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TABLE OF CONTENT

A CASE CONTROL STUDY OF FACTORS RELATED TO OBESITY AMONG ELEMENTARY SCHOOL CHILDREN IN BANYUWANGI SUB-DISTRICT	1
Wiwik Uliyani ¹	
EVALUATION OF THE LEVEL OF PATIENT SATISFACTION WITH PHARMACEUTICAL SERVICES IN THE INSTALLATION OF OUT PATIENT PHARMACY ISLAMIC HOSPITAL PURWOKERTO.....	13
Iva Rinia Dewi ¹ , Rofik Kholid ¹ , Putu Maratus Solikhah, Arinda Nur Cahyani ¹	
ANALYSIS OF RISK FACTORS SUNTING IN CHILDREN AGED 0-24 MONTHS IN BANYUMAS REGENCY	28
Erna Kusuma Wati ¹), Setiyowat Rahardjo ²), Arrum Firda Ayu Maqfiroch ²)	
KNOWLEDGE AND SKILLS IN THE USE OF FIRE EXTINGUISHERS THROUGH FIRE FIGHTING TRAINING FOR PRINTING WORKERS PT X KARANGANYAR	36
Bachtiar Chahyadhi ¹), Maria Paskanita Widjanarti ²), Arbi Oktavandi ³).	
OSTEOPOROSIS: KNOWLEDGE, ATTITUDES, AND PRACTICES AMONG UNIVERSITY STUDENTS	48
Mariany Puspita Subrata ¹ , Ermi Girsang ¹ , Putranto Manalu ^{1*}	
PERSONAL HYGIENE AND HEALTHY BEHAVIOR TOWARD SCABIES INCIDENCE IN JEMBER REGENCY: A CROSS-SECTIONAL STUDY.....	62
Khaidar Ali ¹ , Muhammad Addin Rizaldi ¹ , Khoiron ² , Isa Ma'rufi ²	
POST-TRAINING EVALUATION: BEHAVIOR OF COMMUNITY HEALTH CENTER MANAGEMENT TRAINING ALUMNI	80
Tuti Surtimanah ^{1*} Setia Kahadiwan ² Lilis Sriyani ³ Rina Rostarina ⁴ Tati Nurhayati ⁵ Irna Avianti ⁶	
THE RELATIONSHIP BETWEEN WORK PERIOD, WORK POSTURE, WORK CLIMATE, AND NOISE WITH WORK FATIGUE AT CHARCOAL BRIQUETTE INDUSTRY	99
Hidayatul Amalia, Ekawati, Bina Kurniawan	
THE DIFFERENCE BETWEEN THE EFFECT OF OXYTOCIN MASSAGE AND BREAST CARE ON THE BREAST MILK PRODUCTION IN POSTPARTUM MOTHERS	118
Atik Ismiyati ¹), Mina Yumei Santi ²), Dyah Noviawati Setya Arum ³) Nuriana Kartika Sari ⁴)	
LITERATURE REVIEW: THE IMPACT OF STUNTING ON THE LEARNING ACHIEVEMENT OF ELEMENTARY SCHOOL CHILDREN	124
Wulan Syarani Asdam and Septa Indra Puspikawati	
THE RELATIONSHIP BETWEEN EATING HABITS, MENSTRUATION DURATION, AND NUTRITIONAL STATUS WITH ANEMIA INCIDENCE IN ADOLESCENT GIRLS AT MAN 1 OGAN ILIR	137
Novliza Rizkia Putri ¹ , Rini Anggraini ² , Nurmalia Ermi ³	
TREND AND SPATIAL ANALYSIS OF DIABETES MELLITUS DISEASE 2019-2023 IN YOGYAKARTA CITY	153
Annisa Setyaningrum ^{1,2} , Solikhah Solikhah ^{2,3*} , Sulistyawati ²	

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TABLE OF CONTENT

A CASE CONTROL STUDY OF FACTORS RELATED TO OBESITY AMONG ELEMENTARY SCHOOL CHILDREN IN BANYUWANGI SUB- DISTRICT	1
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Wiwik Uliyani¹

EVALUATION OF THE LEVEL OF PATIENT SATISFACTION WITH PHARMACEUTICAL SERVICES IN THE INSTALLATION OF OUTPATIENT PHARMACY ISLAMIC HOSPITAL PURWOKERTO	12
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Iva Rinia Dewi¹, Rofik Kholid¹, Putu Maratus Solikhah, Arinda Nur Cahyani¹

ANALYSIS OF RISK FACTORS SUNTING IN CHILDREN AGED 0-24 MONTHS IN BANYUMAS REGENCY	28
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Erna Kusuma Wati¹), Setiyowat Rahardjo²), Arrum Firda Ayu Maqfiroch²)

KNOWLEDGE AND SKILLS IN THE USE OF FIRE EXTINGUISHERS THROUGH FIRE FIGHTING TRAINING FOR PRINTING WORKERS PT X KARANGANYAR	36
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Bachtiar Chahyadhi¹), Maria Paskanita Widjanarti ²), Arbi Oktavandi³).

OSTEOPOROSIS: KNOWLEDGE, ATTITUDES, AND PRACTICES AMONG UNIVERSITY STUDENTS	48
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Mariany Puspita Subrata¹, Ermi Girsang¹, Putranto Manalu^{1*}

PERSONAL HYGIENE AND HEALTHY BEHAVIOR TOWARD SCABIES INCIDENCE IN JEMBER REGENCY: A CROSS-SECTIONAL STUDY	62
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Khaidar Ali¹, Muhammad Addin Rizaldi¹, Khoiron², Isa Ma'rufi²

POST-TRAINING EVALUATION: BEHAVIOR OF COMMUNITY HEALTH CENTER MANAGEMENT TRAINING ALUMNI.....	80
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Tuti Surtimanah^{1*} Setia Kahadiwan² Lilis Sriyani³ Rina Rostarina⁴ Tati Nurhayati⁵
Irna Avianti⁶

THE RELATIONSHIP BETWEEN WORK PERIOD, WORK POSTURE, WORK CLIMATE, AND NOISE WITH WORK FATIGUE AT CHARCHOAL BRIQUETTE INDUSTRY	99
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Hidayatul Amalia, Ekawati, Bina Kurniawan

**THE DIFFERENCE BETWEEN THE EFFECT OF OXYTOCIN MASSAGE
AND BREAST CARE ON THE BREAST MILK PRODUCTION IN
POSTPARTUM MOTHERS 111**

Atik Ismiyati¹⁾, Mina Yumei Santi²⁾, Dyah Noviawati Setya Arum³⁾ Nuriana
Kartika Sari⁴⁾

**LITERATURE REVIEW: THE IMPACT OF STUNTING ON THE
LEARNING ACHIEVEMENT OF ELEMENTARY SCHOOL CHILDREN. 124**

Wulan Syarani Asdam and Septa Indra Puspikawati

**THE RELATIONSHIP BETWEEN EATING HABITS, MENSTRUATION
DURATION, AND NUTRITIONAL STATUS WITH ANEMIA INCIDENCE
IN ADOLESCENT GIRLS AT MAN 1 OGAN ILIR 137**

Novliza Rizkia Putri¹, Rini Anggraini², Nurmalia Ermi³

**TREND AND SPATIAL ANALYSIS OF DIABETES MELLITUS DISEASE
2019-2023 IN YOGYAKARTA CITY..... 153**

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A CASE CONTROL STUDY OF FACTORS RELATED TO OBESITY AMONG ELEMENTARY SCHOOL CHILDREN IN BANYUWANGI SUB- DISTRICT

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ABSTRACT

Obesity in school-aged children is a problem that can have a lasting impact until adulthood. In Indonesia, 11.9% of children aged 5-12 years are overweight and 7.8% are obese (IHS, 2023). Based on data from the health screening results of grade 1 elementary school students for the 2019/2020 academic year in Banyuwangi sub-district, there were 4.07% cases of obesity and 0.44% of obesity cases. This study aims to analyze the relationship between the parental income, frequency of junk food consumption and physical activity with the incidence of obesity in grade 1 elementary school children in Banyuwangi sub-district. This research method is observational with a quantitative approach and case control study design. The population used in this study was 1,178 students with obese and normal. The sample size for this study was determined using the Sample Size formula by Lemeshow et al, 1990, and the result of calculating the sample size for this study was

144. Sampling was carried out by probability sampling. Data was obtained by measuring students' BMI and interviews about parental income, FFQ questionnaire interviews and PAQ-C questionnaires. Analysis was carried out using the OR, and using chi-square analysis with a significance level ($\alpha=5\%$). The research results showed that the parental income (p value 0,000 and OR = 17,043), frequency of junk food consumption (p value = 0.005 and OR= 2.619) and physical activity (p value = 0.012 and OR = 2.333) are related to the incidence of obesity in elementary school children in the sub-district Banyuwangi.

Keywords: consumption of junk food, physical activity, elementary school children

INTRODUCTION

Obesity is a problem that still occurs in children. Obesity is a condition in which a person has a body with excessive fat deposits which can pose a risk to health. The problem of overnutrition has now become a global health problem, the prevalence of obesity throughout the world is increasing from year to year, as many as 21-24% of children in America are overweight and 10% are obese (Nur Amalia et al., 2016). The obesity epidemic is quickly becoming the biggest global public health challenge, ranking in the top three causes of chronic health disorders (Indonesian Ministry of Health, 2018). In Indonesia, 11.9% of children aged 5-12 years are overweight and 7.8% are obese (Indonesian Health Survey, 2023). Based on data from the Indonesian Health Survey (IHS, 2023), in East Java Province, 13.8% of children aged 5-12 years are overweight and 9.7% are obese. Based on data from the health screening results of grade 1 elementary school students for the 2019/2020 academic year in Banyuwangi sub-district, there were 4.07% cases of obesity and 0.44% of

obesity cases. In the working area of Banyuwangi sub-district, namely the Kertosari, Singotrunan and Sobo health centers, there are 47 elementary schools and based on data from the health screening results of grade 1 elementary school students for the 2019/2020 academic year, it is known that the number of obesity cases is 6.50% and obesity cases are 0.47 %. Even though the prevalence of overweight and obesity among elementary school students is 6.50% and 0.47%, Banyuwangi sub-district is the center of the city which is currently increasing rapidly in the establishment of restaurants and junk food outlets, especially around schools, making it easier for students to access junk food which encourages obesity.

Obesity in school-aged children is a problem that can have a lasting impact until adulthood. Obesity has many factors, the factors that often occur in children are behavioral factors, namely food consumption and physical activity. Modern lifestyles tend to cause children's nutritional status to be above normal, so that children

become fat or obese. This is because children eat a lot, but are less active, so the energy that enters the body is much more than the energy used for activity and growth (Izhar, 2020). Children with a high frequency of consuming junk food will increase fat deposits in the body and increase the risk of obesity.

Generally, what is included in the junk food category is food that has little nutritional content, but is high in salt, high in sugar, high in fat and high in energy. The presence of junk food in the Indonesian food industry can influence school children's eating patterns. The level of junk food consumption among teenagers is currently relatively high, with the average teenager consuming junk food 3 to 4 times a month (Widyastuti, 2018). Adolescents who consume excess calories will have a 4.69 times higher risk of experiencing obesity than adolescents who consume normal calories. Likewise, adolescents who consume excess fat and carbohydrates will be 2 times more likely to experience obesity compared to adolescents who

consume too much fat and carbohydrates sufficient (Kurdanti, et al. 2015). Based on Nur Amalia et al, 2016, the habit of eating junk food tends to be carried out by children who have a high socio-economic status. With increasing purchasing power, parents tend to spoil their children with junk food. The availability of junk food and easy access to it have a big influence on children's junk food eating habits (Nur Amalia et al, 2016).

Apart from that, the risk of obesity is also influenced by a person's physical activity. A high Body Mass Index (BMI/Age) which describes overnutrition includes a pattern of high energy consumption and lack of physical activity which leads to a sedentary lifestyle. As time goes by, technological developments become more sophisticated, making it easier for humans to fulfill their daily needs and physical activity decreases. Physical activity is a form of behavior while energy expenditure is the outcome of behavior. Low physical activity combined with excessive eating patterns can lead to obesity.

Based on the description above, researchers conducted research on the relationship between the parental income, frequency of junk food consumption and physical activity with the incidence of obesity in elementary school children in Banyuwangi sub-district. The research was conducted by measuring BMI/Age, parental income, frequency of consumption of junk food and physical activity in elementary school children. This study aims to determine the relationship between the parental income, frequency of consumption of junk food and physical activity with the incidence of obesity in elementary school children in Banyuwangi sub-district.

METHOD

This research uses observational research with a case control study design. This research uses a quantitative approach and does not provide any intervention. This research was conducted at elementary schools in Banyuwangi sub-district, Banyuwangi district, East Java Province in July-August 2022. The population used in this

study was 1,178 students with obese and normal taken from 44 schools in Banyuwangi sub-district, and the selection of the population was based on students' nutritional status, namely obesity (case) and normal (control). The sample size for this study was determined using the Sample Size formula by Lemeshow et al, 1990, and the result of calculating the sample size for this study was 144. The case group is respondents with obese nutritional status and the control group is respondents with normal nutritional status. Sampling was carried out by probability sampling using random sampling techniques from each group. Data collection was carried out by collecting primary and secondary data. Primary data collection techniques in this research was obtained by measuring students' BMI and interviews about parental income conditions at the time the research was conducted, FFQ questionnaire interviews regarding the frequency of consumption of junk food in the last 1 month and PAQ-C questionnaires regarding students' physical activity in the

last 7 days. Method of measuring the respondent's parental income category, it is said to be low if the parental income is below the Banyuwangi district minimum wage and it is said to be high if the parent's income is above the Banyuwangi district minimum wage. The results of measuring the frequency of consumption of junk food in this study were grouped into two categories, namely rarely (score < mean) and often (score > mean) and the results of measuring physical activity in this study were grouped into two categories, namely good physical activity (> Median) and physical activity less (<Median). Secondary data was obtained from data from the health screening results of grade 1 elementary school students for the 2019/2020 academic year, in the form of IMT results for elementary school students in Banyuwangi sub-district.

The dependent variable in this study is the incidence of obesity. The independent variables in this study are the parental income, frequency of junk food consumption and physical activity. Data processing

in this research was carried out univariate and bivariate. Univariate analysis was used to analyze the frequency and percentage distribution of each variable. The bivariate analysis stage in the research is used to continue the results of the previous univariate analysis which is useful for answering the research hypothesis, namely to determine the relationship between the dependent variable and the independent variable. Bivariate analysis was carried out using the Odds Ratio (OR) to determine the prevalence value and relationship value of the independent variable to the dependent variable, and using chi-square analysis with a significance level (α) of 5% or (0.05).

RESULT AND DISCUSSION

RESULT

1. Frequency Distribution of Factors Associated with the Incidence of Obesity

Table 1. Presenting factors associated with the incidence of obesity. Factors in this study consisted of parental income, frequency of junk food consumption and physical activity. Shows the results of the

frequency distribution of research respondents based on parental income, frequency of junk food consumption and physical activity. Parental income is the condition of the respondent's family income at the time the research was

conducted. Junk food consumption frequency is the respondent's frequency of junk food consumption during the last 1 month. Physical activity is the frequency of the respondent's physical activity during the last 7 days.

Table 1. Frequency Distribution of Factors Associated with the Incidence of Obesity

Variable	Category	Case (n)	Percentage (%)	Control (n)	Percentage (%)
Parental Income	low	8	11,1	49	68,1
	high	64	88,9	23	31,9
	total	72	100,0	72	100,0
Frequency of Junk Food Consumption	rarely	28	38,9	45	62,5
	often	44	61,1	27	37,5
	Total	72	100,0	72	100,0
Physical Activity	Good	27	37,5	42	58,3
	Less	45	62,5	30	41,7
	Total	72	100,0	72	100,0

Source: Questionnaire Data Processing (2022)

Seen from table 1. it can be seen that in the case group there were 8 (11.1%) respondents whose parents had low incomes, while 64 (88.9%) respondents whose parents had high incomes. In the control group, 49 (68.1%) respondents had low income parents, while 23 (31.9%) respondents had high income parents. Based on the frequency of junk food consumption in the case group was 28 (38.9%) respondents who rarely consumed junk food, while 44 (61.1%) respondents often consumed junk food. In the control group, 45 (62.5%) respondents rarely consumed junk

food, while 25 (37.5%) respondents often consumed junk food. Then, regarding the physical activity carried out by the case group was 27 (37.5%) respondents who had good physical activity while 45 (62.5%) respondents had less physical activity. In the control group, 42 (58.3%) respondents had good physical activity, while 30 (41.7%) respondents had less physical activity.

2. Analysis of the Factors Associated with the Incidence of Obesity

Table 2. Presents an analysis of the relationship between the respondent's parental income, the

respondent's frequency of junk food consumption, the respondent's physical activity and the incidence of obesity. To determine the prevalence value and the relationship value of the independent variable with the

dependent variable, the Odds Ratio (OR) is used. Next, the analysis was carried out

using the Chi-Square test with a degree of significance (α) of 5% or 0.05

Table 2. Analysis of the Factors Associated with the Incidence of Obesity

Variable	Category	Case (n)	Percentage (%)	Control (n)	Percentage (%)	OR	P Value
Parental Income	low	8	11,1	49	68,1	Ref	0,000
	high	64	88,9	23	31,9	17,043	
	total	72	100,0	72	100,0	CI (7,025-	
Frequency of Junk Food Consumption	Rarely	28	38,9	45	62,5	Ref	0,005
	Often	44	61,1	27	37,5	2,619	
	Total	72	100,0	72	100,0	CI (1,337-5,131)	
Physical Activity	Good	27	37,5	42	58,3	Ref	0,012
	Less	45	62,5	30	41,7	2,333	
	Total	72	100,0	72	100,0	CI (1,196-4,554)	

Source: Questionnaire Data Processing (2022)

From table 2, Based on the Odds Ratio (OR), parental income is a risk factor of obesity among elementary school children in Banyuwangi sub-district (OR=17.043, CI (7,025-41,352)). So, respondents who have parents with high incomes are 17,043 times more likely to be obese than respondents who have parents with low incomes. Based on the relationship test using the Chi Square test by looking at the Pearson Chi-square value, it was obtained that the p value was <0.05, namely 0.000, which means that there is a

relationship between parental income and the incidence of obesity in elementary school children in Banyuwangi sub-district.

Based on the results, frequency of consumption of junk food is a risk factor of obesity in elementary school children in Banyuwangi sub-district (OR=2.619, CI (1.337-5.131)). So, respondents who often consume junk food are 2.619 times more likely to be obese than respondents who rarely consume junk food. Next, the results of the relationship test using the Chi Square

test by looking at the Pearson chi-square value obtained a p value <0.05 , namely 0.005, which means there is a relationship between the frequency of junk food consumption and the incidence of obesity in elementary school children in Banyuwangi sub-district.

Then on the respondents' physical activity, looking at the odds ratio (OR) physical activity is a risk factor of obesity in elementary school students in Banyuwangi sub-district (OR=2.333, CI (1.196-4.554)). So, respondents who lack physical activity are 2.333 times more likely to be obese than respondents whose physical activity is good. Based on the results of the relationship test using the Chi Square test by looking at the Pearson chi-square value, it was obtained that the p value was <0.05 , namely 0.012, which means there is a relationship between physical activity and the incidence of obesity in elementary school children in Banyuwangi subdistrict.

DISCUSSION

1. Analysis of the Relationship between Parental Income and the incidence of Obesity

The research results show that the majority of children with high-income parents have obese nutritional status, while the majority of children with low-income parents have normal nutritional status. Based on results research, parental income is a risk factor for obesity and based on chi-square test analysis, it states that there is a relationship between parental income and the incidence of obesity in elementary school children in Banyuwangi sub-district. Research conducted by Rendy et al 2016 shows that the magnitude of the influence of high income on child obesity is known to be $OR = 3.8$, which means that children who have families with high incomes have 3 times the risk of becoming obese compared to children who have families with low incomes (Rendy et al 2016). This is in line with research conducted by Mayulu et al which states that there is a significant relationship between family income and the incidence of obesity (Mayulu et al, 2013). This is confirmed by research which states that a p value <0.05 (0.027) is obtained, which means there is a relationship between the

incidence of obesity and family income (Widyantari et al, 2018).

2. Analysis of the Relationship between Frequency of Junk Food Consumption and the incidence of Obesity

The results of the research show that the majority of children who frequently consume junk food rarely have normal nutritional status, while the majority of children who frequently consume junk food frequently have obese nutritional status. Based on results research, frequency of junk food consumption is a risk factor for obesity and based on chi-square test analysis, it states that there is a relationship between frequency of junk food consumption and the incidence of obesity. Factors that can cause high consumption of junk food in elementary school children are behavioral and environmental factors, where children's behavior in consuming food influences the child's nutritional status. Then environmental factors include the school environment, family environment and the surrounding environment that supports children to consume food, such as easy access to consume junk

food because it is close to various kinds of junk food outlets. This is in line with research conducted by Nur Amalia et al, which states that there is a significant relationship between the frequency of junk food consumption and overnutrition (p value = 0,013) and there is an influence between the frequency of consumption of junk food and the incidence of overnutrition with an (OR=2.13) (Nur Amalia et al, 2016). Supported by research conducted by Rizona, it was found that $p < 0.05$ (0.048), so statistically there is a significant relationship between the frequency of consuming junk food and the incidence of obesity in elementary school children in the working area of the Aur Duri health center, Jambi city (Rizona, 2020).

3. Analysis of the Relationship between Physical Activity and the incidence of Obesity

The results showed that the majority of children with good activity had normal nutritional status, while the majority of children with less activity had obese nutritional status. Based on results research, physical activity is a risk factor for obesity and based on chi-square test

analysis, it states that there is a relationship between physical activity and the incidence of obesity. This is in line with research conducted by Feby et al, it is known that the Odds Ratio value=0.016, CI(0.004 –0.068) which indicates that physical activity is a risk factor for the incidence of obesity in adolescents with light physical activity 0.016 times more risk of becoming obese, in comparison with adolescents with physical activity moderate (Feby et al, 2016). The results of other research also state that there is a significant relationship between physical activity and the incidence of overnutrition in children at SDN 04 Sendangmulyo, Tembalang sub-district, Semarang City (Anindyawati, 2016). The results of this study were strengthened by research conducted by Muchtar et al which stated that there was a relationship between physical activity and the incidence of obesity with $p=0.005$ ($p<0.05$) (Muchtar et al, 2012). Other research states that there is a significant relationship between physical activity and the incidence of obesity (Danari et al, 2013). This is

supported by the opinion of Edelman and Mandle, 2010 in Agustina, 2019 which states that less physical activity supports the occurrence of excess body weight (Agustina et al, 2019).

