and are confused about choosing the right snack. In addition, based on Riskesdas 2018 data, Indonesian adults' daily fiber choosing groups of food ingredients, and are confused about choosing the right snack. In addition, based on Riskesdas 2018 data, Indonesian adults' daily fiber intake is still below the recommended daily fiber intake of 20-25 g/day.

Based on the above conditions, easy and simple eating techniques are needed to help diabetic patients measure their food (food portions). The concept of the T-Model Plate, which is known as an effort to overcome overweight and obesity conditions, is a modification in eating proportion where ½ part of the plate contains vegetables, ¼ part contains carbohydrates and the remaining ¼ part contains side dishes. Fiber has a known positive effect on health. Both soluble and insoluble fiber are essential for diabetics.

By delaying stomach emptying, soluble fibers such fructooligosaccharide (FOS), pectin, -glucans (found in wheat and barley grains), galactomannan gums, alginates, and psyllium may slow down the absorption of glucose (Perry and Wing, 2016). Meanwhile, insoluble fiber such as cellulose, some hemicellulose, resistant starch, and lignin will ferment in the intestine and produce short chain fatty acids (SCFA) (Zhao et al., 2018). It is hoped that by applying the T model plate concept, fiber intake in diabetes patients will increase so that glycemic control is achieved. As a result, This study's objective was to investigate the T-Plate Model as a straightforward dietary therapy for diabetes mellitus.

## METHODS

An experimental group with a pre-posttest control group was used in this investigation and randomized control trial study design. Our research was carried out in three Primary Health in Malang City (Kedung Kandang, Mulyorejo and Ciptomulyo). The three Primary Health are among the top five areas in Malang with regard to the increasing number of diabetes patients per year with low coverage of health services, which is why we choose this spot. The Kedung Kandang Health Center is on Malang City's western edge; the Ciptomulyo Health Center is in the city's center; and the Mulyorejo Health Center is on Malang City's eastern edge, close to Malang Regency.

We used sample random sampling with criteria such as the age range of 50-70 who took part in the aging program activities at the health facility, non-insulin therapy, not following other therapy, had BMI above 23 kg/m$^2$ and light physical activity. A number of 18 diabetic patients who satisfied the inclusion criteria and

were willing to follow this therapy were separated into two groups by randomizing the member of group. Having comorbidities that hindered memory, not having a complete food recall data, and having insufficient blood chemistry data were the exclusion criteria.

Nine diabetes patients in the C group were eating according to the T-Plate Model, while the remaining patients in the T group were eating fruit first and then utilizing the T- Plate Model. Diabetes patients who satisfied the inclusion criteria and were willing to follow this therapy were separated into two groups. Before starting the program, the nutrition statue, blood pressure, and body fat of all diabetes patients who will be following the diet will be assessed. We used a mercury tensimeter to measure blood pressure and Body Composition Monitor Model HBF-375 Karada Scan to measure body composition.

The past 24 hours' worth of food consumption will also be noted. The task of keeping track of food intake will fall to enumerators who have a nutrition diploma. A quick introduction to diet therapy utilizing a T-style plate will thereafter be given to each participant. Information on the food therapy, which each group will follow for the following three months, will be given as part of the ongoing diet therapy.

Our enumerator team will keep a 24-hour food diary during the intervention period. We will gather recall data three times, on two working days and one holiday, at least once every week. Technically, we will choose the participant's food intake information from Monday through Friday on weekdays. On weekends and holidays, we will record the amount of food consumed. Two techniques will be used to obtain information on food intake: home visits and video calls or text messages with accompanying pictures. We use two different techniques to minimize bias of food intake.

All participants will be brought back to the health center on the final day of the intervention to have their height, weight, and HbA1c assessed once more. Participants will also take part in a final educational session that contains the findings of a three-month food intake monitoring program. If a participant's diet is determined to be incompatible with the dietary therapy for people with diabetes mellitus, suggestions for altering it will be given to them as well. The HbA1c test results will thereafter be disclosed at least a week after the final meeting of this activity.