CONCLUSION AND RECOMMENDATION

There is a meaningful relationship between the parental income, frequency of junk food consumption and physical activity with the incidence of obesity in elementary school children in Banyuwangi sub-district.

Suggestions that can be given is that it is hoped that parents can introduce healthy food to their children by choosing food at home or purchasing food outside the home, parents can set limits on junk food consumption at home, and parents are expected to encourage children to do physical activities at home.

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EVALUATION OF THE LEVEL OF PATIENT SATISFACTION WITH PHARMACEUTICAL SERVICES IN THE INSTALLATION OF OUTPATIENT PHARMACY ISLAMIC HOSPITAL PURWOKERTO

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ABSTRACT

Hospital is one of the complete health service facilities that includes inpatient, outpatient and emergency services. Patient satisfaction is the patient's perception that their expectations have been met, The purpose of this study was to determine the evaluation of the level of patient satisfaction in the Outpatient Pharmacy Installation of Purwokerto Islamic Hospital based on the dimensions of Tangibles, Responsiveness, Assurance, Empathy and Reliability. This type of research is descriptive research with a cross-sectional approach. A sample of 93 people who were waiting for medicine at the Outpatient Pharmacy Installation of RSI Purwokerto from a total population of 1327 people calculated using the Slovin formula. The sampling method used in this study was accidental sampling. The results of this study showed that respondents were female with a percentage of 65.6%. with an adult age category with a percentage of 73.1%. High school education history with a percentage of 43%, self-employed work with a percentage of 29.0%. The results of the satisfaction level based on 5 dimensions are real evidence 74.19%, responsiveness 75.91%, assurance 75.91%, empathy 73.76%, reliability 75.27%. The conclusion of this study is that 5 dimensions are included in the satisfied category, namely in the range of 61-80%..

Keywords: Evaluation, Patient Satisfaction, Five dimension;, Purwokerto Islamic Hospital

INTRODUCTION

The healing center is one of the wellbeing care offices that have an critical part in moving forward the degree of Open Wellbeing by giving whole person wellbeing administrations that incorporate inpatient, outpatient and crisis services(Kemenkes RI 2020). The obligation of the clinic as a implies of wellbeing care is to supply quality wellbeing administrations and can be responsible to the community. By demonstrating quick, exact benefit and a sense of security agreeing to wants of the community, it can progress the quality of benefit at the clinic. In its benefit, the clinic comprises of a few benefit offices, one of which is IFRS (Clinic Drug store establishment), a utilitarian benefit unit that organizes all pharmaceutical benefit exercises in hospitals(Kemenkes RI 2016).

One of the most excellent administrations that patients anticipate is pharmaceutical administrations in healing center drug store establishments. Based on the control of the Serve of Wellbeing Proclaim No. 72 of 2016

pharmaceutical benefit guidelines in clinics, pharmaceutical administrations are coordinate and mindful administrations to patients related to pharmaceutical arrangements such as drugs, therapeutic substances, conventional solutions with the point of accomplishing unequivocal comes about to move forward the quality of understanding wellbeing.

Pharmaceutical benefit measures point to move forward the quality of pharmaceutical administrations, guarantee lawful certainty for pharmaceutical work force and ensure patients and the public from silly utilize of drugs within the setting of quiet security (Kemenkes RI 2011).

Pharmaceutical administrations influence the level of quiet fulfillment. An imperative portion of wellbeing care is persistent fulfillment. Persistent fulfillment is the patient's recognition that his desires have been met, and the quiet will feel fulfilled on the off chance that the execution of wellbeing administrations he gotten rises to or surpasses what he anticipated (Kosnan 2019). Fulfillment overview strategies that are well known and

have been utilized in different areas, one of which is the field of Wellbeing is presented by Parasuraman, Zeithaml, and Berry (1988) which has been tried in detail and has been created into a estimation instrument for planned quality concurring to clients called the SERVQUAL Instrument (Benefit Quality) (Rohmah 2019). The SERVQUAL instrument is an instrument to degree the level of quiet fulfillment with wellbeing administrations which incorporates five measurements, specifically Unmistakable (coordinate prove), Unwavering quality (unwavering quality), Responsiveness (responsiveness), Affirmation (confirmation), and compassion (compassion). Based on the inquire about comes about of Heryanadi, C et al, (2021) appear that the appearance measurement (unmistakable) is the most noteworthy fulfillment, specifically 72% with parameters on the appearance and offices of clinic drug stores exterior and interior, the affirmation measurement is 70%, the responsiveness measurement is 67%, the empathy measurement is 66%, and the least fulfillment is on the

unwavering quality measurement, specifically 65% on the benefit method isn't convoluted and simple to get it (Heryanadi, Hardian & Ardiansyah 2021). Based on preparatory considers that have been conducted at Purwokerto Islamic clinic number of outpatient BPJS quiet visits in November in a week come to 1327 patients. From interviews conducted to 10 individuals said there's disappointment with the benefit since the holding up time is still long and the need of seating so that there are still patients and families of patients who don't get a situate. Based on the background above, the author is interested in conducting research on evaluating the level of patient satisfaction with pharmaceutical services at the Outpatient Pharmacy Installation of Purwokerto Islamic Hospital.

METHODS

Research Type and Design

This research is a descriptive study with a cross-sectional approach. This approach is used to describe phenomena that occur at a certain time during the research period.

Time and Location of the Research

The research was conducted from November 2023 to June 2024, located at the Outpatient Pharmacy Installation of the Purwokerto Islamic Hospital.

Population and Sample

The population in this study were all patients who were waiting for medicine at the Outpatient Pharmacy Installation of the Purwokerto Islamic Hospital, with an average of 1,327 patients per week. The sample size was determined using the Slovin formula, resulting in a total sample of 93 respondents.

Sampling was carried out using the accidental sampling technique, namely taking respondents based on their presence at the research location when the research was taking place. Samples were taken over a six-day period (Monday to Saturday), with the number of daily respondents determined based on the proportion of the comparison of the number of daily patients to the total weekly patients. The number of daily samples obtained were:

- a. Monday : 17 respondents

- b. Tuesday : 20 respondents

- c. Wednesday : 15 respondents

- d. Thursday : 17 respondents

- e. Friday : 13 respondents

- f. Saturday: 11 respondents

Research Instrument

The instrument used was a questionnaire that had been tested for validity and reliability. The test results showed that this instrument was valid and reliable for use in data collection.

Data Processing and Analysis

The data processing process includes the following stages: editing, coding, processing, cleaning, and tabulating. The collected data were analyzed using the SPSS version 25 computer program to produce data interpretations that were relevant to the research objectives. Data in the form of percentage and to determine satisfaction using

Scoring and Organizing.

Scoring calculation is done utilizing Likert scale as takes after:

Table 1 Categories of Likert Scale (Sugiyono 2014)

Assessment	score
(SP) very satisfied	5
(P) satisfied	4
(CP) quite satisfied	3
(KP) less satisfied	2
(TP) not satisfied	1

Estimation of persistent fulfillment is measurement utilizing the taking after done by calculating the rate of each equation :

$$\% \text{ Patient satisfaction rate} = \frac{\text{number of scores obtained}}{\text{maximum number of scores}} \times 100\%$$

From the comes about of the fulfillment measurements within the calculation will be seen the category ponder. Category level of fulfillment of fulfillment level for each point of can be seen in Table 2

Table 2 categories of patient satisfaction (Santriatsi 2018)

Satisfaction level	rating scale value
(TP) not satisfied	0-20%
(KP) less satisfied	21% - 40%
(CP) quite satisfied	41 – 60%
(P) satisfied	61 – 80%
(SP) very satisfied	81 – 100%

RESULTS AND DISCUSSIONS

1. This inquire about was conducted at the Purwokerto Islamic clinic pharmaceutical establishment on 10-15 June 2024. The level of understanding fulfillment was measured utilizing an instrument within the frame of a survey comprising of 5 measurements of benefit quality, specifically, the measurements of coordinate prove (substantial), responsiveness (responsiveness), confirmation (confirmation), sympathy (emphaty), and unwavering quality (unwavering quality) are dispersed to outpatients who get Pharmaceutical Services (Rizqi 2020) (Pitaloka & Istiana Kusumastuti 2024). The reason analysts chose outpatients is since outpatients get pharmaceutical administrations specifically from drug store staff. Examining was carried out by coincidental examining and gotten 93 respondents from a population of 1,327 patients for one month who

had met the incorporation criteria.

dissemination of surveys.

Here are the characteristics of respondents gotten from the

2. Characteristics Of Respondents

a. Gender

Table 3 Characteristics By Sex

No	description	total	
		frequency	percentage
1	male	32	34.4%
2	female	61	65.6%
Total		93	100%

(Source: Primary Data)

The division of sex points to decide the proportion of the number of men with ladies. Based on the comes about of the consider pointed at Table 3 can be seen from the 93 respondents generally female with a rate of 65.6% compared to the male sex of 34.4%. This is often in line with investigate conducted by Maria (2020) ladies tend to be more concerned with the health of each family part and this is often moreover in line with investigate conducted by Rizqi (2020) for the most part ladies are more

powerless to malady and more rapidly need to urge wellbeing help on the off chance that they involvement wellbeing issues compared to men-size (Rizqi 2020).

b. Age

Table 4 Characteristics of Respondents By Age

No	Description	total	
		frequency	percentage
1	Children (0-19 years)	5	5.4%
2	Young adults (20-24 years)	15	16.1%
3	Adults (25-64 years)	68	73.1%
4	Elderly (>65 years)	5	5.4
Total		93	100%

(Source: Primary Data)

The table presents the distribution of respondents based on age groups. It categorizes the participants into four groups: children (0-19 years), young adults (20-24 years), adults (25-64 years), and the elderly (>65 years). The majority of respondents fall within the adult category (25-64 years), accounting for 73.1% (n=68) of the total sample. The young adult group (20-24 years) constitutes 16.1% (n=15) of the respondents. Both the children (0-19 years) and elderly (>65 years) groups have the same proportion, each representing

c. Level of Education

Table 5 Characteristics of Respondents Education History

No	description	total	
		frequency	percentage
1	Bachelor	19	20.4%
2	high school	40	43.0%
3	junior	high 16	17.2%
4	elementary	18	19.4%
	Total	93	100%

(Source: Primary Data)

Based on the comes about of the ponder in Table 5 appears the level of rudimentary instruction of 19.4%, Junior Tall School 17.2%, tall school 43.0%, and S1 20.4% in this ponder most respondents were tall school taught. This can be in line with inquire about conducted by

d. Jobs

5.4% (n=5) of the total sample. The total number of respondents is 93 (100%). Typically in line with inquire about conducted by Clara Ritawany Sinaga (2022) which comes about in that agreeing to information on the characteristics of respondents by age, it can be known that the number of respondents is youths 18-25 a long time ancient, specifically 12%, grown-ups 26-45 a long time ancient, to be specific 45%, elderly 45-65 a long time ancient, specifically 43% (Clara 2022)(Sinaga, Salim & Ardilla 2018)

Muhammad D et al., (2020). This appears that the higher the level of instruction of respondents, the more they will have broad data, so that individuals with higher instruction will be superior educated than those with lower instruction (Muhammad, Almasyhuri & Setiani 2020).

Table 6 Characteristics of Job Respondents

No	Information	Total	
		Frequency	Percentage
1	Private Employees	12	12.9 %%%
2	Students	1	1.1%
3	Self-Employed	27	29.0%
4	Laborer	13	14.0%
5	Housewives	24	25.8%
6	Public Servants	16	17.2%
	Total	93	100%

(Source: Primary Data)

Based on the comes about of the think about in Table 6 appears the work of respondents private representatives 12.9%, understudies 1.1%, self-employed 29.0%, specialists 14.0%, Housewives 25.8%, gracious hirelings 17.2%. In this case, most of the respondents ' employments are self-employed. Typically in line with investigate conducted by Hartono et al., (2019) which appears that work can influence a person's evaluation and perception of something, since each work encompasses a distinctive environment in creating an evaluation of an anticipated thing (Hartono & Sulo 2019).

1. Level Of Patient Satisfaction

Based On 5 Dimensions

Understanding fulfillment is an person evaluation of the seen

and anticipated level of Benefit. In case the execution is underneath desires, the quiet will be baffled and disappointed, on the opposite, in the event that the execution is as anticipated by the quiet, the quiet will feel fulfilled (Sinala *et al.* 2018) (Mayang Sari, Rahma Wani & Muhammad Andry 2023). Fulfillment can be measured by 5 measurements of benefit quality, specifically coordinate prove (unmistakable), responsiveness (responsivennes), affirmation (confirmation), sympathy (emphaty), and unwavering quality (reliability)(Trisnawati & F.X. Sulistiyanto Wibowo S 2022)(Kelley & Turley 2001).

a. Dimensions of direct evidence (*tangible*)Table 7 Levels Of Patient Satisfaction Based On Tangible Evidence (*Tangible*)

No	description	Number	
		of frequency	percentage
1	Not satisfied	0	0
2	Less satisfied	0	0
3	quite satisfied	30	32.3%
4	satisfied	60	64.5%
5	Very Satisfied	3	3.2%
Total		93	100%
average			74.19%
Categories			satisfied category

Based on the comes about of inquire about that can be seen in Table 7 appears that respondents who communicated very fulfilled by 32.3% with an normal rate of 74.19%. This is often since the offices contained in Purwokerto Islamic Clinic have satisfactory offices such as clear signage, the area of pharmaceutical establishments that are effectively available, comfortable data benefit rooms, drug store officers who see slick in uniform.

After the assessment on this measurement there are 42 respondents who chose the

category very fulfilled, the foremost broadly chosen is Articulation number 2 (seating in drug stores is adequate). The tall number of respondents who select the category is very fulfilled with articulation Number Two since it is seen from the reality that the need of accessibility of seating offices in outpatient drug store establishments so that numerous patients are holding up for pharmaceutical by standing. Dimensions of responsiveness (*responsiveness*). For the question items as follows:

Petugas farmasi berpenampilan rapi dalam berseragam	<i>Pharmacy staff appear neat in uniform.</i>
Tempat duduk di farmasi menukupi	<i>Seating in the pharmacy is sufficient.</i>
Letak ruangan farmasi mudah dicapai	<i>The pharmacy room is easily accessible.</i>

Fasilitas seperti AC, kipas angin, TV ada diruang tunggu membuat nyaman	<i>Facilities such as air conditioning, fans, and TV in the waiting area provide comfort.</i>
Ruang farmasi memiliki fasilitas seperti toilet	<i>The pharmacy room has facilities such as a toilet.</i>
Instalasi farmasi memiliki papan petunjuk yang jelas	<i>The pharmacy installation has clear signage.</i>
Tersedianya ruangan khusus untuk pelayanan informasi obat	<i>A dedicated room is available for medication information services.</i>
Ruangan pelayanan informasi yang nyaman	<i>The medication information service room is comfortable.</i>

Table 8 Levels Of Satisfaction Based On Responsiveness(*Responsiveness*)

No	description	total	
		frequency	percentage
1	Not satisfied	0	0
2	Less satisfied	0	0
3	Quite satisfied	28	30.1%
4	Satisfied	56	60.2%
5	Very Satisfied	9	9.7%
	Total	93	100%
	average		75.91%
	Categories		satisfied category

(Source: Primary Data)

Based on the comes about of inquire about that can be seen in Table 8 appears that respondents who communicated very fulfilled by 30.1% with an normal rate of 75.91%. This is often prove by the drug store staff who are responsive and speedy in giving administrations to patients. Drug specialists give composed data on the off chance that the persistent does not get it. Drug store staff are competent and talented in performing administrations to patients, and drug

store staff give administrations rapidly to understanding complaints. After the assessment on this measurement, there were 44 respondents who chose the category very fulfilled, the foremost chosen was Articulation number 1 (the medication was given on time by the officer). Typically prove by a few patients complain that holding up for drugs within the outpatient drug store establishment of Purwokerto Islamic healing center takes a long time

b. Dimension *Of Assurance*

The question items as follows:

<i>Pasien yakin obat yang diberikan dapat menyembuhkan mereka</i>	Patients are confident that the medication given can cure them.
<i>Pasien yakin dengan obat yang diterimanya</i>	Patients trust the medication they receive.
<i>Adanya jaminan jika terjadi kesalahan dalam informasi obat</i>	There is a guarantee in case of errors in medication information.
<i>Kualitas pelayanan di farmasi terjamin mutunya</i>	The quality of pharmacy services is assured.
<i>Layanan yang diberikan cepat dan tepat</i>	The services provided are fast and accurate.
<i>Petugas farmasi bersikap ramah dan sopan kepada pasien saat memberikan obat</i>	Pharmacy staff are friendly and polite when dispensing medication to patients.
<i>Privasi pasien selalu dijaga oleh petugas farmasi</i>	Patient privacy is always maintained by pharmacy staff.
<i>Petugas farmasi mempunyai wawasan yang luas dan kecakapan dalam memberikan pelayanan</i>	Pharmacy staff have extensive knowledge and competence in providing services.

Based on the comes about of the ponder that can be seen in Table 9 appears that the reply respondents who expressed very fulfilled by 26.9% with an normal rate of 75.91%. Usually prove by the drug store staff who are able to instill certainty in patients at the time of Sedate Organization so as to create patients feel sure with the drugs they get and quiet security is continuously kept up by drug store staff.

Table 9 Level Of Satisfaction Based *On Assurance*

No	description	total	
		frequency	percentage
1	Not Satisfied	0	0
2	Less Satisfied	0	0
3	Quite Satisfied	25	26.9%
4	Satisfied	62	66.7%
5	Very Satisfied	6	6.5%
Total		93	100%
average			75.91%
Categories			satisfied category

(Source: Primary Data)

After being assessed on this measurement, there were 32 respondents who chose the category very fulfilled, the foremost various in explanation

6 (drug store staff being inviting and neighborly to patients when giving pharmaceutical).

This is often prove by

the number of patients who are served with restricted time and due to need of Drug store staff so that not all patients are served well.

(*Emphaty*)

The question items as follows:

c. Dimensions Of Empathy

<i>Petugas farmasi memahami kebutuhan pasien</i>	Pharmacy staff understand the needs of patients.
<i>Petugas farmasi memantau keluhan pasien tentang pengobatan</i>	Pharmacy staff monitor patients' complaints about their medication.
<i>Petugas farmasi memberikan perhatian yang baik kepada pasien</i>	Pharmacy staff provide good attention to patients.
<i>Petugas farmasi memberikan layanan dengan sepenuh hati</i>	Pharmacy staff deliver services wholeheartedly.
<i>Komunikasi antara pasien dan petugas farmasi baik</i>	Communication between patients and pharmacy staff is good.
<i>Petugas farmasi tidak membiarkan pasien</i>	Pharmacy staff do not neglect patients.
<i>Petugas farmasi mengambil peran tentang masalah pasien terkait pengobatan</i>	Pharmacy staff take an active role in addressing patients' medication-related issues.
<i>Petugas farmasi senantiasa memupuk perhatian pada kerja</i>	Pharmacy staff consistently cultivate dedication to their work.

Based on the comes about of the think about that can be seen in Table 10 appears the answers of respondents who communicated very fulfilled by 38.7% with an normal rate

of 73.76%. This can be prove by the drug store staff give services wholeheartedly, communication between patients and staff is sweet, and drug store staff allow great consideration to patients.

Table 10 Levels Of Satisfaction Based On Empathy (*Emphaty*)

No	description	total	
		frequency	percentage
1	Not Satisfied	0	0
2	Less Satisfied	0	0
3	Quite Satisfied	36	38.7%
4	Satisfied	50	53.8%
5	Very Satisfied	7	7.5%
Total		93	100%

average	73.76%
Categories	satisfied category

(Source: Primary Data)

Based on the comes about of the think about that can be seen in Table 10 appears the answers of respondents who communicated very fulfilled by 38.7% with an normal rate

of 73.76%. This can be prove by the drug store staff give services wholeheartedly, communication between patients and staff is sweet, and drug store staff allow great consideration to patients.

d. Dimensions *Of Reliability*

The question items as follows:

<i>Petugas farmasi menjelaskan tentang cara penggunaan obat</i>	Pharmacy staff explain how to use the medication.
<i>Petugas farmasi memberikan keterangan tentang kegunaan obat yang diberikan</i>	Pharmacy staff provide information about the purpose of the prescribed medication.
<i>Petugas farmasi menjelaskan tentang dosis seharusnya obat yang diminum</i>	Pharmacy staff explain the correct dosage of the medication.
<i>Petugas farmasi menjelaskan tentang cara penyimpanan obat</i>	Pharmacy staff explain how to store the medication properly.
<i>Petugas farmasi menjelaskan tentang efek samping obat</i>	Pharmacy staff explain the side effects of the medication.
<i>Petugas kegiatan administrasi tampak lebih teratur</i>	Administrative activities in the pharmacy appear more organized.
<i>Apoteker memberi informasi aktivitas apa saja yang perlu dihindari berkaitan dengan penggunaan obat</i>	The pharmacist provides information on activities that should be avoided in relation to medication use.
<i>Prosedur untuk mendapatkan obat difarmasi tidak membingungkan dan mudah dipahami</i>	The procedure for obtaining medication at the pharmacy is not confusing and easy to understand.

Based on the comes about of the ponder that can be seen table 11 appears that the answers of respondents

who communicated very fulfilled by 30.1% with an normal rate of 75.27% this is often prove by the drug store

staff when giving drugs to patients clarify around the value and utilize of drugs, dosages to be taken, and

strategies for getting drugs at the drug store simple to get it.