Excel will be used to recapitulate the complete collection of data. The dietary history data will be presented before and after the dietary intervention. The participant's food intake during the intervention will be examined as a point of change. Before and after diet therapy, information on changes in height, weight, and HbA1c levels will be presented.

SPSS for Windows: Statistical Product and Service Solutions series 25 was used to evaluate and report mean and standard deviation for all acquired data. The Shapiro-Wilk test was used to determine the normality of the data, the Mann-Whitney U test for normally distributed data and an independent t-test for typically skewed data were used to evaluate participant characteristic data. Wilcoxon and Paired Samples t-Tests, two types of tests, were utilized to examine BMI, blood pressure, body fat, and nutritional intake, including carbohydrates and fiber. A p-value of 0.05 or lower was deemed significant. With the letter number No.:488 / KEPK- POLKESMA/ 2019, the Poltekkes Kemenkes Malang ethics committee determined that this study was ethically eligible.

## RESULT

Table 1 lists specific of participant characteristics. There were 18 volunteers who regularly took anti-hyperglycemic medications and had type 2 diabetes. Participants' average ages range from 55 to

60 years old, with the T group having the oldest mean age (60 ± 6.16). Most of them are women (two men and the others were women) who do not work. In addition, all of them had an increase in blood pressure categorized as grade 1 hypertension but did not take anti-hypertension medicine. The findings of the interviews revealed that none of the patients had ever received nutrition education, particularly about eating habits. Furthermore, all responders only engaged in light to moderate activity.

**Table 1.** Relationship of Demographic Characteristics with Independence of Elderly

| **Variable** | **C (n=9)** | **T (n=9)** | **p-*value*** |
|---|---|---|---|
| Age (years) | 55.89 ± 4.57 | 60.00 ± 6.16 | 0.13[a] |
| Weight (kg) | 59.10 ± 8.97 | 65.93 ± 11.70 | 0.17[a] |
| Height (cm) | 151.33 ± 4,86 | 155.62 ± 6.80 | 0.18[a] |
| Systolic blood pressure (mmHg) | 139.30 ± 18.47 | 134.44 ± 11.30 | 0.34[a] |
| Diastolic blood pressure (mmHg) | 83.40 ± 9.49 | 81.67 ± 12.25 | 0.85[a] |
| Body Fat (%) | 37.70 ± 4.64 | 35.63 ± 7.78 | 0.48[b] |
| BMI (kg/m$^2$) | 26.09 ± 3.13 | 27.16 ± 4.15 | 0.63[b] |
| HbA1c | 9.40 ± 1.88 | 8.07± 0.92 | 0.06[a] |
| Diabetes History | 8.40 ± 1.35 | 5.78 ± 4.29 | 0.69[a] |
| Recall 24 hours: | | | |
| Energy (Cal/day) | 1083.58 ± 102.96 | 706.89 ± 153.28 | 0.00 *[a] |
| Carbohydrate | 152.96 ± 43.62 | 101.76 ± 21.38 | 0.08[a] |
| Fiber | 8.54 ± 1.07 | 3.86 ± 1.28 | 0.10[b] |

*) Statistical test paired sample t test, significant p <0.05

[a] different in control group; [b] different in treatment group

The findings of the interviews revealed that none of the patients had ever received nutrition education, particularly about eating habits. Furthermore, all responders only engaged in light to moderate activity. In body composition result, we found that both groups had high body fat, which was above 30% with the highest body fat percentage in group C. In addition, based on BMI calculations, the results showed that the treatment group had an average BMI that was higher than the control group, which was 27.16 ± 4.15 and 26.09 ± 3.13, respectively.