Table 11 Level Of Satisfaction Based *On Reliability*

No	description	total	
		frequency	percentage
1	not satisfied	0	0
2	less satisfied	0	0
3	quite satisfied	28	30.1%
4	satisfied	59	63.4%
5	Very Satisfied	6	6.5%
Total		93	100%
average			75.27%
Categories			satisfied category

(Source: Primary Data)

After an in-depth assessment on this measurement, there were 34 respondents who chose to be disappointed, the foremost various of which were found in explanation 5 (drug store staff clarified almost the side effects of the medicate). Typically prove by a few

patients feel that drug store staff don't clarify the side impacts of drugs when giving data on the drugs they get. The level of patient satisfaction with pharmaceutical services in the installation of Outpatient Pharmacy Islamic Hospital Purwokerto

Table 12 levels of patient satisfaction with pharmaceutical services in Outpatient Pharmacy installation Islamic Hospital Purwokerto

No	description	Number	
		of frequency	Category
1	tangible	74.19%	satisfied
2	responsiveness	75.91%	satisfied
3	assurance	75.91%	satisfied
4	empathy	73.76%	satisfied
5	realibility	75.27%	satisfied
average		075%	satisfied

(Source: Primary Data)

Based on Table 12 appears the level of understanding fulfillment

with pharmaceutical administrations within the outpatient drug store

establishment of Purwokerto Islamic clinic as a entire from each measurement, specifically the measurement of substantial prove (tangibles) with a rate of 74.19%, the measurement of responsiveness (responsiveness) with a rate of 75.91%, the measurement of Ensure (assurance) with a rate of 75.91%, the sympathy (emphaty) with a rate of 73.76%, the measurement of unwavering quality (reliability) with a rate of 75.27%, and by and large categorized as fulfilled with an normal of 75.01%.

Based on the inquire about information, it can be seen that the reaction measurement and the ensure measurement get the most elevated rate of fulfillment of 75.91%. Tall fulfillment on the measurement of responsiveness appears that the drug store staff at Purwokerto Islamic Clinic in giving pharmaceutical administrations responsive,

quick, and fitting to patients. Whereas the tall fulfillment on the measurement of confirmation appears that drug store staff are able to instill certainty in patients at the time of Medicate Organization so as to create patients feel certain with the drugs they get and patients feel that persistent protection is continuously kept up by drug store staff.

CONCLUSION

Based on the comes about of the assessment of the level of quiet fulfillment with pharmaceutical administrations within the establishment of Outpatient Drug store Islamic Healing center of Purwokerto can be concluded that the level of patient fulfillment is within the category of fulfilled with the rate of each measurement is the measurement of substantial prove (tangibles) of 74.19%, the measurement of responsiveness (responsiveness) of 75.91%, assurance of 75.91%, measurement of compassion (emphaty) of 73.76%, measurement of unwavering quality (realibility) of 75.27%

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ANALYSIS OF RISK FACTORS STUNTING IN CHILDREN AGED 0-24 MONTHS IN BANYUMAS REGENCY

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ABSTRACT

Stunting is a chronic malnutrition problem. Stunting mainly occurs in the first 1000 days of life (from the time the fetus until 0-24 months) and continues until the age of five. The purpose of the study was to analyze the risk factors for stunting in children aged 0 – 24 months in Banyumas Regency. Observational research design with cross sectional design, 8 months research duration. One hundred children between the ages of 0 and 24 months made up the study's sample, using cluster random sampling technique. Research variables included gender, history of breastfeeding, history of infectious disease, parenting, number of family members, mother's age, parenting, education and nutritional knowledge of the mother. Bivariate test to determine the relationship between risk factors chi square test. data analysis using chi square test to determine the relationship of risk factors. According to the study's findings, 42.0% of children between the ages of 0 and 24 months had stunting. Male gender (p: 0.017), breastfeeding (p: 0.036), a history of viral infections within the previous month (p: 0.047), and a high size of the family (p: 0.019) are risk factors for stunting. In an attempt to lower the prevalence of stunting in children aged of 6 - 24 months, it is necessary to increase breastfeeding until 24 months of age and prevent children from suffering from infectious diseases, especially diarrhea and acute respiratory infections.

Keywords: Age 0-24 months, Risk Factors, Stunting,

INTRODUCTION

Currently, stunting is a global public health priority, World Health Organization (WHO) has set a target to reduce the prevalence of stunting among children under five years of age by 40% between 2010 and 2025 (World Health Organization (WHO), 2018). Reduced stunting prevalence in Indonesia is intended to reach 14.0% by 2024 (Sekretariat Negara Republik Indonesia, 2021). Stunting occurs during the first 1000 days of life, more commonly occurring in children aged 6-24 months (45.5%). (Chirande et al., 2015)

Based to the Indonesian nutritional status study, the prevalence of stunting was 24.4% in Indonesian, 20.9% in Central Java, and 21.6% in Banyumas Regency (Kementerian Kesehatan RI, 2021). According to WHO guidelines, a prevalence of more than 20% is considered a public health issue. Stunting is a condition of short and very short body that exceeds a deficit of -2 SD below the median length or height. Nutritional problems that food intake and disease are two direct causes of stunting, indirect factors are food availability and access,

parenting patterns of mothers and children, health services, environmental sanitation, which are related to basic causes such as the quality and quantity of potential resources in the community such as education, human resources, economy, environment, organization and technology (BKKBN, 2021). Research in Bangladesh shows that rural children who have access to cleaner water, better toilets, and handwashing facilities are less likely to develop environmental enteropathy and have better linear growth. Factors related to stunting include maternal education, income, socio-economic status, prenatal consultation or antenatal care (Ramos et al., 2015)

Researchers are interested in studying the risk factors for stunting in children ages 0–24 months in Banyumas Regency because there is still an issue with nutritional status in this age group. In previous studies, there was no relationship between maternal age, birth spacing, nutritional status and the incidence of stunting, and there was a significant relationship between maternal parenting patterns and the incidence

of stunting. stunting.(Wati et al., 2022)

METHODS

This research employed an observational study with cross sectional design conducted over an 8 month period. The study involved 100 mothers of children 0-24 months, selected using a cluster random sampling technique. Sampling will be carried out using the cluster random sampling technique by taking data from children aged 0-24 months in each village (8 villages), then the randomization process will be

carried out at the individual level in each village. Data collection was carried out through direct completion of questionnaires by the mothers, supplemented by observations as the primary data source. Secondary data from health profile and other available sources were also utilized. Data analysis consisted of univariate analysis and bivariate analysis using the Chi-Square test. The study received ethical approval from the Ethics Commission of the Faculty of Health Sciences, Jenderal Soedirman University (Approval No. 1128/EC/KEPK/V/2023).

RESULTH AND DISCUSSION

Table 1. Distribution of characteristics of children aged 0-24 months in Banyumas Regency

Variabel	n	%
Sex		
Man	40	40,0
Female	60	60,0
Breastfeeding History		
No	73	73,0
Yes	27	27,0
History of infectious		
Yes	71	71,0
No	29	29,0
Parenting Patterns		
Less	60	60,0
Both	40	40,0
Houshold family size		
Large (> 4 person)	23	23,0
Small (\leq 4 person)	77	77,0
Mothers Age		
Risk (<20 and >35 years)	39	39,0
Not at Risk (20-35 years)	61	61,0
Mother's Education		
Primary	93	93,0

Variabel	n	%
Higher	7	7
Mother's Knowledge		
Less	36	36,0
Good	64	64,0
Nutritional Status		
Stunting	43	43,0
Normal	57	57,0
Total	100	100,0

Sumber : Data Primer Tahun 2023

Based on Table 1, it is known that the incidence of stunting in children aged 0-24 months in this study was 43.0%, the gender was mostly 60% female, not breastfed until the age of 24 months as much as 73%, children who had a history of disease were 71.0%. Parenting patterns of the under-five children were mostly 60.0%, and the number of family members was 77.0%. Maternal characteristics include maternal age, most of which 61.0% are not at risk, the majority of maternal education is elementary (93.0%).

Table 2. Analysis of risk factors for stunting among children aged 0-24 months in Banyumas Regency

Dairy and Stunting Regency							
Variabel	Nutritional Status				Total		P-Value
	Stunting		Normal		n	%	
	n	%	n	%			
Sex							
Man	23	57,5	17	42,5	40	100,0	0,017*
Female	20	33,3	40	67,7	60	100,0	
Breastfeeding History							
No	36	49,3	37	50,7	40	100,0	0,036*
Yes	7	25,9	20	74,1	60	100,0	
History of infectious							
Yes	35	49,3	36	50,7	40	100,0	0,047*
No	8	27,6	21	72,4	60	100,0	
Parenting Patterns							
Less	26	42,3	34	56,7	40	100,0	0,934
Both	17	42,5	23	57,5	60	100,0	
Household family size							
Large (> 4 person)	5	21,7	18	78,3	40	100,0	0,019*
Small (≤ 4 person)	38	49,4	39	50,6	60	100,0	
Mother's Age							
Risk (<20 and >35 years)	15	38,5	24	61,5	40	100,0	0,464
Not at Risk (20-35 years)	28	45,9	33	54,1	60	100,0	
Mother's Education							
Primary	42	45,2	51	54,8	40	100,0	0,112
Higher	1	14,3	6	85,7	60	100,0	
Mother's Knowledge							
Less	15	41,7	21	58,3	40	100,0	0,840
Good	28	43,8	36	56,2	60	100,0	

Bivariate analysis based on Table 2 indicates that the variables of gender, number of family members, history of infectious diseases, and breastfeeding history are risk factors for stunting in children ages 0–24 months in Banyumas Regency. The study found that male children ages 0–24 months had stunting rates of up to 57.55 with a p-value of 0.017. According to earlier studies, the gender component is strongly linked to both the risk of chronic malnutrition and stunting (AOR: 1.67; 95% CI: 1.07; 2.62 for boys compared to girls) (Vonaesch et al., 2017). There was a statistically significant correlation between breastfeeding and stunting (p value 0.036) among the 49.3% of stunted children aged 0–24 months in this study who had not been nursed. During the first two years of life, inadequate nursing increases the risk of

stunting and death (Black et al., 2013).

Several studies have shown that even though mothers have a high level of education and good knowledge about nutrition, low family economic conditions can hinder access to nutritious food, health services, and adequate sanitation. Education and knowledge are not always directly proportional to practices in everyday life. Many mothers already know the importance of exclusive breastfeeding or good complementary feeding, but still follow family habits or myths that are less appropriate (Tamir et al., 2024). Mother's parenting plays an important role in child growth, not always found a significant relationship between parenting and stunting. Other factors such as nutritional intake and children's health conditions

also play an important role (Rahmayana et al., 2008)

Diarrhea and acute respiratory infections were the most prevalent infectious illnesses among children ages 0–24 months in this survey over the previous month. Malnutrition and infections typically coexist because they have an impact on one another. Poor nutritional status decreases the body's immunity to infection, which can increase the severity and duration of infection. Infections cause loss of appetite and decreased absorption of nutrients by the body, which can lead to continuous weight loss and increase the severity of malnutrition (Black & Heidkamp, 2018).

Stunting describes chronic malnutrition, a growth failure characterized by linear growth retardation resulting from inadequate nutrient intake and recurrent infections and chronic diseases that last from

pregnancy to two years of age (Fleeson et al., 2017).

Previous research states that the number of large family members increases the risk 1.07 times greater than families with small family members. Families with a large number of family members will have an impact on food intake and distribution in the family, reducing the nutritional adequacy of children, causing stunting (Muche et al., 2021). Family size, socioeconomics, and illiterate parents are factors associated with stunting (Birhanu et al., 2017; Kofuor et al., 2014)

CONCLUSION

According to this study, 42.0% of children aged 0-24 months were stunted. Male gender (p: 0.017), breastfeeding (p: 0.036), history of infectious disease within the previous month (p: 0.047), and having a large number of family

members ($p: 0.019$) are risk factors for stunting in children aged 0-24 months. To lower the incidence of stunting in children aged 6-24 months, breastfeeding should be increased until the child is 24 months old. Avoiding infectious diseases, particularly diarrhea and acute respiratory infections, is also important.

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KNOWLEDGE AND SKILLS IN THE USE OF FIRE EXTINGUISHERS THROUGH FIRE FIGHTING TRAINING FOR PRINTING WORKERS PT X KARANGANYAR

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ABSTRAK

In manufacturing companies, the use of production equipment and facilities has the potential and risk of fire hazards that can occur at any time. Prevent and reduce the impact of fire with a fire suppression system. Training and simulations on the use of fire extinguishers are conducted to improve workers' knowledge and skills. This study aims to determine the differences in knowledge and skills in using fire extinguishers before and after training for printing workers at PT X Karanganyar. This study used an experimental design with a pre-experimental approach, using a one group pre-test post-test design. The intervention used is fire extinguisher training. Fire extinguisher training is carried out by providing material on the fire triangle, how to control fires, how to use fire extinguishers, parts of fire extinguishers with theory and simulation methods for two weeks. The population of this study amounted to 50 respondents of PT X Karanganyar printing workers. This study used a total sampling technique with measurement of knowledge using a questionnaire and measurement of skills using a checklist. The data analysis technique used was the paired T test. The results showed that there was a significant difference in knowledge ($p=0.000$; $p<0.05$) and skills ($p=0.001$; $p<0.05$).

Keywords: Light Fire Extinguisher Knowledge, Light Fire Extinguisher Skills, Light Fire Extinguisher, Light Fire Extinguisher Training.

INTRODUCTION

Manufacturing companies transform basic goods into high-value goods by using equipment that is at risk of danger (Sutriyanto, 2021). BPJS Ketenagakerjaan 2019-2020 data shows a significant increase in workplace accidents in the manufacturing and construction sectors, with fire as one of the serious threats. Fires are caused by the interaction of heat, fuel and oxygen, disrupting operations and causing financial losses. In Central Java, there were 466 cases of building and residential fires in 2019-2024.

Training will result in increased knowledge and skills. Some of the stages in the process include:

- A. Receiving, which is the ability to receive stimulus or stimuli with full attention, which is initially passive. stimulus with full attention, which is initially passive and then develops into active responsiveness. then develops into active responsiveness.
- B. Responding, namely the ability to respond deliberately to a stimulus or stimuli, feel involved, and actively paying attention.

- C. Valuing, in the form of an assessment process or value judgment of certain symptoms or activities, which then encourages further responses or certain activities, which then encourages further responses to find ways to take action against the situation that occurs.

- D. Organization, involves the application of values in action or organizing, where individuals are able to form an internal value system based on values that have been accepted. system based on values that have been accepted.

Research conducted by Sinaga and Handayani (2017), stated that the characteristics of respondents showed that 76.6% of them had not participated in the training. The average score before training was 36.17, while after training it increased to 42.17. With this finding, it can be concluded that there is a significant difference in the scores before and after the training. the use of fire extinguishers.

Fire prevention requires extinguishing systems such as sprinklers, fire alarms, and fire

extinguishers. Based on the Indonesian Ministerial Decree No. 186 Year 1999, companies must be able to manage fires through training to improve knowledge and skills. PT X Karanganyar, which is engaged in woven bags and cement bags, has 315 workers, including 50 in the printing department.

In 2019, there was a fire caused by static electricity that ignited solvent and paint materials. Solvent and paint material is one of the flammable materials because it contains methanol material with a flash point of 11°C. PT X only has APAR as a protection system, with limited training for management and staff. The fire fighting training program only focuses on staff and management, so it has not reached all workers in the printing department. then, it is necessary to improve the fire fighting training program so that all workers will have a level of fire hazard awareness. the training program carried out only focuses on providing material with the lecture method.

Workers in the production area have not received adequate training on fire extinguishers, so they rely on HSE and security staff. An initial survey

showed that 80% of workers lacked knowledge and 90% lacked skills in the use of fire extinguishers. These deficiencies risk exacerbating fires. This study aims to assess the differences in knowledge and skills in the use of fire extinguishers before and after training for printing workers at PT X Karanganyar.

METHODS

This study uses experimental design with a pre-experimental approach. The design used was a one group pre-test post-test design, with an intervention in the form of fire extinguisher training. The research location is the printing section of PT X Karanganyar which is located on Jl. Raya Palur Km.8, Jetis Village, Jaten District, Karanganyar Regency, Central Java Province.

Firefighting training is the process of educating workers on the skills and knowledge of using fire extinguishers. Firefighting skills worker's ability to execute the practical use of firefighting in the workplace. Fire extinguisher knowledge is the ability to understand and explain information related to the parts and how to use a fire

extinguisher.

Measurement Tool: APAR Knowledge Questionnaire consisting of 15 items of statement analysis. Assessment of APAR knowledge uses a Guttman scoring data collection measurement scale. Measurement results: answers correctly score 1, answers not correctly score 0. Measurement Tool: fire extinguisher skills checklist which consists of 10 assessment items. The fire extinguisher skills assessment uses a Guttman scoring data retrieval scale. Measurement results: answers correctly score 1, answers not correctly score 0.

The research was conducted from May to July 2024. The study population consisted of 50 printing workers of PT X Karanganyar. The sampling technique used was non-probability sampling, namely total sampling, where all members of the population were taken as samples because there were less than 100 people. Thus, the sample of this study amounted to 50 people. The reason for using total sampling is that the researcher focuses on printing areas where fires have occurred. Research results from the population can be

directly generalized because it includes all members of the population.

The measuring instrument has been tested for validity and reliability so that it is valid and reliable, the knowledge questionnaire on the use of APAR is measured by a test (Knowledge; $p < 0.05$; Cronbach's Alpha > 0.7). Other variables that have the possibility of influencing the dependent variable have been made inclusion criteria such as having more than 3 years of work experience, the age of workers is productive age, and the level of education is high school.

Differences in knowledge and skills in using fire extinguishers through fire extinguisher training are measured by measuring knowledge using a questionnaire of 15 statement items and measuring skills using a checklist of 10 assessment items. The measurement scale for knowledge and skills in using APAR uses a ratio scale. For knowledge results if answered correctly get a score of 1 while wrong score 0. For skill results if done correctly get a score of 1 if wrong score 0.

The criteria for assessing the skills of using fire fighting by means

of workers simulating the use of fire fighting with a checklist guide. respondents who simulate the use of fire will be observed by researchers, for example, such as respondents being able to correctly show the parts of fire fighting, it will be assessed by researchers as correct with a score of 1. Determination of the correct answer in fire fighting skills by observation method using the fire extinguisher skills checklist.

Researchers conducted a data normality test for the variable knowledge and skills of fire extinguishers both pretest and posttest data using the Shapiro-Wilk test, the p-value results were 0.063, 0.056, 0.056, 0.051, which means the p-value > 0.05 so it can be concluded that the data on knowledge and skills of fire extinguishers are normal data.

RESULT AND DISCUSSION

1. Characteristics of research subjects

Table 1. Characteristics of research subjects

Respondent Characteristics	n	%
Age		
Late adolescence (16-25 years)	5	10%
Early adulthood (26-35 years old)	31	62%
Late adulthood (36-45 years)	14	28%
Early old age (46-55 years)	0	0.0%
Education Level		
Elementary School	0	0.0%
Junior High School	11	22%
Senior High School	35	70%
Collage/Other	4	8.0%
Fire extinguisher training experience		

Statistical analysis uses a paired T test to test differences before and after APAR training on knowledge and skill variables. Duration of the training is 3 hours. The training and simulation materials were fire classification, fire triangle theory, potential fire hazards in the printing work area, fire extinguishing media, how to use fire extinguishers, parts of fire extinguishers, techniques for carrying fire extinguishers, and fire extinguisher inspection stages. The device used to test statistical analysis is SPSS version 26 testing at a significance level of 5%.

Ever	5	10%
Never	45	90%

The results of the distribution of respondents' age characteristics show that the dominant age is in the early adult category (62%), the dominant education

(70%), the dominant APAR training experience has never conducted APAR training (90%).

level is Senior high school education

2. Differences in APAR Knowledge Through APAR Training

Table 2. Distribution of Knowledge of APAR Use

No	Statement	Questionnaire		
		Pre-test	Post-test	Difference (Σ)
P1	Fire classification is a grouping based on the source of the fire.	28	49	+21
P2	Fires can be classified into class A, B, C and D fires.	29	28	-1
P3	Based on the theory of the fire triangle, the factors that cause fires include: Heat, combustible materials, and carbon dioxide.	25	28	+3
P4	Uncontrolled electrical disturbances and uncontrolled cigarette end flames are some examples of sources of ignition.	28	28	0
P5	Fires of flammable liquids such as petroleum are class A fires.	22	27	+5
P6	Fires from materials containing metals such as iron or steel are class D fires.	30	28	-2
P7	APAR stands for assembled fire extinguisher.	21	50	+29
P8	APAR with a type of extinguishing media in the form of pressurized water is effective for extinguishing fires originating from paper materials.	27	25	-2
P9	Images (handle and lever) circled on the side function as a handle used to lift and extinguish the fire.	29	33	+4
P10	Fire extinguishers with Foam media types are commonly used to extinguish class C fires.	26	27	+1
P11	APAR with a type of gas chemical media, usually the gas uses oxygen gas (O ₂)	26	27	+1
P12	The ideal distance for spraying APAR with a fire source is about 3 meters.	25	28	+3
P13	Bring the top handle together with the bottom handle - Sweep - Hold and pull the locking pin - Point the hose (S-S-P-A) is a step to operate APAR properly and correctly.	24	27	+3
P14	The technique used when bringing fire extinguisher to the location of a fire properly and correctly is to guide it to the shoulder to the location of the fire.	30	30	0
P15	The purpose of carrying the fire extinguisher guided on the shoulder is to make it easier to make the mobility of the fire extinguisher carrier.	32	32	0
Mean		26.8	31.1	4.3

The results of the knowledge pre-test before the fire extinguisher training showed an average score of 8.04. A total of 64% of respondents, i.e. 32 out of 50, could answer correctly on how to carry a fire extinguisher, indicating that they had observed or received training before. However, the lowest score was obtained on the question regarding APAR abbreviations, where 58% of respondents could not answer correctly. This indicates that many workers only know the name of the fire extinguisher without understanding the abbreviation.

The results of the knowledge post-test after the APAR training showed an average score of 9.34. All

respondents (100%) managed to answer correctly about the APAR abbreviation, signaling the success of the training in improving basic understanding. However, 50% of respondents could not answer correctly about the ability of fire extinguishers with pressurized water media materials in extinguishing fires from paper materials. This is because the company uses Dry Chemical Powder extinguishers as the main tool, so respondents focus more on this type and consider water extinguishers ineffective for paper fires, which explains their inability to answer the question correctly.

Table 3. Paired T Test Results of Fire Extinguisher Knowledge

Test	n	Descriptive Statistics		Paired T Tests	
		Mean	t	df	Sig. (2-tailed))
Pre-Test	50	8.04			
Post-Test	50	9.34	-5.508	49	0.000

This study shows an increase in knowledge of the use of fire extinguishers on PT X Karanganyar printing workers after training. A paired t-test with a t value of -5.508 and a significance of 0.000 indicated that the average post-test score (9.34) increased compared to the pre-test (8.04), demonstrating the

effectiveness of the training. The training used a lecture method outside of working hours, with material delivered through a projector and PowerPoint application covering the definition, classification, and techniques for using fire extinguishers.

Respondents actively

participated in the question and answer session, increasing their understanding. With 80% of workers experiencing an increase in knowledge, these results are consistent with previous studies showing an increase in knowledge following extinguisher training.

According to Setyaningrum (2020), the interactions between trainers and trainees have different variations. trainers and trainees affect the formation of knowledge and skills arising from the training. The expectation is that the training will result in increased knowledge and

skills. Training on the use of fire extinguishers which includes materials such as fire classification, types of fire extinguishers, how to use, install, and maintain fire extinguishers. use, installation, and maintenance of fire extinguishers. training conducted on an ongoing basis can have a positive impact on the quantity and quality of employee work. It also creates an experienced, skilled and error-free workforce, as well as ensuring the company meets fire prevention requirements. ensures the company meets fire prevention requirements.

3. Differences in fire extinguisher skills through fire extinguisher training

Table 4. Distribution of Knowledge of APAR Use

No	Statement	Checklist		
		Pre-test	Post-test	Difference (Σ)
P1	Able to demonstrate Dry Chemical Powder type extinguishers	29	28	-1
P2	Able to show CO2 type extinguishers	31	27	-4
P3	Able to show the safety pin on APAR	26	32	+6
P4	Able to show the APAR nozzle and handle	30	28	-2
P5	Workers are able to carry fire extinguishers on their shoulders to facilitate mobility to the fire scene and are able to set a distance of 3 meters from the source of the fire.	27	31	+4
P6	Pulling the safety pin of the fire extinguisher	33	38	+5
P7	Directing the fire extinguisher hose upward and then pressing the handle to ensure that there is no blockage in the fire extinguisher.	23	30	+7
P8	Directing the APAR nozzle to the fire source	33	37	+4
P9	Pressing the handle continuously until the fire is extinguished or until the contents of the extinguisher run out	34	38	+4
P10	Sweeping the hose to the base of the fire from right to left or vice versa according to the wind direction.	31	35	+4
Mean		29.7	32.4	2.7

The pre-test results showed that the average fire extinguisher usage skill

before the training was 5.98. A total of 68% of respondents were able to use

fire extinguishers correctly, such as pressing the handle and extinguishing the fire, which reflects their practice in replenishing and restocking fire extinguishers. However, the lowest score was found in the indicator of being able to point the hose upwards for checking, where 54% of respondents had not done so correctly. This is likely due to a lack of training, with only 10% of respondents having received fire extinguisher training.

The post-test results showed that the average skill of using APAR increased to 6.64. A total of 76% of

respondents were able to practice the use of fire extinguishers correctly, including pulling the pin and pressing the handle to extinguish the fire. This shows that the training with simulation and practice methods by HSE staff improved their skills. However, 46% of respondents were not able to correctly demonstrate the use of CO2 fire extinguishers. This problem was caused by labeling defects on the CO2 extinguishers used during the post-test, which hindered proper identification.

Table 5. Paired T Test Results of Fire Extinguisher Skills

Test	<i>n</i>	Descriptive Statistics	Paired T Test		
		Mean	<i>t</i>	<i>df</i>	Sig. (2-tailed))
Pre-Test	50	5.98	-	49	0.001
Post-Test	50	6.64	3.384		

This study shows an increase in the skills of using fire extinguishers on PT X Karanganyar printing workers after training. Paired T test results with a *t* value of -3.384 and a significance of 0.001 showed that the mean post-test score (6.64) was higher than the pre-test (5.98), indicating an increase in skills. The simulation training method contributed significantly to the skills improvement, with 56% of workers

having improved scores. The training intervention using the simulation method, after the lecture, was conducted in the field with practical explanations by certified staff. The results are consistent with previous studies that have shown improved skills after simulation training.

CONCLUSIONS

Based on the results of research and discussion regarding

differences in knowledge and skills in the use of fire extinguishers through fire extinguisher training for printing workers at PT X Karanganyar, then the practical implication that can be applied is to make the training program on the use of fire extinguishers a mandatory program

for all employees.

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OSTEOPOROSIS: KNOWLEDGE, ATTITUDES, AND PRACTICES AMONG UNIVERSITY STUDENTS

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ABSTRACT

Prevention of osteoporosis at a young age is necessary. However, limited research has been conducted on osteoporosis among young people. This study aimed to analyze knowledge, attitudes and practices regarding osteoporosis among 384 university students using an analytic observational method with a cross-sectional design. Differences of knowledge, attitudes and practices by gender and field of study were analyzed using independent t-test and Mann Whitney test. The influence of knowledge and attitudes on the practices was conducted using Pearson product moment test. The results showed that the average knowledge (34.61 ± 4.77) of students regarding osteoporosis were classified as moderate, the attitudes (28.57 ± 6.56) and practices (4.58 ± 2.24) of students regarding osteoporosis was classified as poor. The results of the bivariate test showed that there was a difference in the mean score of total knowledge about osteoporosis between men and women ($p=0.021$), health and non-health fields ($p=0.003$). In addition, there is a relationship between attitude and practice regarding osteoporosis ($r: 0.144$; $p = 0.005$). This study shows that the implementation of education and awareness programs for students regarding risk factors of osteoporosis should be designed to improve osteoporosis awareness and prevention.

Keywords: attitude; knowledge; osteoporosis; practice; students

INTRODUCTION

Osteoporosis is still a global health problem with high rates of morbidity, mortality and healthcare costs. It is considered the second most important health problem after heart disease in developing countries (Shen *et al.*, 2022). Osteoporosis is a bone disease characterized by low bone mineral mass and deterioration of bone tissue microarchitecture (Dempster, Marcus and Bouxsein, 2021). The disease develops slowly over several years, which may not be diagnosed except after a fracture due to minor trauma (Khired *et al.*, 2022). *The International Osteoporosis Foundation (IOF)* notes that globally, one in three women and one in five men over the age of 50 has a fracture due to osteoporosis and more than 8.9 million people experience fractures every year, even every 3 seconds 1 person will experience a fracture. By 2050 in Asia it is estimated that more than 50% of people will experience fractures due to osteoporosis. The incidence of vertebral fractures in Indonesia was found to be 9.0% in women and 16% in men and when compared to other countries in Southeast Asia, the incidence of

osteoporosis in Indonesia is still higher (Subashini C Thambiah, 2020).

Genetic factors play an important role in determining whether or not a person is at a higher risk of developing osteoporosis. However, lifestyle factors such as diet and physical activity also influence bone development in adolescence and the rate of bone loss later in life (Oumer *et al.*, 2020; Bailey and Lin, 2021). Factors that contribute to osteoporosis include advancing age, female sex, postmenopausal status, hypogonadal or premature ovarian failure, low body mass index, ethnicity, rheumatoid arthritis, low bone mineral density, vitamin D deficiency, low calcium intake, high kyphosis, smoking, alcohol abuse, immobility, and long-term use of certain drugs (Rozenberg *et al.*, 2020; De Martinis *et al.*, 2021; Abdo and Idris, 2022). The diet and food choices of young adults are one of the reasons for the development of osteoporosis in the future (Davies, Rangan and Allman-Farinelli, 2020; Oumer *et al.*, 2020). This can cause osteoporosis conditions to occur even in children, adults, men and

premenopausal women (Davies, Rangan and Allman-Farinelli, 2020; Rozenberg *et al.*, 2020; Sakka and Cheung, 2020). Osteoporosis can occur at any age. Therefore, it's very important to achieve maximum peak bone mass as it determines bone quality in later life. This is the basis for the need to emphasize the management and control of osteoporosis disease, which aims to control the consequences of the disease, such as fractures, and begin to think about ways to reduce its incidence pattern (Oumer *et al.*, 2020; Sakka and Cheung, 2020).

Various studies have been conducted to evaluate knowledge, attitudes and practices. However, most of the studies that have been conducted previously focus on people who already have osteoporosis or are designed for older age groups and the main target is to reduce the consequences of osteopenic patients (Amer *et al.*, 2021; Lulla *et al.*, 2021; Huang *et al.*, 2023; Saltık *et al.*, 2023). The results showed that the level of knowledge of patients with osteoporosis was better because they had been or were on treatment and often consulted about their disease

with health professionals (Amer *et al.*, 2021). Therefore, the results of such studies cannot be generalized to the entire population. The importance of adequate knowledge, attitudes and actions at a young age to prevent the incidence of osteoporosis makes research necessary because there are still very few studies conducted at a young age. Therefore, this study will focus on analyzing the knowledge, attitudes and actions to prevent osteoporosis in Prima Indonesia University students. College students often engage in behaviors that increase disease risk, such as poor sleep, diet, exercise, and alcohol use. The selection of the young age group of students at Prima Indonesia University is because this university is one of the growing universities in Medan city with a large number of students from various regions in North Sumatra so that the results of the study can later outline the knowledge, attitudes and actions to prevent osteoporosis in the young age group in Medan City.

METHOD

This research used an analytic observational method with a

cross-sectional design conducted at Universitas Prima Indonesia, Medan, Indonesia, which was conducted from April-August 2024 and has gone through the Health Research Ethics Committee (KEPK) Universitas Prima Indonesia, number 101/KEPK/UNPRI/III/2024.

Sampling was done through purposive sampling method using Lemeshow's formula from 5350 population and obtained a minimum sample size of 384 respondents. Data was collected using a semi-structured questionnaire consisting of 4 sections: 1) respondent characteristics: gender, age, field of study, 2) knowledge about osteoporosis, attitudes that cause osteoporosis and practices to prevent osteoporosis. The knowledge and attitude measurement scale was measured using a five-point likert scale with the answer options "strongly disagree, disagree, undecided, agree, and strongly agree". While the practice of preventing osteoporosis was measured by giving the answer options "Yes" and "No". The practice section consisted of 10 questions with a maximum score of 10. The knowledge and attitude section

consisted of 10 questions with a maximum score of 50. Before the questionnaire was distributed to respondents, validity and reliability tests were carried out on 30 respondents who were distributed to students outside the research subjects who had the same characteristics as the target population (students from Universitas Sumatera Utara in Medan).

The inclusion criteria in this study were students who were physically healthy, active, and willing to participate in the study, while the exclusion criteria were students who have a history of chronic illnesses like hypertension, diabetes, and bone disorders and were therefore not included in this study. This criterion was chosen to ensure that participants could answer the questionnaire well and to provide a baseline of knowledge, attitudes and preventive practices before disease symptoms occur in the student group. The data collection was the subject of analysis by means of statistical applications. Descriptive statistics of frequency and percentage were used to describe categorical data, and mean with standard deviation (SD) was used for

numerical data. An independent t-test and a correlation test were used to assess the relationship between two numerical variables, and an independent t-test was used to compare total knowledge, attitude, and behavior scores between men and

women. Respondents were given questionnaires to measure knowledge, attitudes, and behaviors. The groupings of students' knowledge, attitudes and actions about osteoporosis are shown in table 1.

Table 1 . Classification of knowledge, attitudes and practices regarding osteoporosis (Ramli, Rahman and Haque, 2019)

Percentage Score (%)	Knowledge	Attitude	Action	Level
80-100	40-50	40-50	8-10	Good
60-79	30-39	30-39	6-7	Moderate
<60	<30	<30	<6	Poor

RESULTS AND DISCUSSION

Univariate Analysis

Table 2. Overview of Respondent Characteristics

Characteristics	Percentage	
	n	%
Gender		
Male	152	39.6
Female	232	60.4
Age		
≤ 20 years	311	81.0
> 20 years	73	19.0
Field		
Health science	238	62.0
Non Health science	146	38.0

The validity test showed that the calculated r value for all questions in the questionnaire was greater than the r-table value (0.239) and the Cronbach Alpha reliability value was 0.83. These results indicate

that the questionnaire can be used as an instrument to measure knowledge, attitudes and practices about osteoporosis prevention in student groups. The number of respondents in this study was 384 students. Based

on the sociodemographic survey of respondents, 60.4% were female, while 39.6% were male. The majority of respondents from the age of 20 years were 81.0% where 238 respondents (62.0%) students came from the field of Health (Table 2).

This study analyzed health and non-health disciplines to identify significant differences in disease prevention knowledge, attitudes, and behaviors between health and non-health students.

Table 3. Evaluation of Students' Knowledge about Osteoporosis

Statment	Answer				
	Totally disagree n (%)	disagree n (%)	agree n (%)	Strongly agree n (%)	Totally agree n (%)
Osteoporosis causes bones to become porous and break easily	14 (3.6)	51(13.3)	43 (11.2)	187 (48.7)	89 (23.2)
Only women have osteoporosis	94 (24.5)	169 (44.0)	43 (11.2)	51 (13.3)	27 (7)
No age-related changes in bone density	36 (9.4)	137 (35.7)	97 (25.3)	87 (22.7)	27 (7)
Clear symptoms of osteoporosis appear early	15 (3.9)	50 (13.0)	16 (4.2)	215 (56.0)	88 (22.9)
Consumption of more than three cups of black coffee, strong tea, and fizzy drinks a day will increase the rate of bone loss.	0 (0)	0 (0)	31 (8.1)	215 (56.0)	138 (35.9)
Vitamin D improves calcium absorption	54 (14.1)	123 (32.0)	49 (12.8)	118 (30.7)	40 (10.4)
Bone loss is accelerated in menopausal women. This is due to a decrease in female hormones	7 (1.8)	4 (1.0)	24 (6.3)	201 (52.3)	148 (38.5)
Dietary habits have not been linked to osteoporosis	4 (1)	74 (19.3)	71 (18.5)	160 (41.7)	75 (19.5)
Osteoporosis can be prevented by eating enough calcium-rich foods	4 (4)	25 (6.5)	39 (10.2)	208 (54.2)	108 (28.1)
Diet, exercise, calcium lactate, or medication cannot prevent bone loss from getting worse once you have it	26 (6.8)	140 (36.5)	119(31.0)	69 (18.0)	30 (7.8)

An overview of respondents' knowledge about prevention and risk factors for osteoporosis is shown in Table 3. Respondents agreed (56.0%) and strongly agreed (22.9%) that osteoporosis symptoms will appear at an early stage even though osteoporosis tends to show no symptoms at an early stage. Respondents also generally still do not know for sure that vitamin D can help calcium absorption where there are 14.1% of respondents who

answered strongly disagree, 32.0% of respondents answered disagree and there are 12.8% of respondents who still doubt whether vitamin D increases calcium absorption or not. In general, respondents already knew that osteoporosis causes bone loss (agree 48.7% and strongly agree 23.2%), drinking coffee and soft drinks can increase the risk of osteoporosis, and calcium consumption can prevent osteoporosis.

Table 4. Evaluation of Students' Attitudes about Osteoporosis

Statment	Answer				
	Totally disagree n (%)	disagree n (%)	agree n (%)	Strongly agree n (%)	Totally agree n (%)
I agree to have my bone mass measured regularly	99 (25.8)	188 (49.0)	23 (6.0)	52 (13.5)	22 (5.7)
I agree that we need to pay more attention to our bone density as we get older	5 (1.3)	15 (3.9)	24 (6.3)	178 (46.4)	162 (42.2)
I agree that morning sun exposure is beneficial for bone health	70 (18.2)	186 (48.8)	34 (8.9)	75 (19.5)	19 (4.9)
I agree that smoking or drinking can damage bone health	35 (9.1)	121 (31.5)	74 (19.3)	125 (32.6)	29 (7.6)
I agree that family history makes us more likely to get osteoporosis	11 (2.9)	45 (11.9)	63 (16.4)	194 (50.5)	71 (18.5)
I agree that we should eat calcium-rich foods to prevent osteoporosis problems in the future	17 (4.4)	34 (8.9)	49 (12.8)	209 (54.4)	75 (19.5)
I think people with osteoporosis will make daily activities more difficult	36 (9.4)	28 (7.3)	22 (5.7)	80 (20.8)	218 (56.8)

I agree and am motivated to eat a balanced diet to prevent osteoporosis	67 (17.4)	211 (54.9)	30 (7.8)	40 (10.4)	36 (9.4)
I agree and am motivated to exercise regularly to prevent osteoporosis	79 (20.6)	179 (46.6)	45 (11.7)	56 (14.6)	25 (6.5)
I totally agree that losing bone, dieting, exercising, calcium lactate, or taking medication won't prevent it from getting worse	87 (22.7)	153 (39.8)	75 (19.6)	60 (15.6)	9 (2.3)

Respondents' attitudes about osteoporosis prevention showed that 49.0% of respondents disagreed and 25.8% strongly disagreed to take regular bone mass measurements. This shows that lack of knowledge forms a poor attitude in preventing osteoporosis at a young age. Respondents also disagreed that sun

exposure is beneficial for bone health (48.8%). On average, respondents were not motivated to eat a balanced diet (54.9%) and exercise regularly (46.6%) in preventing osteoporosis. This is because respondents did not know that osteoporosis can occur due to poor lifestyle factors at a young age (Table 4).

Table 5. Evaluation of Student Practice on Osteoporosis

Statment	Answer	
	No (%)	Yes (%)
I eat a calcium-rich diet (such as milk, meat and protein, dried fish, green vegetables)	128 (33.3)	256 (66.7)
Not drinking more than three cups of black coffee, strong tea, or soda daily	295 (76.8)	89 (23.2)
I enjoy at least 10 minutes of sunlight every day	77 (20.1)	308 (79.9)
I get at least 30 minutes of moderate physical activity at least three days a week	257 (66.9)	127 (33.1)
I pay attention to safety in my daily life so that I do not fall down	291 (75.8)	93 (24.2)
I smoke	278 (72.4)	106 (27.6)
I consume drinks – alcoholic alcohol and softdrinks	223 (58.1)	152 (39.6)
I limit the use of salt in consuming food	317 (82.6)	67 (17.4)
I try to maintain bone health from an early age because it can reduce the risk of osteoporosis.	108 (28.1)	276 (71.9)

I consult with health workers about how to prevent diseases including osteoporosis.	107 (27.9)	277 (72.1)
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Osteoporosis prevention practices by Universitas Prima Indonesia students are depicted in table 5. As many as 79.9% of respondents do not enjoy 10 minutes of sunlight every day. The physical activity of the respondents also showed a very small percentage, only 33.1% of respondents who did

physical activity while 66.9% did not do physical activity.

Based on the results of the study in table 6, students have a fairly good knowledge (34.61 ± 4.77) about osteoporosis, but not accompanied by good attitude (28.57 ± 6.56) and practice (4.58 ± 2.24).

Table 6 Total Score of Knowledge, Attitude and Practice Regarding Osteoporosis

Variable	Mean \pm SD	Percentage Score (%)	Level
Knowledge	34.61 ± 4.77	69.22	Moderate
Attitude	28.57 ± 6.56	57.14	Poor
Action	4.58 ± 2.24	45.8	Poor

Bivariate Analysis

The results showed that there was a difference in the mean score of knowledge between men and women ($p=0.021$) while the results

showed no difference in the mean score of attitude and practice about osteoporosis prevention between men and women

Table 7. Comparison of total knowledge, attitude and practice scores regarding osteoporosis between men and women

Variable	Mean \pm SD		t-test	p-value
	Male	Female		
Knowledge	35.30 ± 4.48	34.16 ± 4.91	2.316	0.021
Attitude	28.92 ± 6.02	28.67 ± 6.80	0.373	0.710
Action	4.55 ± 2.05	4.60 ± 2.36	-0.204	0.839

The results showed that there was a difference in the average knowledge score between students from the health science field compared to students from the non-health science field ($p=0.021$). This result shows that students from the health field have better knowledge about osteoporosis compared to students from the non-health field. However, there was no difference in attitude scores and

osteoporosis prevention practices between health and non-health students. This means that although health students have higher knowledge, but in taking attitudes and actions to prevent osteoporosis at a young age is not well implemented so there is no difference in prevention practices when compared to students from non-health fields (Table 8).

Table 8. Comparison of total scores of knowledge, attitude and practice regarding osteoporosis by field of study

Variable	Mean \pm SD		t-test	p-value
	Health science	Non health science		
Knowledge	35.16 \pm 4.99	33.72 \pm 4.27	2.998	0.003
Attitude	28.93 \pm 6.79	28.50 \pm 5.99	0.633	0.527
Action	4.69 \pm 2.19	4.40 \pm 2.33	1.254	0.211

There is a significant correlation between the total score of knowledge and attitude ($p<0.0001$) with the correlation coefficient showing a fairly strong positive correlation with $r=0.505$. This shows that an increase in knowledge will improve students' attitudes about osteoporosis. Attitude and practice regarding osteoporosis also showed a significant correlation ($p=0.005$), although the correlation coefficient only showed a minimal positive correlation between the two

variables ($r=0.144$). This means that higher attitude scores will be associated with better practices regarding osteoporosis. The results of this study also showed that there was no correlation between knowledge and practice regarding osteoporosis ($p=0.116$). This means that good knowledge about osteoporosis does not necessarily change the behavior of respondents in preventing osteoporosis at a young age.

Table 9. Correlation between the total score of knowledge, attitude and practice regarding osteoporosis

Variables	r	p-value
Knowledge vs Action	0.080	0.116
Attitude vs Action	0.144	0.005

DISCUSSION

Students are one of the largest parts of society. Therefore, improving students' knowledge, attitudes, and practices towards osteoporosis can minimize the risk of high incidence of osteoporosis even though this disease is a global health problem that is generally in the elderly age group (Althobiti, 2022). The results of this study showed that most of the students had fairly good knowledge. The study participants were aware of the risk factors of osteoporosis, as most of them answered correctly about smoking and lack of physical activity can cause osteoporosis. Research on osteoporosis awareness among university students and young adults shows mixed results. A previous study in Saudi Arabia reported that 44.6% of students had good knowledge, with age, education, and employment associated with higher awareness (Alhalafi and Alhalafi,

2023). Women demonstrated an intermediate level of awareness, with higher education correlating to better knowledge (Ayyash *et al.*, 2023). However, a systematic review of Chinese studies revealed poor levels of knowledge and perception regarding osteoporosis and its risk factors across all participants (Wang *et al.*, 2024). In this study, knowledge of osteoporosis was better among students with a health field. This suggests that reliable information provided by health educators can increase knowledge and self-efficacy and improve community health status. These studies emphasize the importance of raising awareness about osteoporosis through educational programs and campaigns to prevent osteoporosis disease (Khired *et al.*, 2022).