On blood examination related to glycemic control, it was found that both the control and treatment groups had glycemic control that had not reached the PERKENI recommended glycemic target of <7%. The interview results also revealed that the control and treatment groups' means+SD indicated that they had been dealing with diabetes for 5 to 10 years, with the longest duration of diabetes in the control group (8.40 + 1.35).

Furthermore, the eating history study using 24-hour food recall found that the average energy intake up to group C was higher than the control group (1083.58 + 102.96). The outcomes of statistical analyses revealed a sizable variation in the amount of energy consumed between two groups. The treatment group's average carbohydrate intake was lower than that of the control group (101.76 + 21.38). In addition, fiber intake in both groups was still far from Perkeni's recommendation of 25-30 g per day, Although the treatment group's fiber intake was lower than that of the control group, respectively 3.86 + 1.28, and 8.54 + 1.07. After 3 months of the intervention period, it was found that several variables measured before the intervention period changed. The difference in the results before and after the intervention is presented in Table 2.

Based on the table below some of the variables monitored in both groups during the intervention tended to decrease. We observed reductions in body fat, systolic and diastolic blood pressure, carbohydrate intake, and fiber intake in group C. A rise in BMI was seen in this group, though. While in group T there was

a decrease in BMI, body fat, systolic and diastolic blood pressure and carbohydrate intake. Interestingly, we noted an increase in fiber intake in this group.

**Table 2.** The Mean △ Some Variable Both of Group After Intervention Periods

| Variable | Group | |
|---|---|---|
| | C | T |
| △ BMI | 0,27 | -0,04* |
| △ BF | -0,48 | -0,93 |
| △ SBP | -16,33* | -10,67 |
| △ DBP | -5,11 | -1,67 |
| △ Energy | 14,77 | 74,01 |
| △ CH | -49,59* | -16,32 |
| △ Fiber | -0,27 | 2,04 |

*) Statistical test paired sample t test, significant p <0.05. △ result post-pre. -) mean decrease.

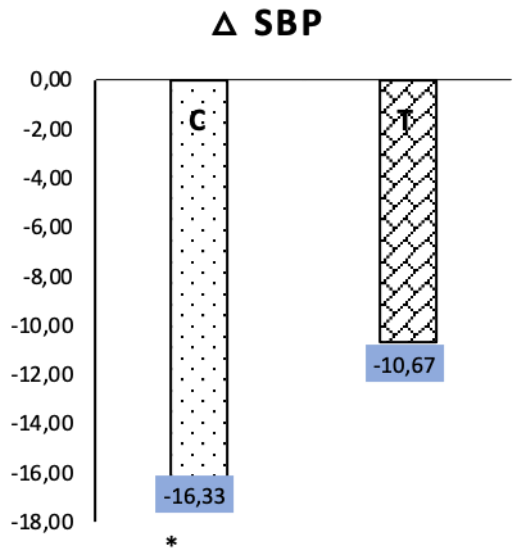


**Figure 1.** The mean △ systolic blood pressure of both groups after intervention.

On the last day of the intervention, we recorded specific changes in the variables we measured, some of which are presented in the figure below. Systolic blood pressure decreased in both group C and group T (Figure 1). The mean systolic blood pressure in C group significantly decreased became 125.11+11.36 with an average systolic blood pressure of 77.56+6.89.

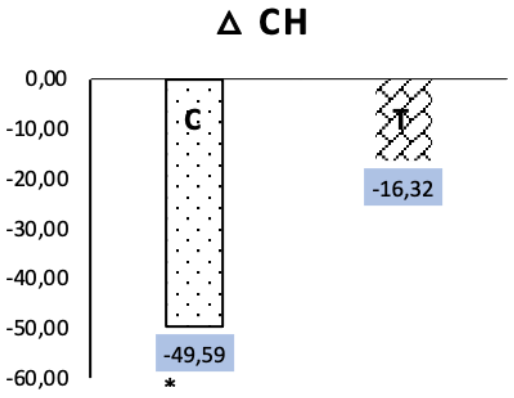


**Figure 2.** The mean △ carbohydrate intake of both groups after intervention

In addition, we found a downward trend in carbohydrate intake in both groups (Figure 2). Especially in group C, there was a significant decrease in carbohydrate intake compared to before the intervention. The amount of decrease in carbohydrate intake in group C was 49.59 g, while in group T it was only 16.32 g. These results are based on the average 24-hour recall results during the ongoing therapy period. The results of the recall are carried out on two working days and one day off for three months.