Attitude is one of the important aspects of self-efficacy especially in health intervention programs. In addition, motivation can

lead to good attitudes about osteoporosis especially when people realize that risk issues can be reduced by minimizing negative behaviors (Schunk and DiBenedetto, 2021). In this study, the findings indicated a poor level of attitude regarding osteoporosis. The correlation test in the study illustrated a negative correlation between knowledge and attitude towards osteoporosis and indicate a gap between knowledge and actual attitudes or practices in disease prevention (Ssekamatte *et al.*, 2021). Knowledge about how to prevent disease does not always guarantee a change in behavior. Factors such as habit, personal preference and social norms also need to be considered. Younger people can be comfortable with their current lifestyle and have a hard time changing, even though they know the risk (Gimeno-Mallench *et al.*, 2020). The mean total score for the study participants' current practices indicated poor practices in osteoporosis prevention. This may be because they feel that they are not worried about the disease at this time and therefore do not take preventive measures. This is supported by previous findings that knowledge

does not always guarantee preventive behavior.

Although younger age groups have good knowledge about osteoporosis problems, unhealthy diets and lifestyles are difficult to abandon. Previous research reported that adolescents tend to consume carbonated drinks regularly which can result in Ca^{2+} shifts and cause osteoporosis (Wang *et al.*, 2024). Acebes-Sánchez *et al.* reported that 22.4% and 55.6% of college students did not achieve the WHO recommendations for physical activity. observed that 51.39% of college students did not meet the standard of doing 30 minutes of physical activity daily (Acebes-Sánchez, Diez-Vega and Rodriguez-Romo, 2019). Therefore, by avoiding a sedentary lifestyle and becoming more active through daily exercise, you can reduce your risk of developing osteoporosis (Khired *et al.*, 2022). Knowledge and attitudes without application are useless. Learning about osteoporosis alone cannot guarantee that participants will practice preventive measures against osteoporosis unless it is accompanied by strong determinants. Nonetheless, the results of this study still showed a

significant correlation between participants' attitudes and practices regarding osteoporosis. These results suggest a positive attitude is essential for implementing preventive measures.

CONCLUSION

In this study, it was found that the participants had a moderate level of knowledge, while the attitudes and practices related to osteoporosis prevention were poor. Positive correlations between knowledge and attitudes, attitudes and osteoporosis prevention practices indicate that good knowledge leads to positive attitudes and good attitudes lead to better osteoporosis practices. The lack of correlation between the knowledge and the practice of students in relation to osteoporosis. These findings suggest that educational programs should be implemented that increase awareness of risk factors and preventive measures. The results of this study can be used to guide the development of appropriate strategies and education to enhance the attitudes and practices of youth in osteoporosis prevention.

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PERSONAL HYGIENE AND HEALTHY BEHAVIOR TOWARD SCABIES INCIDENCE IN JEMBER REGENCY: A CROSS-SECTIONAL STUDY

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ABSTRACT

Scabies is an endemic in both tropical and subtropical regions, in which this reemerging disease commonly found among vulnerable population such as the homeless, refugees, and immunocompromised individual. This study aims to analyze the association between personal hygiene and healthy behavior with scabies incidence among students (*santri*) in Khalafi and Salafiyah Islamic boarding schools in Jember Regency.

This quantitative research utilized a cross-sectional approach. The outcome variable was scabies incidence, while the exposure variables were personal hygiene and healthy behavior. The cluster random sampling was used, where the Islamic boarding schools were grouped into Khalafi (Modern) and Salafiyah (Conservative). The total respondents from the Khalafi dan Salafiyah was 89 and 62, respectively. The correlation between variables was assessed using the chi-square test, where the Prevalence Ratio (PR) was estimated. Path analysis was conducted in SmartPLS3.

The scabies prevalence in the Khalafi and Salafiyah is 41 cases (46.07%) and 16 cases (25%), respectively. In both types of Islamic boarding schools, personal hygiene and healthy behavior were significantly associated with scabies with p-value 0.000 ($p < 0.05$), with personal hygiene showing a strong association (Coefficient > 0.5). The PR estimation in Khalafi school is, personal hygiene (PR: 10.87) and healthy behavior (PR: 13.27) toward scabies incidence. Meanwhile, the PR estimation in Salafiyah is personal hygiene (PR: 42.64). The model found that the personal hygiene can influence the scabies incidence.

The scabies incidence was found high in Khalafi compared to Salafiyah, in which personal hygiene and healthy behavior were positively significant. Exposure variable is associated with a higher likelihood of scabies incidence. Therefore, Islamic boarding schools and the Jember Health Office organize educational and training programs on personal hygiene and healthy behaviors for students.

Keyword: Scabies, Personal hygiene, Healthy behavior, Islamic boarding school

Background

Scabies is a skin disease caused by the infestation and sensitization to *Sarcoptes scabiei var. hominis* (1). It is endemic in both tropical and subtropical regions (2), but this disease is often overlooked because it is not life-threatening, resulting in low prioritization for management (2). However, chronic and severe cases can lead to dangerous complications (3). Scabies is reemerging disease in developed countries, particularly vulnerable population such as the homeless, refugees, and immunocompromised individual (4).

Scabies causes discomfort due to highly pruritic lesions (3), leading to scratching that can result in secondary infections from *Streptococcus pyogenes* (GAS) and *Staphylococcus aureus* (5–8). Complications from secondary infestations of GAS and *S. aureus* are often observed in children in developing countries (5). Moreover, CDC in 2024 noted that anyone can be vulnerable to scabies, as it affects people of all genders, ages, ethnicities, and socioeconomic backgrounds (9). As a result, scabies

requires attention to mitigate its harmful effects.

Scabies is recognized as a public health issue among population, with an estimated global prevalence of 300 million cases, often found in impoverished countries, where rates can exceed 50% (10,11). The World Health Organization (WHO) reports that scabies affects over 200 million people at any given time, with a 5-50% of children in resource-poor areas are affected (WHO, 2023). Urban et al (2020) reported that scabies affects approximately 455 million people worldwide, with high distribution in tropical and low-income region (12). High prevalence of scabies is typically found in environments with high population density and interpersonal contact, such as prisons, orphanages, and Islamic boarding schools (*pondok pesantren*) (13–16). Transmission occurs through direct skin-to-skin contact between individuals (17).

Islamic boarding schools (IBS), also known as *pondok pesantren*, are religious schools with a boarding system, where students are referred to as *santri*. The curriculum includes both general knowledge and religious

education, with an emphasis on Islamic teachings (18). The Indonesian Ministry of Health in Ratnasari et al. notes that Indonesia has the largest Muslim population globally, with 14,798 Islamic boarding schools was recorded exhibiting the potential of high prevalence rates of scabies (3). The incidence of scabies in IBS is notably prevalent, particularly in Indonesia. A study by Sugiarto & Song noted the prevalence of scabies among student in IBS is 22.5% (19). Scabies prevalence among student in IBS in many regency in Indonesia mainly Magelang, Lamongan, Demak, Medan, Padang is 43%, 64.2%, 45.5%, 36.8%, and 24.6%, respectively (20–24). The occurrence of scabies among student in Islamic boarding schools is considered elevated and requires attention.

Islamic boarding schools (ISB) are categorized into two main types: Khalafi and Salafiyah boarding schools, distinguished by their differing educational policy systems. Khalafi boarding schools implement a modern education model that integrates both religious and secular knowledge. They include modern

subjects and employ innovative teaching methods, such as discussions and technology-based learning, to prepare students for contemporary societal challenges. This approach equips students with both religious knowledge and practical skills (25,26). On the other hand, Salafiyah boarding schools, also known as conservative Islamic Boarding Schools, emphasize the study of the Qur'an and Hadith, focusing on the practices of early Muslim generations. Their curriculum is heavily based on classical Islamic texts, which results in graduates having a deep mastery of religious scriptures but often lacking the ability to apply this knowledge to contemporary contexts (27,28).

According to data from the Ministry of Religious Affairs of Jember Regency, there were 557 Islamic boarding schools recorded in Jember in 2015 (29), with a total of approximately 208,280 students enrolled in these institutions (30). The highest incidence of scabies cases was reported in the Mayang District, with a total of 526 cases (30). The Ministry of Religious Affairs noted that there are 19 Islamic boarding

schools in Mayang District, which accommodate a total of 1,031 student (30). The significant number of Islamic boarding schools and their student population in Jember Regency suggests a potential for unrecorded high prevalence rates of scabies, highlighting the need for research to determine the actual prevalence of scabies among student in these institutions. This study aims to analyze the correlation between personal hygiene and healthy behavior concerning the incidence of scabies among student in Islamic boarding schools in Jember Regency, categorizing the schools into Khalafi and Salafiyah. In addition, the prevalence ratio is also measured. Thus, the research will provide insights into the incidence of scabies in both types of IBS and examine any differences in personal hygiene and healthy behavior between Khalafi and Salafiyah boarding schools.

Method

This analytical observational study was conducted using a cross-sectional approach, where data collection for the exposure and outcome variables was carried out at a single point in

time (point time approach) (31). The study was conducted in Jember Regency, East Java. Data were collected from three Islamic boarding schools.

Population and Sample

The population in this study consists of all students who were present and actively participating in the Islamic boarding schools located in Mayang District, Jember Regency. The choice of this district for the study was based on the recorded number of scabies cases, which amounted to 526 cases (Dinkes, 2014). Based on preliminary studies, 17 boarding schools met the criteria of having student residing in dormitories provided by the caretakers or kyai. The number of Khalafi and Salafiyah boarding schools in Mayang District is 14 schools (with 1,226 students) and 3 schools (with 172 students), respectively.

The cluster random sampling was employed, categorizing the Islamic boarding schools into two groups: Khalafi and Salafiyah. The sample size was calculated using Slovin's formula. The total sample of respondents from the Khalafi and Salafiyah Islamic boarding schools is

89 respondents and 62 respondents, respectively.

Variables

Scabies cases served as the outcome variable in this study, where scabies was a skin disease caused by the infestation and sensitization to *Sarcoptes scabiei* var. hominis, affecting student. The exposure variables consisted of individual characteristics, personal hygiene, and healthy behaviors. The individual characteristics variable includes age, gender, and duration of stay in the boarding school.

The personal hygiene variable assessed the cleanliness of each student, measured through the following components:

1. Skin cleanliness (three questions: frequency of bathing, use of soap, and use of different soaps).
2. Bedding cleanliness (three questions: washing of bedding, cleaning of mattresses/carpets/floors/mats, and frequency of sunning pillows).
3. Clothing cleanliness (two questions: changing clothes

and not wearing the same clothes as the previous day).

4. Cleanliness of teeth, nails, and hands (two questions: handwashing method and frequency of nail cutting).

The personal hygiene variable comprises 10 questions, with minimum and maximum scores of 0 and 10, respectively. This variable was then categorized into two groups: low (score: 0-5) and high (score: 6-10).

The other exposure variable was healthy behavior, which includes four questions addressing: a) not wearing or sharing clothes, b) not sharing towels, c) not sharing prayer mats, and d) not sleeping in close proximity. The healthy behavior variable has minimum and maximum scores of 0 and 4, respectively, and was categorized into two groups: low (score: 0-2) and high (score: 3-4). Both personal hygiene and healthy behavior variables were structured in a questionnaire, which underwent validity and reliability testing on 10 students using SPSS version 12.

Scabies Identification

Identification of scabies among student in Islamic boarding school was conducted by a trained health officer. The examination for scabies was performed in three stages:

1. Directly interviewing the student regarding the symptoms, they experienced.
2. Observing the presence of lesions on the skin or other visible characteristics of scabies symptoms.
3. Conducting the burrow ink test.

The Burrow ink test has been shown to have diagnostic validity to identify scabies (7,32). The burrow ink test was a method used to identify the burrows (papules) in the skin created by *Sarcoptes scabiei*, which were characteristic of the skin lesions associated with scabies. Rauwerdink & Balak noted that the burrow ink test was a straightforward and non-invasive diagnostic procedure that can be conducted rapidly (33). This technique entailed the application of a colored ink, such as a purple skin marker, onto lesions suspected of being caused by scabies.

Data collection

The data used in this study was primary data, obtained through the use of questionnaires and observation sheets. The outcome variable data, namely the identification of scabies cases, was recorded on observation sheets (skin lesions and burrow ink test results) and the scabies identification questionnaire (characteristic symptoms of scabies: itching at night and during sweating). Subsequently, the exposure variable data were collected using questionnaires on personal hygiene and healthy behavior, which had previously undergone validity and reliability testing. The collected data were inputted and stored in SPSS, where data analysis was then performed using this tool.

Analysis

The data analysis conducted in this study included univariate and bivariate analyses. Both univariate and bivariate analyses were conducted using SPSS version 12. The multivariate analyses using pathway analysis to discuss about the influence of scabies. The pathway analysis was conducted using a Smart PLS version 3. The T-Value > 1.96

can be interpreted that the variable X influencing variable Z, that the variable Z is a mediation variable to influence a variable Y.

The estimation of the Prevalence Ratio (PR) was obtained using the following formula:

$$PR = \frac{(\text{prevalence in the exposed group})}{(\text{prevalence in the unexposed group})}$$

RESULT

Scabies incidence in Islamic Boarding School

The cross-tabulation of individual characteristics, personal hygiene, and healthy behaviors with the incidence of scabies among student in Khalafi boarding schools is presented in Table 1. According to Table 1, the incidence of scabies among male student, those aged ≥ 13 years, with a duration of stay in the boarding school of less than 6 years, and exhibiting low levels of personal hygiene and healthy behavior, is recorded to have a higher incidence rate of scabies.

The Chi-Square test results indicate that personal hygiene and healthy

behavior are significantly associated with the incidence of scabies ($P < \alpha$ (0.05); reject H_0). Furthermore, personal hygiene demonstrates a strong association (Coefficient > 0.5). Based on Table 1, the incidence of scabies among student with a duration of stay of less than 6 years, and low levels of personal hygiene and healthy behavior, shows a higher incidence rate. The Chi-Square test results reveal that the variables of personal hygiene and healthy behavior are significantly associated with the incidence of scabies ($p < \alpha$ (0.05); reject H_0), with personal hygiene exhibiting a strong association with the incidence of scabies (Coefficient > 0.5).

Table 1 The Association Between Personal Hygiene, and Healthy Behaviors with the Incidence of Scabies in Islamic Boarding Schools

Type	Variabel	Scabies				Total		Coefficient (p-value)	
		Case	%	No Case	%	n	%		
Khalafi school	Sex	Male	33	76,7	10	23,3	43	100	-
		Female	8	17,4	38	82,6	46	100	
	Age	<13 YO	4	57,1	3	42,9	7	100	-
		>13 YO	37	45,1	45	54,9	82	100	

	Student duration	< 6 years	41	46,1	48	53,9	89	100	Constant
		≥6 years	0	0	0	0	0	100	
Personal Hygiene		Low	37	90,24	4	9,8	41	100	0.634 (0.000)**
		High	4	8,3	44	91,7	48	100	
Healthy Behavior		Low	40	59,7	27	40,3	67	100	0.431 (0.000)**
		High	1	4,5	21	95,5	22	100	
Salafiyah school	Sex	Male	12	32,4	25	67,6	37	100	-
		Female	4	16	21	84	25	100	
	Age	<13 YO	4	80	1	20	5	100	-
		≥13 YO	12	21,1	45	78,9	57	100	
	Student duration	< 6 years	16	27,6	42	72,4	58	100	0.153 (0.223)
		≥6 years	0	0	4	100	4	100	
	Personal Hygiene	Low	15	93,8	1	6,3	16	100	0.675 (0.000)**
		High	1	2,2	45	97,8	46	100	
	Healthy Behavior	Low	16	33,3	32	66,7	48	100	0.303 (0.012)*
		High	0	0	14	100	14	100	

Coefficient: Coefficient Contingency

*p-value: <0.05

**p-value: <0.01

YO: Years Old

The estimation of prevalence ratio (PR) between outcome variable and exposure variable was recorded in Table 2. Based on Table 2, the estimation of PR in Khalafi school is as follow: personal hygiene: 10.87

and healthy behavior: 13.27 toward Scabies incidence. On the other hand, the estimation of PR in Salafiyah school is as follow personal hygiene: 42.64 toward Scabies incidence.

Table 2. The Estimation of Prevalence Ratio

Variables	Type of Islamic Boarding School	
	Khalafi	Salafiyah
Student duration	NA	NA
Personal hygiene	10.87	42.64
Healthy Behavior	13.27	NA

The analysis with pathway analysis can be seen in Figure 1. The analysis can be interrupted that characteristic can influence the personal hygiene and personal hygiene affect the event of scabies in Islamic boarding school. From the Figure 1 can see that T-

value of characteristic with personal hygiene furthermore the T-Value of Personal Hygiene with scabies is > 1,96, it means the scabies can occurred if the personal hygiene of student in Islamic boarding school is inadequate.

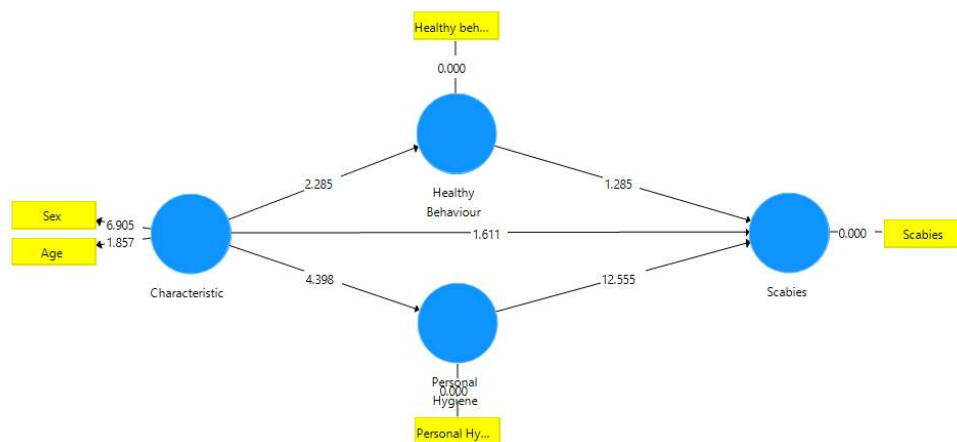


Figure 1. Model of Pathway analysis characteristic, healthy behaviour, and personal hygiene with scabies

The total effect of pathway analysis can be seen on Table 3. From Table 3 we can interpret that just the healthy behaviour does not influence the scabies on student in Islamic boarding school, furthermore characteristic and personal hygiene can influence of

scabies in Islamic boarding school. Based on the analysis the P-value of characteristic with healthy behaviour and personal hygiene is <0.005 , so it can be interpreted that the characteristic influences the healthy behaviour and personal hygiene.

Table 3. Path coefficient of pathway analysis

	Original sample (O)	T Statistics	P Values
Characteristic -> Healthy Behaviour	-0.190	2.316	0.021
Characteristic -> Personal Hygiene	-0.387	4.052	0.000
Characteristic -> Scabies	0.111	4.447	0.000
Healthy Behaviour -> Scabies	-0.064	1.325	0.186
Personal Hygiene -> Scabies	-0.790	12.478	0.000

DISCUSSION

Scabies is a skin disease caused by infestation and sensitization to *Sarcoptes scabiei* var. *hominis*. Scabies is caused by infection of the skin by the human itch mite (*Sarcoptes scabiei* var. *hominis*) (9,34). The most common symptoms

reported for this disease are itching and skin rashes (9).

The incidence of scabies among student in Islamic boarding school in Jember Regency is 57, with the distribution of scabies cases in Khalafi and Salafiyah school being 41 students (46.07%) and 16 students

(25.81%), respectively. Afraniza et al. reported that 45.5% of students at Kyai Gading Demak suffered from scabies (21). A study conducted on student in East Jakarta found that the cases of scabies in that Islamic boarding school were distributed by gender, with male and female cases at 57.4% and 42.9%, respectively (3). Study in Ethiopia found that one out of ten school-age suffer scabies (35). Meanwhile, only 3.1% cases were observed among schoolchildren in Iran (36).

Based on this study, it is evident that the proportion of male student in both types of Islamic boarding schools had a higher incidence of scabies compared to female student. These findings are consistent with another research in Ratnasari et al. (3) and Akmal et al. (24). However, these results differ from those of Downs et al. from Ratnasari et al., (3) and Savin et al. (37), who found differing trends (3,37). Based on another research recorded the 60% of scabies occurrence was distributed among male student in Islamic boarding school (38). The findings align with the research from Ratnasari et al. (3), which explain that the prevalence of

scabies is associated with the gender of the student (3).

Based on age of student can be seen that student under 13 years in both Khalafi school and Salafiyah school showed the highest percentages of scabies incidence, at 57.1% and 80%, respectively. Based on research from Akmal et al. (24) and Rohmawati et al. (39), which indicate that the highest prevalence of scabies occurs among student aged 13 years (24,39). Scabies incidence is also notably prevalent among younger student (10-14 years) due to developing immune systems and communal living condition (40).

The prevalence of scabies concerning the duration of stay reveals that student who have resided for less than 6 years have a high prevalence of scabies in both types of Islamic boarding school. This suggests that student who stay for less than 6 years have a higher risk of developing scabies. This finding is consistent with the study from Desmawati et al. (41), which reported that the majority of respondents living in Islamic boarding school for a short duration had the highest prevalence of scabies (41). The low incidence of scabies

among student who have resided for 6 years or more in both types of Islamic boarding school is linked to the higher personal hygiene levels among these students, particularly in Salafiyah school, where 100% maintain high personal hygiene. This indicates that student aged 6 years or older can maintain personal cleanliness, influencing the occurrence of scabies. However, statistical tests in both Khalafi and Salafiyah school reveal no relationship between the duration of stay and the incidence of scabies ($p > 0.05$).

Personal hygiene is defined as knowledge about individual health practices to maintain personal health, improve health status, and prevent disease. Another study noted that personal hygiene practices include skin cleanliness, foot and nail hygiene, hair hygiene, and overall body hygiene (1). Personal hygiene encompasses bathing frequency, soap and towel usage, dental hygiene practices, handwashing after activities, clothing cleanliness, and bedding hygiene (22). Study from Chinazzo et al. (42) found 6.4% scabies case is confirmed in nail involvement among children (42).

Low socioeconomic status and personal hygiene were the vital risk factor for the occurrence of scabies (36). In Jambi - Indonesia, 66.5% students living with poor personal hygiene, in which it is significant to Scabies incidence in Islamic Boarding School (43).

Based on interview, some students reported bathing less than twice a day, sharing soap with other student, rarely washing bedding, and not drying their pillows or bolsters, which could increase scabies incidence. Additionally, not changing clothes regularly and improper handwashing practices contribute to the low levels of personal hygiene among student in both Islamic boarding schools, elevating their risk of contracting scabies. Chi-square tests revealed a significant relationship between personal hygiene levels and scabies incidence among student in both Khalafi and Salafiyah school ($p < 0.05$). These results are consistent with findings which indicate that personal hygiene is associated with scabies incidence (21,24,41,44). However, these findings differ from those of the research from Desmawati et al. (41) and Wijaya (45), who found

no relationship between personal hygiene and scabies incidence (41,45). The contingency coefficient for personal hygiene and scabies incidence indicates a strong relationship (Coefficient > 0.5). The determinant factors of scabies incidence among student are individual cleanliness and bedroom condition (ventilation and humidity) in Islamic Boarding School (19).

Healthy behavior is another factor influencing scabies incidence, as it pertains to the actions individuals take to prevent health issues. Healthy behavior is an outcome of the knowledge possessed by individuals. In this study, healthy behavior includes student's habits regarding the sharing of clothing, towels, prayer tools, and sleeping arrangements. Observations and interviews with student in both Islamic boarding schools revealed that most student bathe using shared towels, share prayer tools, and exchange clothing with peers. Additionally, some student reported bathing while wearing clothes and using water from a large basin, with many bathing together, who noted that student often bathe using previously used water

(large basins) (46). Some even immerse themselves in shared bathing containers. These practices contribute to low healthy behavior scores among student in both Islamic boarding schools. Chi-square tests indicate a relationship between healthy behavior levels and scabies incidence among student in both Khalafi and Salafiyah school ($p < 0.05$). These results align with Ma'rufi et al. (22), who stated that healthy behavior is measured through three parameters: knowledge, attitudes, and actions regarding scabies (22). A study in Jember also noted that low sanitation in Islamic boarding school found high scabies prevalence (51). In Ethiopia, only 32% of scabies patient is seeking treatment, where the lack of formal education on scabies contributing to low-healthcare-seeking behavior (47).

All three parameters significantly influence the prevalence of scabies, indicating that healthy behaviors such as frequently sharing clothes or towels, sleeping together, and close sleeping arrangements increase scabies incidence. Other study found a relationship between knowledge, attitudes, and scabies incidence

among student in Islamic Boarding School (48). Study from Rohmawati (39) explained that sharing clothing or prayer tools, sharing towels, and sleeping closely are associated with scabies incidence at Ponpes Al-Muayyad Surakarta (39). Study in rural Ethiopia also found that sharing clothing is risk factor for the scabies transmission (49). Misganaw et al (35) noted that contact history, infrequent changing clothes, bedding sharing, and sleeping on the floor were risk factor for the occurrence of scabies.

Table 2 shows the estimated Prevalence Ratio (PR) for exposure variables affecting the outcome. The personal hygiene variable is also significantly related to scabies incidence, with student exhibiting poor personal hygiene having a 10.87 times greater risk of contracting scabies compared to those with good personal hygiene. Additionally, unhealthy behavior shows a significant relationship with scabies incidence, with student exhibiting unhealthy behaviors having a 13.27 times greater risk of contracting scabies compared to those with healthy behaviors. Poor personal

hygiene increases the risk of contracting scabies by 42.64 times compared to those with good personal hygiene. Study by Sanei-Denkordi et al (36) recorded that use of shared articles were over 33,37 (CI: 10.82–102.90) times more likely to contract scabies compared to those with use of personal articles (36). Inadequate bathing habits and unclean bedding significantly contributed to scabies case (OR = 56.336) (50). Based on Path analysis, the model found that inadequate personal hygiene influences the incidence of scabies (T-Value >1.96), in which the total effect of pathway analysis noted that characteristics influence the healthy behavior and personal hygiene ($p < 0.005$).

Limitation

Although the sample was measured using the sampling technique described in the methods, the authors assume that the sample size is still relatively small, indicating the need for further research with a larger sample size. Further research also needed to include demographic, environment, and population characteristics to provide robust result in the incidence of scabies.

RECOMMENDATION

The scabies incidence among student in Islamic boarding school of Jember found high, in which personal hygiene and healthy behavior significant statistically. Based on this finding, preventive measures should be address from stakeholder (Health Office of Jember and *Kyai*/Caregiver). The recommendations for Health Office of Jember are a) enhance promoting healthy behavior to student, such skin-, bedding-, clothing- cleanliness, and also the utilization of personal properties, b) activate Health Post Pesantren to conducting routine screening and first treatment, c) provide health education media (seminar and poster) and d) supply hygiene kits. On the other hand, the recommendations for *Kyai*/Caregiver are: a) ensure adequate hygiene facilities for student, b) conduct routine health inspection to student.

CONCLUSION

The incidence of scabies is notably high among student in Islamic boarding schools in Jember Regency,

with case distributions in Khalafi and Salafiyah school is 46.07% and 25%, respectively. In both school types, the variables personal hygiene, and healthy behaviors were significantly associated with the incidence of scabies ($p < 0.05$). The PR estimation in Khalafi school is as follows personal hygiene (PR: 10.87) and healthy behavior (PR: 13.27) toward scabies incidence. Meanwhile, the PR estimation in Salafiyah schools is personal hygiene (PR: 42.64). $PR > 1$ indicating that poor personal hygiene and unhealthy behaviors are associated with a higher likelihood of scabies incidence among student in Islamic boarding schools. The model found that characteristics can influence personal hygiene which also influence the scabies among student. Therefore, Islamic boarding schools and the Jember Health Office should organize educational and training programs on personal hygiene and healthy behaviors for students.

CONFLICT OF INTEREST

There is no conflict of interest need to disclose

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POST-TRAINING EVALUATION: BEHAVIOR OF COMMUNITY HEALTH CENTER MANAGEMENT TRAINING ALUMNI

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ABSTRACT

The management of the Community Health Center (CHC) has not been optimal. In 2022, management training was carried out by the West Java Health Training Unit for CHC staff and the results needed to be evaluated for improvement and feedback. The purpose of the study determined the behavior of training alumni in implementing the training results in their workplaces. The research was mixed methods with an explanatory sequential design. The research population was 60 alumni, the quantitative research sample was 49 people, and the qualitative research informants were alumni, superiors and co-workers, 13 people each selected purposively. Quantitative data was collected through questionnaires in Google Forms and analyzed descriptively, comparatively and correlatively. Qualitative data was collected through in-depth interviews, and processed using a framework analysis approach. The results of the study were that less than half of the alumni had good knowledge and skills, and 7 out of 10 alumni had good attitudes. Most of them have carried out planning and implementation of PHC management, but only 3 out of 5 alumni carried out monitoring and evaluation. This condition requires support and assistance from organizational leaders so that CHC management is carried out properly to support quality health services.

Keywords: alumni, behavior, training, management, community health center

INTRODUCTION

Community Health Centers (CHC) are first-level health service facilities that organize public health efforts and individual health efforts that prioritize of promotive and preventive efforts in their work areas (Indonesia Health Minister 2019). The CHC management is carried out (Kemenkes RI 2016), but several previous studies have stated that CHC management has not been implemented optimally as outlined (Darsun, Firdawati, and Astiena 2022; Al Hikami, Marianah, and Haksama 2022). CHC management is very important because it is related to the quality of CHC services (Aswad Rotasouw, Andi Alim, Zamli Zamli 2024; Faizal, Riu, and Talibo 2019). One aspect that is constrained in the implementation of CHC management is the human resources factor, both in terms of quantity and quality (Al Hikami, Marianah, and Haksama 2022). The efforts made include conducting training for officers who lead programs at CHC, which are suspected in several studies to be able to improve the performance of these officers (Lestari 2018; Wulandari and Fajrah 2021). A leader at a CHC must

have strong and established management skills in integrating all programs/services, resources, facilities and infrastructure, implementing CHC information systems and empowering the community so that the services provided by the CHC are of high quality.

The West Java Provincial Health Training Unit is an A-accredited training institution, with the main task of organizing health training in accordance with West Java Governor Regulation Number 71 of 2017. In 2022, the West Java Provincial Health Training Unit organized the CHC Management Training (CHC-MT) for CHC officers from Majalengka and Cirebon Districts for 60 people. The implementation of the training refers to the module developed by the Ministry of Health, where the evaluation of training stages 1 (implementation) and stages 2 (learning outcomes) is carried out by conducting a post-test at the end of the training (Pusat Pelatihan Sumber Daya Manusia Kesehatan Kementerian Kesehatan RI 2020). A post-training evaluation in the form of a behavioral review of the

implementation of the results of the CHC-MT in the alumni's workplace has not been carried out. One of the training evaluation models, namely Kirkpatrick's model (Smidt et al. 2009), proposes four levels of evaluation, namely level 1 evaluation of reactions, level 2 evaluation of knowledge as a result of learning, level 3 evaluation of behavior as a result of training after returning to the workplace, and level 4 evaluation of results, namely the effect on organizational performance (Don Kirkpatrick 2012).

Kirkpatrick's model can be used to assess evidence of training results, as well as evaluate whether training can meet the needs of training alumni and the needs of the organization. The purpose of training is basically to meet the needs of training participants and their application in the organization where they work (Pusat Pelatihan Sumber Daya Manusia Kesehatan Kementerian Kesehatan RI 2020). Level 3 evaluation has not been widely carried out, although several publications have presented the results, which include providing input for reviewing the curriculum / training modules and organizing

training and follow-up in the field where training alumni work (Tuti Surtimanah, Dean Rosmawati, Gina Zulfah, Nuraini, Yeni Mahwati 2014). Based on the background above, the purpose of the research was to determine the behavior of alumni of CHC management training in implementing CHC management in their workplace.

METHOD

The research design used mixed methods with sequential explanation, the study begins with a quantitative descriptive design using a cross-sectional approach, followed by a qualitative explanation. The population is alumni of CHC-MT held by West Java Provincial Health Training Unit in 2022, totaling 60 people. The inclusion criteria were participating in and completing the entire training process in 2022, the exclusion criteria were not willing to participate in the research and not filling out the questionnaire completely. The selection of quantitative research samples is the total sample, however, in data collection only 49 people (81.7%) filled out the questionnaire

completely even though they had been followed up to complete it but did not respond again. Supporting data collected from direct superiors (only 30% collected) and alumni colleagues (only 46.7% collected). The selection of qualitative research informants was carried out purposively with the main informants of training alumni by considering the district of work, a total of 13 alumni from Majalengka and Cirebon Districts in West Java Province. Source triangulation was carried out with 13 informants of direct superiors and 13 colleagues of training alumni. The research was conducted in July - December 2023, approximately one year after the CHC – MT was held. In-depth interviews were conducted by researchers who are Widyaiswara and lecturers of the Health Program Evaluation Planning course. They were considered competent in both the material and the methods being studied.

The quantitative data collection instrument was a questionnaire in the Google Form filled out by respondents, compiled by researchers with reference to the training learning outcome indicators. In this study, the

questionnaire used did not undergo statistical validity and reliability testing. Instead, the validity of the questionnaire content was obtained through assessment by experts, namely widyaiswara (expert judgment) who have expertise and experience in related fields. These experts were asked to evaluate the feasibility and relevance of the items in the questionnaire to ensure that the instrument was in accordance with the research objectives. The questionnaire for alumni contained respondent characteristics, 15 knowledge questions with one correct multiple choice answer, 15 scale questions (scale 0 = none to scale 4 = very good) alumni self-assessment of the application of CHC management skills consists of 15 types of skills, namely building holistic leadership capacity, building anti-corruption leadership capacity, conducting health center data and information management, conducting health center financial management instrumentation, conducting planning and budgeting for health centers, conducting asset management in health centers, conducting human resource management in health

centers, conducting management of equipment and infrastructure, conducting management of medicines and consumables in health centers, conducting community health efforts management at health centers, conducting community empowerment management at health centers, conducting explanations of patient safety concepts and health center risk management, conducting health center planning, conducting mobilization and implementation, and conducting supervision, control and performance assessment. Besides that, 7 attitude questions (scale 1 strongly disagree to scale 4 strongly agree for positive questions; scale 1 strongly agree to scale 4 strongly disagree for negative questions) towards the application of CHC management. In addition, questions were asked about the implementation of the training follow-up plan prepared at the end of the training as well as the supporting and inhibiting factors that were felt. Respondents' superiors and alumni colleagues were asked about their opinions on the attitudes and skills of training alumni at their workplace. Quantitative data analysis was carried out through the

stages of data completeness screening, data entry, data processing and merging according to analysis need, variable description analysis, different tests and correlation tests.

Qualitative data collection instruments are basically researchers, but in-depth interview guidelines are developed which are used to guide interviews so as not to deviate from the purpose of exploring explanations of the implementation of CHC management. To enhance the accuracy and increase the trustworthiness of this qualitative research, a triangulation of sources was conducted. This triangulation involved gathering data from multiple perspectives, including training alumni, their supervisors, and their colleagues. By comparing and contrasting the viewpoints of these different sources, we aimed to ensure the validity and reliability of the findings. In addition to triangulation, the research process was carried out in a systematic and transparent manner. The process began with data collection, followed by the transcription of interviews. The transcripts were then analyzed using a framework analysis approach, which

was based on the skills that were expected to be implemented as part of the training. This structured approach allowed for a thorough examination of the data and ensured that the analysis was aligned with the research objectives. In other words, the qualitative analysis in this study follows a framework analysis approach. The process consists of several stages: first, compiling the transcripts; second, identifying meaningful expressions within the transcripts; third, coding and identifying themes and sub-themes; and finally, organizing these themes. Afterward, the qualitative findings are connected with the results of the quantitative data analysis and

discussed in relation to the research objectives

RESULTS AND DISCUSSION

The gender of male and female alumni respondents was balanced, as were the respondents from Majalengka and Cirebon Districts. More than half of the respondents are 40-50 years old, most of them have a bachelor's degree, and work in CHC. The alumni positions are 1/3 of the heads of CHC, another 1/3 of them are heads of CHC administration sub-sections, and the rest are outside these positions. In detail, the characteristics of quantitative research respondents are listed in the following table.

Table 1. Characteristics of Alumni Respondents Quantitative Data (n=49)

Variable	Variable Categories	Alumni	
		f	%
Gender	Man	24	49,0
	Women	25	51,0
Age	Under 40 years	8	16,3
	40 – 50 year	30	61,2
	50 years and above	11	22,5
Education	D3	1	2,0
	D4	6	12,2
	S1	41	83,7
	S2	1	2,0
Workplace agency	Community Healt Center	48	98,0
	District Hospital	1	2,0
Origin of participants	Majalengka District	24	49,0
	Cirebon District	25	51,0
Position	Head of CHC	18	36,7
	Head of CHC administration	15	30,6
	Others	16	32,7

The number of alumni superior respondents was 18 people, 8 of whom were male (44.4%) and 10 of whom were female (55.6%).

Meanwhile, the number of alumni

colleagues respondents was 28 people, 10 of whom were male (35.7%) and 18 of whom were female (64.3%).

Table 2. Description of Alumni Knowledge, Attitude, Skills Scores in Health Center Management According to Respondent Type

Variable	Alumni			Alumni Superior			Alumni colleagues		
	M	Md	SD	M	Md	SD	M	Md	SD
Knowledge	72,4	73,3	17,5	-	-	-	-	-	-
Attitude	76,60	75,0	12,7	82,5	82,1	10,7	79,7	76,7	11,3
Skills	68,8	73,3	15,9	81,3	81,6	16,7	89,7	94,1	10,6

All scores transformed to a score of 100. The distribution of knowledge scores is not normal (Shapiro Wilk test 0.003), as are attitude and skill scores (Kolmogorov Smirnov test <0.05). Using the concept of mastery learning which refers to a benchmark value of 75, the good knowledge category is 44.9%. While the good attitude category according to alumni is 69.4%, according to superiors 94.4%, according to colleagues 71.4%. The good skill category according to alumni is 44.9%, according to superiors 77.8%, according to colleagues 96.4%.

The difference test of attitude scores according to alumni, superiors and colleagues showed no significant difference (Kruskal Wallis test p

0.162), while the difference test of skill scores showed a significant difference (Kruskal Wallis test p 0.000). Significant differences in skill scores occurred between scores according to alumni and superiors (U Mann Whitney test p 0.007), and between scores according to alumni and their co-workers (U Mann Whitney test p 0.000) where skill scores according to superiors and co-workers were higher than those according to the alumni themselves. The Spearman's r correlation test on scores according to alumni respondents, resulted in a low level significant relationship (p 0.002, r 0.441) between attitudes and skills. There was no significant relationship (> p 0.05) between knowledge and

attitudes, and between knowledge and skills.

Table 3. Average Score of Alumni Skills in Health Center Management

Types of skills	Average Score by Respondents *		
	Alumni**	Alumni Superior ***	Alumni colleagues **
1. Building holistic leadership capacity	2,0	3.2	4,0
2. Building anti-corruption leadership capacity	3,0	3.2	4,0
3. Conducting health center data and information management	3,0	3.3	4,0
4. Conducting health center financial management instrumentation	3,0	3.0	4,0
5. Conducting planning and budgeting for health centers	3,0	3.1	4,0
6. Conducting asset management in health centers	3,0	3.0	4,0
7. Conducting human resource management in health centers	3,0	3.2	4,0
8. Conducting management of equipment and infrastructure	3,0	3.1	4,0
9. Conducting management of medicines and consumables in health centers	3,0	3.0	4,0
10. Conducting community health efforts management at health centers	3,0	3.4	4,0
11. Conducting community empowerment management at health centers	3,0	3.4	4,0
12. Conducting explanations of patient safety concepts and health center risk management	3,0	3.2	3,5
13. Conducting health center planning	3,0	3.3	4,0
14. Conducting mobilization and implementation	3,0	3.5	4,0
15. Conducting supervision, control and performance assessment	3,0	3.3	4,0

Based on table 3 according to alumni and superiors, all types of skills still require little supervision, except for "holistic leadership capacity building skills" which still require more supervision according to alumni

themselves. According to colleagues, the skill of "explaining the concept of patient safety and health center risk management" still requires little supervision, while other types of skills have been mastered.

Table 4. Difference Test of Knowledge, Attitude and Management Skills Scores of Alumni Health Centers According to Alumni Characteristics

Individual Characteristics	p value of knowledge	p value of attitude	p value of skills
Jenis Kelamin*	0,000	0,572	0,325
Umur**	0,445	0,383	0,920
Jabatan**	0,252	0,547	0,193
Pendidikan**	0,059	0,883	0,875
Jabatan**	0,252	0,547	0,193
Asal Kab – Kota*	0,325	0,986	0,901

*U Mann WhitneyTest; ** Kruskal Wallis Test

Based on table 4, there is only one variable that is significantly different (p 0.000) in the alumni knowledge score according to gender, where the female alumni score (mean 81.0 - median 80) is greater than the male alumni (mean 63.3 - median 66.7). Factors that support alumni in implementing CHC management are the desire of alumni to apply the knowledge gained stated as 87.8% of alumni, getting support from superiors stated as 46.9% of alumni, the existence of supporting facilities and infrastructure stated as 36.7% of alumni, and orders from superiors stated as 32.7% of alumni. While the inhibiting factors are limited understanding in implementing training results stated as 51% of alumni, facilities and infrastructure that do not support stated as 42.9% of alumni, and transfer of place or position stated as 22.4% of alumni,

20.4% lack of support and not assigned.

The existence of West Java Province Health Training Center Unit is very useful in efforts to improve the competence of health workers stated as 79.2% of alumni. All alumni (100%) stated that they implemented the Follow-up Action Plan made at the end of the training. In detail, as many as 87.8% of alumni have reported to their superiors; as many as 77.6% of alumni have carried out the planning stage (P1); as many as 67.3% of alumni have carried out the implementation drive stage (P2) and as many as 57.1% of alumni have carried out the assessment - supervision - control stage (P3). Alumni stated that the reason for participating in the training was of their own free will as many as 24%, the rest because they were assigned by their superiors. A small portion (4%) were job transfer after

participating in the training, while 96% were assigned to permanent positions before and after the training. Next, the following is a connection between the results of quantitative research and qualitative research consisting of the background of

participating in the training, implementation of CHC management after training, implementation of skills learned in the training, and responses to the existence of the West Java Province Health Training Center Unit.