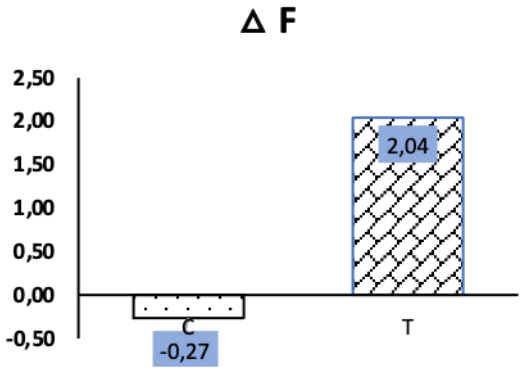


**Figure 3.** The mean △ fiber intake of both groups after intervention.

Besides that, in fiber intake we found differences between the two groups. In Figure 3, it can be seen that group C's fiber intake decreased slightly after the intervention period. However, this was inversely proportional to fiber intake in the T group. A trend of increasing fiber intake was seen in group T where there was an

increase of at least 2 g after three months. Between the two groups, there was no statistically significant difference in the amount of fiber consumed (p>0,05).

In this study, we also observed changes in BMI in both groups. During the 3-month intervention period, we noted that group C experienced no significant reduction in BMI. Meanwhile, a significant decrease in BMI occurred in group T (Figure 4). The decrease in BMI in group T was supported by the trend of decreasing carbohydrates and increasing fiber intake. This was also accompanied by an increase in total energy intake in group T. The results of fiber consumption in the intervention group are directly linked to this condition. The intervention group's BMI improved as intake was increased for three months.

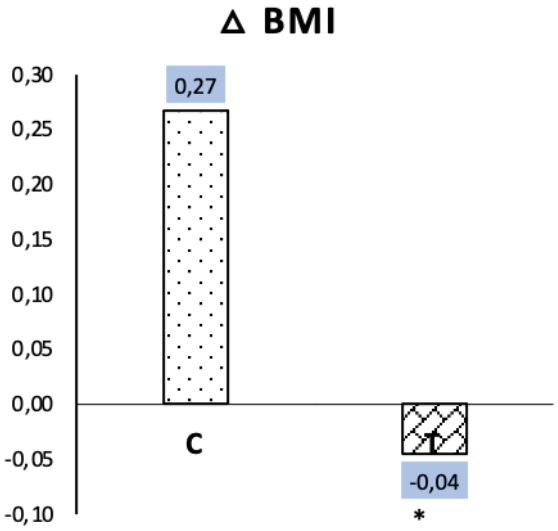


**Figure 4.** The mean △ BMI of both groups after intervention.

## DISCUSSION

We explored whether patients with diabetes mellitus could use the T plate model.. All of the participants in our study were diabetes mellitus type-2 with hypertension grade 1. Considering this condition, nutritional statue rises, becoming obese according to the 2014 Minister of Health Regulation Number 41 cutoff threshold. Similar conditions were also found in diabetic patients in Lajur, India, where nearly 30% of diabetics also had hypertension (Bansode and Prasad, 2022). Argano et al. (2022) also found similar condition that hypertension was the first comorbid disease in elderly diabetes mellitus patients who were treated in the internal medicine ward (57.1%).