Table 4. Connection of Quantitative Results and Qualitative Results

Thema	Quantitative Findings	Qualitative Findings
Background to participating in Community Health Center Management Training (CHC-MT).	Reasons for participating in CHC management training as 24% of their own volition, and 76% assigned by superiors. As 96% were assigned to permanent positions before and after training.	Reason an assignment: Training alumni are generally assigned to attend CHC-MT, special motivation is needed to be able to attend CHC-MT smoothly; New training participants are needed to maintain the spirit; Assignment is based on considerations of the new CHC head and the health center's preparation for accreditation. Difficulties during online training participants are generally poor internet connection and concerns about not being able to attend the training properly so that they do not pass. Importance of CHC-MT: All informants stated that CHC-MT is important for CHC, especially for accreditation needs; Almost all informants stated that even though there is no accreditation, CHC-MT is needed to improve health centers towards a better direction.
Implementation of CHC management after training.	All alumni (100%) stated that they implemented the follow up plan created at the end of the training.	Implementation of follow up plan: In general, the first follow up plan conducted is socialization to the head of the center and colleagues; Both non head of health center and head of health center informants stated that there were changes or steps that had to be taken in the implementation of follow up plan after training, but in different forms Implementation of CHC management: It has been carried out although not optimally; There were changes in implementation of planning, driving implementation, monitoring, control and evaluation, but district health office informants did not know for sure. There is no special assistance from the District Health Office to CHC after CHC Management Training. Implementation of planning has been carried out especially in the planning stage although the

Thema	Quantitative Findings	Qualitative Findings
		documentation evidence is not yet complete. Data is starting to be used as a basis for planning
		Implementation of driving implementation has been implemented with several obstacles; Coordination was not good, many staff were busy, the management cycle had not been followed by all staff, the activities documentation has not been recorded
		Implementation of monitoring, control and evaluation has been implemented with several obstacles: Analysis of the causes of not being implemented, there has been no satisfaction and service survey, poor coordination of monitoring and evaluation and program reporting; Most informants from non-Head of CHC stated that there was document support for the implementation of CHC management.
Supporting and inhibiting factors for CHC management implementation.	Supporting factors for implementation: 87.8% want to apply knowledge; 46.9% support from superiors; 36.7% supporting facilities and infrastructure and 32.7% orders from superiors, 4% moved positions.	Supporting factors for the implementation of CHC-MT obtained from the Cross-sector although still limited, colleagues, and the superiors. Assistance from the District Health Office was obtained prior to the implementation of accreditation.
	Inhibiting factors for implementation: 51% limited understanding; 42.9% facilities and infrastructure do not support; 22.4% transfers; 20.4% lack of support and not assigned.	Barriers to CHC management implementing as limited direction from superiors, especially about the activities reporting; Limited human resource capacity, resulting in a gap between colleagues; Not all communities are ready to accept the CHC management implementation.
	The attitude of alumni after training related to health center management: 82.77% positive and 17.23% negative.	Future expectations for CHC management implementation. all CHC staff can participate in CHC Management Training, materials are adjusted to the task. A companions health districts office give the opportunity to participate in CHC-MT.
Alumni behavior after health center management training	The average post-training knowledge as 72.4 with a minimum score as 13.3 and a maximum as 100.	There was a perceived decrease in knowledge after some time after training for example once every 5 years, so it was felt necessary to refresh the material in addition to possibly providing new material.
	The Skills that require a little supervision	The superior stated that the alumni of the training should be able to master all the skills learned

Thema	Quantitative Findings	Qualitative Findings
	<p>according to alumni are Building anti-corruption leadership capacity; Data and information management; Health center financial management; Budget planning; Asset management; Human resource management; Management of tools and facilities; Management of drugs and consumables; public health efforts management; Community empowerment management; Risk management;</p> <p>Planning; driving of implementation; monitoring, control and evaluation.</p> <p>Skills that require more supervision according to alumni as holistic leadership.</p>	<p>during training easily because the assigned training participants have gone through the consideration of superiors according to their positions and duties.</p> <p>All skills learned during training support the implementation of CHC management. Most of the skills have been carried out, especially human resources and infrastructure management, anti-corruption, cadre empowerment, and risk management. The skills not yet carried out, according to the head of the health center the skills that have not been carried out are related to financial management. Implementation of these skills requires special personal specifications (educational background) are required.</p> <p>The skills is easy to apply if it is in accordance with the duties and functions, and difficult because not all health center staff have participated in CHC-MT. Supervision and assistance are needed during the implementation of CHC management. such as the District Health Office. But now, the personal of the District Health Office also has limited capabilities because they have never participated in CHC-MT.</p>
Response to West Java Province Health Training Center Unit.	<p>The existence of West Java Province Health Training Center Unit according to Cirebon Alumni as 20.8% very useful and 79.2% useful. According to Majalengka Alumni as 25% very useful, 70.8% useful and 4.2% quite useful.</p>	<p>Offline and online training design: Offline learning design is preferred by alumni because it is application or practice-based; Online learning design is less preferred by alumni because it often internet network disruptions but offline learning design is preferred by alumni because it is application-based and has minimal technical disruptions.</p> <p>The method og training were good and varied. The leadership materials are preferred by the CHC head alumni. In general, the training methods used are quite good with the exception of practical training methods such as role play and field practice, which can be deepened or the training hours increased.</p> <p>The learning facilities provided are quite good with suggestions for training space in the hotel is limited if there are many participants. In general, training is preferred if it uses a location at Health Training Center Unit.</p>

Community Health Center Management Training (CHC-MT) is felt to be very necessary to improve the competence of training participants which in turn will improve the quality of Community Health Center (CHC) services to the community (stated by Alumni (A) 1-3-4-5-7), even though for example it is not one of the requirements listed in CHC accreditation (A1-3-4). This is in line with the purpose of the training, namely to improve employee capabilities in carrying out their duties (Gustiana 2022). Training to improve the quality of human resources is needed in the implementation of CHC strategic management, which is ultimately expected to have an impact on improving the quality of CHC services (Agustina, Irawan, and Ginting 2023; Fatma, Rindu, and Lukman 2024) and the effectiveness of CHC which are still felt to be lacking (Fatma, Rindu, and Lukman 2024). Most of the training alumni took part in the training because they were assigned by their superiors, one alumni superior stated that this selection was based on "... considerations of the newly appointed

health center head and the health center that was to be accredited...". Although based on the superior's assignment, in the end they felt the importance of CHC management training. One alumni superior stated "... it is important that the health center head and staff can carry out management well and appropriately...".

Motivation from superiors to prospective training participants is needed to take the training seriously, as well as motivation for training alumni is needed to apply the results of CHC management training (A2). Motivation is a combination of various internal and external factors that encourage someone to take certain actions. Motivation can be developed through effective communication between superiors and subordinates, employees feel respected and more motivated to do their work, without motivation extraordinary work results and achievements cannot be expected. Professionalism is important in the workplace, but employees who are motivated to work are much more important because they can create a desire to be successful and productive

(Fatma, Rindu, and Lukman 2024). There is a strong influence of motivation on employee performance, motivation can be in the form of opportunities for self-actualization, self-esteem, social ownership, a sense of security and physiological needs (Fatma, Rindu, and Lukman 2024). The findings of this study indicate that female training alumni have higher knowledge than male alumni. This is in line with previous research that there are other factors besides motivation that affect a person's performance, such as employee background, length of service (Fatma, Rindu, and Lukman 2024), but were not examined in this study.

Another finding of this study is that although only a small number of training alumni were transferred from the CHC after training, this is very unfortunate. After training, a training alumni should not be transferred to other positions/tasks within 2-3 years so that the training results can be implemented in their workplace. If there is a transfer, it may only be between CHC, and not to other institutions outside the CHC. The time span provided to implement the

skills acquired during training is quite an important factor, because behavioral change requires time according to the work being done. In relation to time and performance, time management is one of the factors that influence employee performance (Muliati and Budi 2021). In this case, the implementation of CHC management also requires time management, because it includes various activities and involves many officers at the CHC.

All training alumni implement the Follow-up Action Plan what made at the end of the training. Most reported to their superiors after training, intended to obtain support in implementing the training results, as well as socialization to colleagues was carried out in the hope of obtaining support and cooperation in implementing the training results (A1-2-3-4). The implementation of the Follow-up Action Plan stages has not been evenly carried out by alumni, the control – supervision and evaluation stages have only been carried out by half of the alumni. This condition often occurs in the field, among other things, due to the habit that is widely practiced where when

preparing activity plan, they did not simultaneously prepare how the evaluation of the activity will be evaluated. The implementation of all stages of CHC management is very necessary to achieve CHC performance, previous research suggests a relationship between planning and driving implementation with CHC performance (Fatma, Rindu, and Lukman 2024). Organizational support for health workers can reduce work fatigue and fulfill high work professionalism, thus organizational support is very important in the implementation of work (Carlasare et al. 2024).

Qualitative results show that there has been a change in the implementation of CHC management after the training, although one of the health service officials (Informant Superior - S 1) could not explain the changes in detail. Informant A2 stated "... the changes are not yet comprehensive, especially for staff ...". There was no special assistance after the CHC Management Training (CHC-MT) for alumni (S-1), but it was integrated with program guidance and assistance when accreditation was about to be carried out (S1). Data began to be

used as a basis for planning, although not all alumni explicitly stated this. Coordination in driving implementation was not yet completely good, the management cycle had not been followed by all CHC officers, and activity documentation was incomplete. Informant A4 stated "... activity recording is still lacking, not because of the lack of human resources but maybe because of the lack of time so that people forget ...". The evaluation - supervision and control has not been carried out well enough, this is in line with previous research where the evaluation - supervision and control in the good category only reached 43.8% (Fatma, Rindu, and Lukman 2024). The analysis of cause the problem steps have not been carried out much, even though this is important for taking corrective or improvement actions appropriately.

The training alumni also stated that not all of them have conducted customer service satisfaction surveys, coordination in monitoring and evaluation and reporting is not good. Most of the CHC management documents exist, but their completeness is not yet known.

Regarding the completeness of documentation at the CHC, previous research stated that the use of a Computer-Based Health Center Information System supports the effectiveness and quality of CHC services which are relatively stable, accepted by users and have a fast response time (Halimah et al. 2023). Organizational leaders should understand and developed an integrated service model by utilizing technological developments, and develop leadership that adapts to a transforming environment (Lemak et al. 2024).

The support from the CHC head in implementing CHC management is very important so that it can run well, likewise understanding of CHC management by all CHC officers is very important so that it does not become an obstacle (A1). Basically, supporting and inhibiting factors could come from internal factors of training alumni and external factors come from the CHC environment where alumni work. The colleague informant (C1) stated "... cross-sectoral support has improved since COVID-19 ...", and "... support is sought through advocacy ..." (A1).

The importance of environmental support for the implementation of CHC management is in line with the opinion that increased performance is influenced by the work environment, in addition to job satisfaction factors and organizational commitment (Pusparani 2021).

The average knowledge level of alumni after training as 72.4 with a minimum score as 13.3 and a maximum as 100, there was a fairly wide range between participants. The knowledge score could not be compared with the post-test score at the end of the training because the number, form and construction of the questions were different. Alumni stated that they needed to refresh their knowledge about CHC management (A1-4), especially with the new policies on health centers, for example the CHC management according to the transformation of the primary service integration policy (Kementerian Kesehatan Republik Indonesia 2022). The holistic leadership skills were stated to still require more supervision than other skills that only require little supervision. Leadership should adapt to technological advances and

environmental transformations and policies (Lemak et al. 2024). Competency or skill evaluation of officers in carrying out their work need to be carried out periodically and systematically so that the gap that occurs is known, and then it is one of the strategies carried out in developing health management work teams (Pokhrel, Liang, and Taylor 2024).

The existence of Health Training Center Unit is felt to be very useful, it is hoped that it will develop special CHC management materials according to the different duties of CHC officers. For example, for managers of activities that are in the nature of public health efforts, material for managing activities that are in the nature of individual health efforts (A5). Along with the policy of integrating primary services based on life cycle targets, there also needs to be material that is developed according to the target service cluster. The limitation of this study is that the questionnaire used has not been empirically tested on similar respondents, but judgment is made to experts who are considered to master the material on health center

management and to experts in compiling research instruments. Ethics testing of the research was not carried out with the consideration of not intervening during this study, and is mandatory from the main tasks and functions of West Java Province Health Training Center Unit.

CONCLUSION

Approximately one year after the training, alumni knowledge about health center management in the good category was only 44.9%, attitudes in the good category were 69.4% and practices in the good category were 44.9%. The implementation of Community Health Center (CHC) management stages in the form of planning was carried out as 77.6% of training alumni, implementation of implementation was carried out as 67.3% of training alumni and assessment of control supervision was carried out as 57.1% of training alumni. Supporting factors have been felt by alumni in the implementation of CHC management, increasing support from the leaders (superiors), colleagues, provision of work facilities that utilize technological developments and transformative

policies can encourage the implementation of CHC management optimally. Refreshing knowledge and continuous competency evaluation become the basic data for mentoring and developing personnel in health centers.

Training activities in the form of internships at CHC that have implemented good health center management are worth trying, combined with classroom reviews to internalize the field experience. Post-training alumni mentoring by mentors from the District Health Office is worth trying, with the note that the mentors have received training or experience in implementing CHC management. Continuous evaluation of alumni knowledge and skills is carried out for mentoring databases. The formation of peer groups of training alumni as drivers of CHC management can be developed as a means of exchanging experiences of good CHC management practices.

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**HUBUNGAN MASA KERJA, POSTUR KERJA, IKLIM KERJA, DAN
KEBISINGAN DENGAN KELELAHAN KERJA PADA PEKERJA
INDUSTRI BRIKET ARANG**

**THE RELATIONSHIP BETWEEN WORK PERIOD, WORK POSTURE,
WORK CLIMATE, AND NOISE WITH WORK FATIGUE AT
CHARCHOAL BRIQUETTE INDUSTRY**

Hidayatul Amalia, Ekawati, Bina Kurniawan

ABSTRACT

Work fatigue is a problem that can affect all workers in carrying out their work. Workers in the charcoal briquette industry are at risk of experiencing work fatigue. This study was conducted to analyze the relationship between work period, work posture, work climate, and noise with job fatigue in charcoal briquette industry workers. The study was an observational analytic type with a cross sectional approach. The sample of this study was determined by purposive sampling technique with sample criteria, namely workers not in the curing section, totaling 30 people. The research instruments were a respondent data sheets, IFRC questionnaire, RULA sheet, Angle Meter application, Area Heat Stress Monitor, and Sound Level Meter. The statistical test used was the Spearman Rank correlation test. The results showed that most of the respondents had a new working period, very risky work posture, work climate exposure above the NAB ($>28^{\circ}\text{C}$), noise exposure below the NAB ($\leq 85\text{ dBA}$), and mild fatigue. The Spearman Rank Correlation test results showed that there was a relationship between work posture ($p\text{-value} = 0.022$), work climate ($p\text{-value} = 0.045$), and noise ($p\text{-value} = 0.000$) with work fatigue. In contrast, work period was not associated with work fatigue ($p\text{-value} = 0.0486$).

Keywords: work climate, noise, work fatigue, work period, work posture

INTRODUCTION

Briquettes are a type of renewable energy that has high export potential, especially briquettes from coconut shell charcoal. Charcoal briquette making workers are at risk of work fatigue. Previous research on briquette making workers found that out of 42 workers, 23 workers (54.8%) experienced work fatigue. (Saptadi et al., 2022).

Work fatigue is a sign that workers are no longer able to carry out their activities (Soedirmas & Prawirakusumah, 2014). Fatigue becomes a form of protection to prevent further damage to the body so rest is needed for recovery (Suma'mur, 2014a).

Workers who insist on continuing to work when they feel tired will experience increased fatigue and disruption to the smooth running of work and will have negative impact on workers' health (Suma'mur, 2014b). Work fatigue will reduce productivity and increase work failure which creates opportunities for work accidents in industry (Harwanti et al., 2016). Department of Manpower and Transmigration data shows that 414 work accidents occur every day in

Indonesia with 27.8% caused by high fatigue. (Susanti & Amelia, 2019).

The period of work will influence the length of exposure of workers to work environmental hazards (Ramdan, 2018). An awkward working posture makes the muscles inefficient at working so that they require more strength to complete the work (Linoe et al., 2022). A hot work climate will reduce performance and agility, thinking ability, reaction time, sensory and motor coordination, which are some of the symptoms of work fatigue. Exposure to noise will have a psychological impact in the form of decreasing worker efficiency and performance, which can be called work fatigue. (Suma'mur, 2014a)

Posture when doing work can influence the occurrence of work fatigue. Different working postures will place a load on different muscles during activities. Working posture was found to determine differences in workers' trunk muscle activity. Therefore, safe work methods must be implemented to protect workers and improve workers' health, prevent fatigue and work-related diseases. (Yang et al., 2022)

The charcoal briquette industry is a manufacturing industry that produces semi-finished goods in the form of coconut shell charcoal into finished goods, namely briquettes. The briquette production process starts from grinding the coconut shell charcoal using a machine until it becomes flour, then mixing the charcoal flour with adhesive using a mixer machine, after that it is blended and printed using a printing machine and cut to size. At this stage the briquettes produced are still wet, then dried using a wood-fired oven for 30 hours at a temperature of 80-90⁰ Celsius.

Based on the results of a preliminary study, workers in the Coconut Shell Charcoal Briquette Industry work 6 days with Sundays off. Workers work from 8 am to 4 pm and take a 1 hour break during the day. However, the oven unit has 9 working hours because it applies work shifts. The results of interviews with 5 workers showed that all workers experienced symptoms of work fatigue, including fatigue (80%), drowsiness (40%), difficulty concentrating (40%), weakness when working (80%), headaches (20%) ,

lack of enthusiasm (40%), and back pain (60%). Apart from that, it is known that the length of service of workers in this industry varies from 2 to 10 years.

Based on observations, it is known that workers in the Charcoal Briquette Industry predominantly work in standing, bending, sitting, reaching, static positions and repetitive movements. Apart from that, the Charcoal Briquette Industry has quite high levels of noise and a hot working climate. Even though exhaust fans are used, the work environment still feels hot resulting from production machines and factory walls and roofs that use zinc. Noise is generated from the machines used for production, especially charcoal grinding machines (crushers). This is supported by the results of interviews with 5 workers, where all workers complained about the noise from the machines and felt stifling and hot in the work environment.

Lack of study in informal briquette industry means there was a lack of data regarding fatigue and factors that influence fatigue. However, with this data, steps can be

taken to prevent worker fatigue. The aim of this research was to analyze the relationship between work period, work posture, work climate and noise and work fatigue in Charcoal Briquette Industry workers.

METHOD

This research is a quantitative, observational analytical type with a cross sectional approach. The research population was 34 people who were workers in the Briquette Industry. This research used a total sampling technique but there were 4 workers who did not come to work during the research so the sample obtained was 30 workers.

The data collection conducted on April 2023 in Sayung subdistrict, Demak regency. Data was collected through interviews with workers using a questionnaire to determine identity and length of service, and an

Industrial Fatigue Research Committee (IFRC) questionnaire to measure the level of work fatigue felt by workers. Observation and documentation of worker activities to measure work posture risks using the RULA sheet. Body posture angles are measured with the Angle Meter application. The work environment climate is measured by Area Heat Stress Monitor and Sound Level Meter for noise. Measurements were carried out at 6 points, namely at the milling unit, mixing unit, blending unit, printing unit, cutting & trimming unit, and holding tank. This research has been asked to pass the code of ethics (No: 105/EA/KEPK-FKM/2023) by the Undip FKM Health Research Ethics Committee. The data that has been obtained is analyzed using a statistical test in the form of the Spearman Rank correlation test.

RESULT AND DISCUSSION

1. Univariate Analysis

Table 1. Results of Univariate Analysis of Charcoal Briquette Industry Workers Variables

Variable	f	Percentage (%)
Length of Work		
New (≤ 5 yrs)	19	63,3
Old (> 5 yrs)	11	36,7
Work Posture		
High Risk (5-6)	12	40,0

Very High Risk (7)	18	60,0
Work Climate		
Under Treshold Value ($\leq 28^{\circ}\text{C}$)	13	43,3
Above Treshold Value ($> 28^{\circ}\text{C}$)	17	56,7
Noise		
Under Treshold Value (≤ 85 dBA)	24	80,0
Above Treshold Value (> 85 dBA)	6	20,0
Work Fatigue		
Mild Fatigue	16	53,3
Moderate Fatigue	8	26,7
High Fatigue	6	20,0

Table 1 shows that the majority of workers have new work period or ≤ 5 years, namely 20 workers (63.3%). This is because production depends on orders and the work does not require special skills so that when there are orders and production is running, new workers can be recruited.

Work postures were dominated by very high risk work postures with a RULA score of 7 for 18 workers (60%). Workers tend to adopt awkward

body postures such as bending, reaching, looking down, body tilting to the side, wrist flexion and extension.

Table 1. also shows that the majority of workers are exposed to a work climate above NAB ($> 28^{\circ}\text{C}$) as many as 17 workers (56.7%) and more workers were exposed to noise below NAB (≤ 85 dBA) as many as 24 workers (80%). The majority complained of fatigue in the mild fatigue category, namely 16 workers (53.3%).

2. Bivariate Analysis

Table 2. Variable Cross-tabulation of Briquette Worker

Variabel Bebas	Kelelahan Kerja						Total		<i>p-value</i>
	Mild		Moderate		High				
	f	%	f	%	f	%	f	%	
Length of Work									
New (≤5 yrs)	9	47,4	6	31,6	4	21,1	19	100	0,486
Old (>5 yrs)	7	63,3	2	18,2	2	18,2	11	100	
Work Posture									
High Risk (5-6)	9	75	3	25	0	0	14	100	0,022
Very High Risk (7)	7	38,9	5	17,8	6	33,3	6	100	
Work Climate									
Under Treshold Value (≤28°C)	9	69,2	4	30,8	0	0	24	100	0,045
Above Treshold Value (>28°C)	7	41,2	4	23,5	6	35,3	6	100	
Noise									
Under Treshold Value (≤85 dBA)	16	66,7	7	29,2	1	4,2	24	100	0,000

Above Treshold Value (>85 dBA)	0	0	1	16,7	5	83,3	6	100
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Relationship between Length of Work and Work Fatigue

Table 2 shows that the Charcoal Briquette Industry workers who experienced high work fatigue were mostly workers with a new work experience category or ≤ 5 years (21.1%). The Spearman Rank test shows that there is no relationship between length of service and work fatigue in workers ($p: 0.486$)

This research is in line with research on tempeh craftsmen which revealed that work experience was not related to work fatigue ($p: 0.465$). This is because most tempe craftsmen have had a long working period so they have sufficient experience and are able to adapt to their work (Bagaskara, 2022).

Workers with long periods of work tend to have mild work fatigue. This is because workers with long service periods have longer experience than workers with new service periods. Work experience can reduce the occurrence of work fatigue

because you can organize work more efficiently, regulate the amount of energy expended and know the most comfortable work position to maintain productivity so that work fatigue is reduced (Ramdan, 2018).

Relationship between Work Posture and Work Fatigue

Table 2 shows that Charcoal Briquette Industry workers with high work fatigue are dominated by workers with very high risk category work postures (33.3%). Based on the results of the Spearman Rank test, a significance value of 0.022 ($p\text{-value} < 0.05$) was obtained, so there is a relationship between work posture and work fatigue in Charcoal Briquette Industry workers.

This research is in line with previous research on container crane operators which stated that work posture was related to work fatigue ($p\text{-value} = 0.0001$) because an awkward work posture will easily cause fatigue (Amalia et al., 2017).