Patients with diabetes mellitus who are elderly are more likely to develop hypertension. Inversely, it is generally observed that insulin resistance puts hypertensive patients at the risk of developing diabetes mellitus (Mancusi et al., 2020). Insulin resistance and obesity go together to the combined occurrence of diabetes mellitus and hypertension. Additionally, both of them have the same risk factors, including obesity, dyslipidemia, atherosclerosis, vascular inflammation, and remodeling of the arteries (Petrie, Guzik and Touyz, 2018). Insulin resistance and chronic hyperglycemia both contribute significantly to the development of vascular problems. This is made more severe by the lack of measures to reduce diabetes mellitus risk factors that can be modified, such as obesity, sedentary lifestyle, and unhealthy diets which can increase the risk of intestinal dysbiosis, inflammatory reactions, and ROS that lead to macro-microvascular complications (Galicia-Garcia et al., 2020).

Furthermore, we found that they had lived with type-2 diabetes for <10 years and had low glycemic control. This is consistent with several research from various nations, including Qatar, China, and Turkey, which likewise revealed the cut points for adult men and women's body fat percentages aged >= 40 years ranging between 25-35% and 35-45% (Li et al., 2017; Bahat et al., 2020; Bawadi et al., 2020). Obesity risk may be increased by an excessive buildup of body fat (ABG), as measured by the percentage of body fat above the cutoff limit (Macek et al., 2020).

Bae et al. also published the results of the other trial, which involved diabetic individuals in the US with BMI > 25 kg/m2 and HbA1c values > = 7% (Bae et al., 2016). Increased plasma free fatty acid (FFA) levels in obese individuals are known to result in peripheral (muscle) insulin resistance. (Sobczak, Blindauer and Stewart, 2019; Henderson, 2021). By secreting unesterified fatty acids, adipose tissue participates in the metabolism and production of hormones, glycerol, and other molecules like leptin, cytokines, adiponectin, and proinflammatory agents (NEFAs). Unesterified fatty acids (NEFAs), which are released more often from adipose tissue in obese patients, have an impact on the pancreatic ß cells' ability to secrete insulin (Algoblan, Alalfi and Khan, 2014; Chobot et al., 2018).

According to a 24-hour food recall, we documented that they had a low intake of energy, carbohydrates, and fiber. This means that it has not been able to meet the daily fiber needs according to Indonesian Endocrinology Association (PERKENI) recommendations (Soelistijo, 2019. This is in line with the results of RISKESDAS 2018, that Indonesian adults' average intake of vegetables and fruit is still < 5 servings a day or the equivalent of 8-10 g of fiber only. Recent research conducted by Susilowati, Rachmat and Larasati (2020) in Central Bogor Regency also shows a similar situation where type 2 diabetes with controlled glycemic levels can only consume 152.9 g and 131.69 g of vegetables and fruit per day.

Meanwhile, people with diabetes mellitus with uncontrolled glycemic levels were only able to consume vegetables and fruit of 116.2 g and 102.40 g, respectively. WHO (2020) recommends at least adults can consume 250 grams of vegetables and 150 grams of fruit per day (Kalmpourtzidou, Eilander and Talsma, 2020). A recent meta-analysis study found that people with diabetes mellitus whose daily fiber intake is increased by 10–40 g has better glycemic control (Silva et al., 2013; Mao et al., 2021)

Our study recorded that some of the variables monitored in both groups during the intervention tended to decrease. When the intervention time is over, we noted a similar pattern of decreases in body fat, blood pressure, and energy intake variables. In addition, we also noted a trend of increasing energy intake. Then there are also differences in changes that are contrary to the two groups, which include BMI and fiber intake. First, focusing on dietary food record, we analyze that carbohydrate intake in diabetes patients only reaches 25-30% of Perkeni's recommended carbohydrate intake of the total daily energy requirement. When in fact, people with diabetes mellitus can consume carbohydrates 45-65% of the total daily energy needs with a note still considering the type of carbohydrates.

According to our data, there is a positive association between a patient's systolic blood pressure and the amount of carbohydrates and fiber they consume. Numerous studies on the impact of restricting carbohydrate intake on blood pressure have not produced encouraging results, according to a meta-analysis study. (Choi et al., 2022). Li et al. (2021) found that intake of high-quality carbohydrates or those containing high fiber and substitution of plant products possibly prevent the emergence of new instances of hypertension by consuming low-quality carbs. According to Abbanezhad et al. (2020), a diet heavy in monounsaturated fatty acids was superior to one high in carbs for decreasing SBP and DBP. Increased fiber consumption has been linked to lower systolic and diastolic blood pressure, according to prospective studies by 4.3 mmHg and 3.1 mmHg in adults with hypertension, respectively (Reynolds et al., 2022). By comparing several scientific studies that have been conducted regarding carbohydrate intake, fiber intake and blood pressure, we can conclude that

the intake of fiber-rich foods can affect blood pressure.

The second part of the study that we found was the change in BMI. Some people with diabetes mellitus who applied fruit consumption before using the T model plate experienced a decreased BMI. Meanwhile, people with diabetes mellitus who only applied for the T model plate experienced an increase in BMI. Changes in carbohydrate and fiber intake in patients with diabetes mellitus encourage this opposite condition. A decrease in BMI is followed by a decrease in carbohydrate intake and an increase in fiber for people with diabetes mellitus. Burger et al. (2012) reported that increasing fiber intake among diabetes patients can decrease the mortality. An experimental study with an RCT design conducted by (Miketinas et al. (2019) showed that changes in fiber intake in adults after energy reduction therapy are strong predictors of weight loss programs.

The physical and chemical properties of fiber can provide a satiety effect because the satiety effect, especially soluble fiber, can delay gastric emptying and prolong transit time in the intestine so that it impacts the release of the satiety hormone (Hervik and Svihus, 2019; Giuntini, Sardá and de Menezes, 2022). In addition, the consumption of fiber in foodstuffs can affect intestinal motility by increasing the volume and weight of feces so that the consistency and frequency of stools also increase (Rebello, Greenway and Dhurandhar, 2014; Müller, Canfora and Blaak, 2018). When -glucan, lupine kernel fiber, rye bran, whole rye, or high fiber mixed meals are employed, a number of studies have demonstrated a decrease in intake and body weight, according to Clark and Slavin ( 2013). This is consistent with our discovery that obese people may experience weight loss after increasing their fiber intake by 2 grams per day for three months.

Applying a T-plate diet and consuming fruit before meals can contribute to efforts to increase fiber intake for diabetics. Increasing fiber intake through daily intake of vegetables and fruit not only improves the glucose response of people with diabetes mellitus but can prevent the development of impaired glucose tolerance in adult (McRae, 2018; Kimura et al., 2021). Modification of fruit consumption before using the T-style plate and the application of the T-plate diet without modification appeared to be successful but not significant. This may occur as a result of the adaptation process of the body's metabolic system in type-2 diabetes mellitus patients where previously fiber consumption was very low.

The benefits of our research include the opportunity to experiment with the eating aids suggested for obese individuals in order to get closer to the fundamentals of eating in accordance with a typical diabetes diet. Also, we collected samples from a variety of locations in order to explain the food habits of diabetic patients in Malang. Our study's flaw is that women continue to dominate the sex proportion, but the sample size is still quite tiny.

## CONCLUSIONS

The application of the eating model using the T-plate model alone can decrease blood pressure and reduce carbohydrate intake. Meanwhile, dietary modification by consuming fruit before using the T-plate model can increase fiber intake and reduce BMI. Future research can refer to special eating aids intended for diabetic patients. Meal aids that help diabetic patients apply the principles of the diabetes mellitus diet in a simple and easy way. Besides that, further research can also be carried out which raises the effect of various foods that contain fiber that can be eaten before main meals to increase fiber intake in a day.

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