Workers carry out many activities with extreme bent work postures, such as lifting sacks, collecting charcoal flour, and putting briquette mixture into buckets using shovels. The risk of muscle fatigue increases as the body position moves further away from the center of gravity (Daryono et al., 2016).

Charcoal Briquette Industry workers work with static work postures and repetitive movements which cause work fatigue. Static body postures have a big potential to cause health complaints. Fatigue is caused by the buildup of lactic acid in the muscles during work which can occur due to lack of muscle stretching. (Hijah et al., 2021).

In contrast with research result on laundry worker, there was no relationship between work posture and health complaints especially on complaints of musculoskeletal disorders. (Fuadah et al., 2022)

Workers can stretch their muscles independently for 5 minutes by relaxing the muscles

of the back, neck, shoulders, hands and feet. Companies can implement Workplace Stretching Exercise which is a stretching program in the workplace to achieve elasticity, flexibility and comfort in muscles (Hastuti, 2013).

Relationship between Work Climate and Work Fatigue

Table 2 shows that workers with high work fatigue are dominated by workers who are exposed to a work climate above NAB or $>28^{\circ}\text{C}$ (35.3%). The Spearman Rank test shows that there is a relationship between work climate and work fatigue in workers ($p: 0.045$).

This research was in line with research on Tempe Craftsmen at the Primkopti Lenteng Agung Tofu and Tempe Center which revealed that work climate is related to work fatigue ($p\text{-value} = 0.010$). In this research, it was found that 66.7% of workers complained about work fatigue due to exposure to the work climate (Bagaskara, 2022).

Most workers were exposed to a work climate above threshold value ($>28^{\circ}\text{C}$). Work climate that exceeds the threshold value will trigger work fatigue because the body's process of retaining heat reduces the oxygen supply needed by the body (Suryaningtyas & Widajati, 2017).

The hot working climate arises from the walls and roof of the factory which are made of zinc. Zinc is a good heat conductor so that the sun's heat absorbed by the zinc will be radiated towards the surroundings, thereby increasing the factory temperature. Giving zinc a bright color will affect the absorption of solar heat on the zinc. A study concluded that white tin roofs had the lowest solar absorption, while black tin roofs were the roofs that absorbed the highest solar heat (Nazaruddin et al., 2020).

Production machines and ovens also increase the temperature in the work area. Insufficient ventilation can improve the working climate in

the room even though the Charcoal Briquette Industry has used exhaust fans at several points in the work area. Therefore, it is necessary to add an exhaust fan in the work area so that each work unit has an exhaust fan installed as artificial ventilation so that the heat in the room can flow out smoothly (Wahyuni et al., 2020). Research shows that adding ventilation by installing 3 exhaust fans can reduce the temperature from 33.6°C to 26.8°C (Fakhruddin, 2022).

In the Charcoal Briquette Industry, drinking water facilities are provided for workers, but based on interviews, workers only drink if they feel thirsty. Workers who work in hot climates are advised to drink at least 1 glass of water every 15-20 minutes even if they don't feel thirsty. This is done so that workers get used to drinking enough and regularly so that fluid needs while working are met (Awwalina et al., 2022).

Relationship between Noise and Work Fatigue

Table 2 shows that workers in the Charcoal Briquette Industry who experience high work fatigue are dominated by workers who are exposed to a work climate above NAB or >85 dBA (83.3%). The Spearman Rank test shows that there was a relationship between noise and work fatigue in workers ($p:0.000$).

This research was in accordance with research on production workers in metal industry centers which shows that there was a relationship between noise and work fatigue and workers who are exposed to noise are 10.485 times more likely to get tired than those who do not experience noise. Research results show that workers with exposure to high intensity noise experience high levels of fatigue (Laziardy, 2017).

Of the 6 measurement points, only 1 point had a noise intensity exceeding NAB, namely the milling unit with a

noise intensity of 87.8 dBA. The noise in this grinding unit comes from the charcoal grinding machine and exhaust fan which are fully operational for 7 working hours. When noise exceeds the Threshold Limit Value (NAB), work productivity will be disrupted because workers feel disturbed and cause a decline in psychological conditions which results in work fatigue (Suma'mur, 2014b).

Even though there was only 1 work unit area where the noise intensity exceeds the NAB, fatigue is still felt by workers in other units because in other units there are also sources of noise in the form of production machines and exhaust fans which cause noise close to the threshold value. Exposure to noise in the workplace causes physiological changes in the body because it can increase pulse rate, blood pressure, and constrict blood vessels, resulting in workers becoming tired easily (Safitri et al., 2023).

The Charcoal Briquette Industry has several production

machines but has never carried out regular maintenance on these machines. Based on observations, there was 1 blending machine that was damaged because it had not been regularly maintained. Regular maintenance on production machines needs to be carried out to reduce the intensity of noise generated by machines due to wear and tear on components that rub against each other and damage to machine components. Therefore, regular maintenance is required on the machine by lubricating and repairing damaged machine parts (Maghfiroh, 2021).

Apart from maintaining the charcoal briquette machine, workers also need to equip themselves by wearing ear plugs when working. This means that if the impact of maintenance is not optimal, workers can still be protected by using protective equipment (Morata et al., 2024).

This research only involved a small sample so the results may not represent all the facts in this industry. However, it is still possible to use the

results of this research to design measures to prevent work fatigue in similar industries.

CONCLUSION AND RECOMMENDATION

It can be concluded that the Charcoal Briquette Industry workers are dominated by new workers (≤ 5 years) (63.3%), very high risk work posture (60%), working in an environment with a work climate above threshold value ($>28^{\circ}\text{C}$) (56.7 %), and working in environments with noise below threshold value (≤ 85 dBA) (80%). Most workers complained of work fatigue with a mild fatigue category of 53.3%. There was a relationship between work posture, work climate, and noise with work fatigue and work experience was not related to work fatigue.

Companies need to implement Workplace Stretching Exercises, provide bright colors to the zinc, add exhaust fan units in the work area, carry out regular maintenance on production machines. Workers are advised to stretch their muscles independently for 5 minutes and drink water regularly.

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THE DIFFERENCE BETWEEN THE EFFECT OF OXYTOCIN MASSAGE AND BREAST CARE ON THE BREAST MILK PRODUCTION IN POSTPARTUM MOTHERS

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ABSTRACT

UNICEF and WHO recommendations to reduce infant morbidity and mortality by providing breast milk alone for the first six months of life. WHO statistics in 2017 showed exclusive breastfeeding coverage in several countries was below 50%. Exclusive breastfeeding in Indonesia in 2019 was 67.74%, while in Sleman Regency in 2019, it was 82.25%. Knowing the effect of oxytocin massage and breast care on the smooth production of breast milk in postpartum women at Kedaton Clinic. This type of research uses pure experimentation with a post-test-only control design. The research sample was postpartum women, with 15 treatment and 15 control group samples. The results of the analysis of most respondents in the treatment group (86.6%) in the category of smooth milk production, with a mean of 17.27, and in the control group, most respondents (73.4%) in the category of smooth milk production, with a mean of 13.73. The difference test results showed sig. (2-tailed) of 0.243 > 0.05. There is no difference in effectiveness between the treatment group, mothers who performed oxytocin massage, and the control group who performed breast care. It is expected that health workers, especially midwives, can provide education on oxytocin massage and breast care for postpartum women so that breast milk production runs fluently.

Keywords: Oxytocin Massage, Breast Care, Breast Milk Production

INTRODUCTION

UNICEF and WHO recommendations to reduce infant morbidity and mortality include exclusive breastfeeding for the first six months of life and continuing until two years of age (World Health Organization, 2017). The Sustainable Development Goals (SDGs) target that by 2030, the neonatal mortality rate will fall to 12/1,000 live births and the mortality rate of children under five years old down to 25/1,000 KH. One of the efforts that can be made is to increase the coverage of exclusive breastfeeding (UNICEF, 2017). WHO statistics 2017 showed that exclusive breastfeeding coverage in some countries was below 50%. Meanwhile, UNICEF said that the average exclusive breastfeeding coverage data worldwide was only 38%. The Indonesian Health Profile 2019 data showed that exclusive breastfeeding coverage was 67.74%. Furthermore, the Sleman Regency health profile data in 2019 amounted to 82.25%, but this figure has not reached the Sleman Regency strategic plan target of 84% (Dinkes Sleman, 2020).

Exclusive breastfeeding is the best nutrition for infants because it contains complete nutritional values with a composition that suits the baby's needs. Therefore, the key to successful exclusive breastfeeding is the implementation of early breastfeeding initiation within the first hour after the baby is born (World Health Organization, 2017). Early breastfeeding initiation will stimulate the smooth production of breast milk. Currently, the implementation of exclusive breastfeeding in the community is still relatively low. This is caused by non-optimal breast milk production. Thus, in addition to early breastfeeding initiation, it is necessary to increase breast stimulation, which can increase milk production. This stimulation can be in oxytocin massage or breast care (Hastuti, 2017).

The early days after delivery are an essential time for the mother's success in exclusive breastfeeding for six months. Breastfeeding obstacles begin with poor milk production early on, causing mothers to feel worried and not confident that they cannot

breastfeed optimally. This is the beginning of a mother's failure to breastfeed exclusively. Breast milk production is strongly influenced by the mother's mindset and breastfeeding frequency. Maternal anxiety and fear of a lack of breast milk production and a low level of maternal understanding of the breastfeeding process, so the mother decides to give formula milk (Azizah, 2016).

Breast stimulation is necessary to facilitate milk production, one of which is oxytocin massage. This action can stimulate the production of the hormone oxytocin, which plays a role in breast milk production. Oxytocin massage is a technique that can overcome breast milk production that is not smooth, namely by stimulating the oxytocin reflex or let-down reflex. The benefits that can be obtained by doing an oxytocin massage make the mother relax and calm so that the milk comes out (Haryono, 2014) This technique involves massaging the back area right along the spine at costa 5-6 to the scapula, increasing the work of parasympathetic nerves, and stimulating the posterior pituitary to

release the hormone oxytocin (Adriani, 2017).

Other benefits of oxytocin massage are that it can reduce swelling, breast milk blockage, and maternal fatigue after childbirth (Astutik, 2016). Research conducted by Natalia in 2019 mentioned that oxytocin massage can significantly increase breast milk production before and after the procedure. Research conducted by Siregar (2014) states that several factors influence the implementation of exclusive breastfeeding for six months, including breast milk that does not come out immediately after childbirth, babies have difficulty sucking nipples, flat or short nipples, working mothers, and ease of obtaining formula milk.

Complementary therapy in increasing breast milk production has also been studied by Erfina *et al.* (2020) and Geddes *et al.* (2013), that applying pressure to specific points on the body can increase breast milk production compared to postpartum exercise activities. Yahya *et al.* (2020) and Anita *et al.* (2020) also conveyed that the combination of back massage therapy and

acupressure can be used as a complementary therapy for postpartum primiparous women in helping to increase oxytocin hormones. Similarly, Fang *et al.*, (2024) in China through massage in postpartum women can increase the desire to breastfeed and the lactation process runs smoothly.

In addition to these complementary therapies, breast massage also plays a role in increasing breast milk production. Research conducted by Kilci Erciyas & Kavlak (2024) The amount of breast milk expressed with back and breast massage was higher than that of mothers who did not get back and breast massage. Back massage and acupressure therapy can increase prolactin hormone levels so that this therapy can be given to postpartum mothers and breastfeeding mothers to facilitate breast milk and can be considered to be practiced in obstetric care (Anita *et al.*, 2020). The results of another study also concluded that breast massage is effective in increasing the amount of breast milk released (Viswanath *et al.*, 2016).

Oxytocin massage is an easy and effective technique to stimulate

reflex milk letdown by increasing the oxytocin hormone. (Purwanti & Hanum, 2017). In addition, this massage relaxes mothers and reduces swelling, congestion, and engorgement of their breasts (Wulandari *et al.*, 2018). Breast massage is done by explicitly massaging the soft tissue of the breast to increase the flow of lymph and blood so that the reflex milk release is better (Bowles, 2011). Oxytocin massage can even increase milk production in mothers who have premature babies (Karbandi *et al.*, 2017).

Oxytocin massage and breast care are two ways to increase breast milk production. Oxytocin massage and breast care aim to relax the muscles. This is to the results of research that muscle relaxation significantly increases the success of breastfeeding because it can increase the level of endorphins, analgesic hormones, and natural happiness of a person's body, so they experience a reduction in stress, pain, and anxiety. (Kiliçli & Gül, 2024).

Based on a preliminary survey conducted by researchers by taking data on postpartum women who

control postpartum at Kedaton Clinic, out of 13 people met, nine people said that their breast milk did not come out immediately on the first day. Four people came out immediately but a little. A total of 4 people have been given formula and breast milk. A total of 10 people work and are currently on maternity leave but have concerns about not being able to store breast milk. Based on these conditions, the researcher is interested in conducting a study entitled "Differences in the Effect of Oxytocin Massage and Breast Care on Breast Milk Production in Postpartum Women at Kedaton Clinic in 2022".

Method

This study uses a post-test-only control design, which is to determine the difference in the effect of oxytocin massage and breast care on the smooth production of breast milk in postpartum mothers. This type of research is used to prove the existence of a causal relationship (Sugiyono, 2015). The inclusion criteria in this study were postpartum women in physiological conditions, postpartum women from the first to the seventh day, postpartum women who breastfed with a frequency of at least

six times per day, and mothers who did not consume breast milk enhancers and were willing to be respondents. Exclusion criteria in this study are having disease complications, such as diabetes, high blood pressure, breast tumors, and breast cancer. The participants in this study were postpartum mothers at Kedaton Clinic, with 15 women in the treatment group and 15 women in the control group. The sampling technique in this study used simple random sampling. This sampling technique provides an equal opportunity for each member of the population to become a member of the sample (Sugiyono, 2015). The independent variables in this study were oxytocin massage and breast care treatment. The dependent variable was breast milk production. Univariate and bivariate data analysis techniques were used in this study. The data normality test used the Shapiro-Wilk Test because the number of samples was < 50 . The normality test results were that the data were not normally distributed, and then the data were analyzed using the Mann-Whitney Test (Notoatmodjo, 2012).

RESULT AND DISCUSSION

1. Results

Table 1. Distribution of Respondent Characteristics in Postpartum Women at Kedaton Clinic in 2022

Variable	Group				Total	
	Oxytocin Massage		Breast Care			
	f	%	f	%	f	%
Age						
< 20 and > 35 years	0	0	1	6.7	1	3.3
20 – 35 years	15	100	14	93.3	29	96.6
Employment status						
Employed	7	46,7	9	60	16	53.33
Not employed	8	53.33	6	40	14	46.67
Parity						
Primipara	9	60	9	60	18	60
Multiparous	6	40	6	40	12	40

The analysis results in Table 1 above show that in this study, most respondents were aged 20-35 years (93.3%), and most were working (60%). Most of the respondents (60%) were primiparous or had a history of childbirth that had been experienced once.

Table 2. Distribution of Mean Breast Milk Production of Postpartum Women at Kedaton Clinic in 2022

Variable	n	%	Mean	Mean difference
Oxytocin massage				
Smooth	13	86.6	17.27	3.54
Fairly smooth	1	6.7		
Not smooth	1	6.7		
Breast care				
Smooth	11	73.4	13.73	
Fairly smooth	2	13.3		
Less smooth	2	13.3		

The results of the analysis in Table 2 above show that most of the respondents in the intervention group (86.6%) were in the category of adequate breast milk production, with an average of 17.27 and in the control group, most of the respondents (73.4%) were in the category of proper breast milk production, with an average of 13.73.

Table 3. Difference between Oxytocin Massage and Breast Care for Postpartum Breast Milk Production at Kedaton Clinic in 2022

Variable	N	Mean	Mean difference	p-value
Oksitosin massage	15	17.27	3.54	0.243

Breast care	15	13.73
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Based on the table above, it is known that the sig. (2-tailed) is $0.243 < 0.05$; then H_0 is accepted, and H_a is rejected. So, it can be concluded that there is no difference in effectiveness between the treatment group, mothers who do oxytocin massage, and the control group, mothers who are breastfeeding.

2. Discussion

The results showed that most respondents were aged 20-35 (93.3%). This age range is the ideal age for reproduction because, at that age, a woman is more prepared physically, emotionally, and mentally. This condition is very supportive for women who undergo pregnancy, childbirth, and breastfeeding. At a healthy reproductive age, egg quality, cervical capacity, and hormonal conditions are still excellent (Hidayati, 2012). In Happy's research (2018), the age variable was divided into two categories, namely ≤ 35 years of reproductive age category and > 35 years of non-reproductive age category. In the ≤ 35 year category, 53 (76.8%) respondents practiced

exclusive breastfeeding, while in the > 35 year category, 5 (50%) respondents practiced exclusive breastfeeding. The statistical test results obtained a p-value of 0.120 ($p < 0.05$), it can be concluded that there is a relationship between age and exclusive breastfeeding (Happy, 2018). Based on the respondents' employment status, most are working, namely 60%. Work today is a necessity for every individual. Through work, families can fulfill needs such as food, clothing, shelter, and social needs. Therefore, respondents with working status can use their income to meet their needs, including needs related to the lactation process, such as buying books about breastfeeding and breastfeeding and buying food that supports the quality of breast milk. In addition, working will provide opportunities for mothers to actualize and reduce stress that can affect breast milk production. Working is not a reason to stop exclusive breastfeeding for at least four months and, if possible, up to 6 months, even if maternity leave is only three months. With a great deal of knowledge about

breastfeeding and how to express breast milk correctly, breast milk pumping equipment, and support from the work environment, a working mother can exclusively breastfeed (Bahriyah, 2017).

Based on the respondents' parity status, most were primiparous, 60%. The number of children is quite influential with the mother's activities. The first child is usually expected, and the mother focuses more on caring for the baby. So that it will support the mother in the lactation process; these results are in line with the research of Khofiyah (2019), where this study was obtained (p-value 0.001), which means that there is a relationship between parity and exclusive breastfeeding (Khofiyah, 2019). Similarly, the results of research by Fakhidah (2018), where the results of the study obtained the results (p-value of 0.031), mean that there is a relationship between parity and exclusive breastfeeding (Fakhidah and Palupi, 2018). Mothers who have previously given birth have more experience in exclusive breastfeeding for their babies (Khanal, Sauer, and Zhao, 2013). With more parity, the

mother's confidence in breastfeeding her baby exclusively will increase. Still, mothers who have high parity but low exclusive breastfeeding can be caused because the mother has previously failed to provide exclusive breastfeeding, which ultimately traumatizes the mother (Sudargo & Kusmayanti, 2019).

The results also showed that the majority of respondents' smoothness of breast milk production was in the smooth category, namely for the oxytocin massage group by 86.6% and the breast care group by 73.4%. This shows that both actions are effective in smoothing postpartum women's milk production because both can stimulate the production of the hormone oxytocin, which plays a significant role in the milk production process. Physiologically, breast care by encouraging the breast will affect the pituitary to secrete more progesterone, estrogen, and oxytocin hormones by stimulating the mammary glands through massage so that breast milk can come out smoothly. Statistical test results with a p-value = 0.243, more significant than the value of $\alpha = 0.05$, mean no difference in oxytocin massage and

breast care with the adequacy of breast milk production in postpartum women.

The mean difference in milk production between oxytocin massage and breast care was 3.54. Oxytocin massage and breast care have no difference in milk production as both measures aim for adequate breast milk. Oxytocin massage and breast care stimulate the letdown reflex, while oxytocin massage affects the letdown reflex by massaging the cervical spine. In contrast, breast care affects the letdown reflex due to stimulation of the nipple and around the breast. This milk letdown reflex will cause the contraction of myoepithelial cells. The contraction of these cells will squeeze the milk out of the alveoli and into the duct system to further flow through the ducts to the baby's mouth so that breast milk is available (IDAI, 2013).

Oxytocin massage is effective if done twice daily for 3-5 minutes or approximately 2-3 minutes with 2-3 massages. The implementation of oxytocin massage therapy can affect the release of colostrum in postpartum women, and oxytocin massage has a significant effect on

primiparous postpartum women (Wahyuningsih, 2022). Oxytocin massage is one of the solutions to overcome breast milk deficiency. Breast milk is produced due to the combined work of hormones and reflexes. The prolactin reflex is for the milk formation reflex, while the oxytocin reflex is the milk flow or release reflex (let down reflex). After being produced by the milk-making source, the milk is released from the milk-making source and flowed into the milk ducts. Oxytocin massage stimulates the oxytocin reflex (let down reflex). This is for research Tuti (2016) conducted on the relationship of oxytocin massage with the smooth production of breast milk in postpartum mothers. The results of the study stated that most respondents who were given oxytocin massage produced smooth breast milk production, and there was a very close relationship between oxytocin massage and smooth breast milk production with a p-value of 0.001, which means that oxytocin massage can affect smooth breast milk production (Tuti, 2016).

Breast care is caring for the breasts so that milk comes out

smoothly. Physiologically, breast care by stimulating the breasts will affect the pituitary glands, which produce progesterone, estrogen, and oxytocin hormones, primarily by stimulating the mammary glands through massage. Movement in breast care helps stimulate the milk production reflex. Some of the goals of breast care are to keep the breasts clean, flex, and strengthen the nipples, and the treated breasts will produce enough milk for the baby's needs. Good breast care will make a mother not have to worry about the shape of her breasts changing rapidly, making them less attractive. In addition, good breast care will cause the nipple not to blister when sucked by the baby, facilitate the flow of breast milk, and overcome flat or submerged nipples so that they can be more prominent so that they can be sucked by the baby (Kemenkes RI, 2018).

Based on the above analysis results, both can accelerate breast milk production, so both can be applied to postpartum mothers. Oxytocin massage and breast care also have many other benefits, such as increasing the firmness of the breast

and surrounding skin, relaxing the breast and breast area, preventing breast cancer, preventing breast milk blockage, and maintaining breast hygiene, especially in the nipple and many more (Nur et al., 2020). Furthermore, the mean difference in milk smoothness between oxytocin massage and breast care was 3.52. This means that oxytocin massage is slightly better in facilitating breast milk production. It can only be adjusted to the mother's condition, as in postpartum mothers with a history of spontaneous labor; the oxytocin massage method can be applied, while in postpartum mothers with a history of SC delivery, the breast care method can be used.

CONCLUSION

The majority of respondents were 20-35 years old (93.3%), working (60%), and primipara (60%). Breast milk production in the intervention group was as much as 86.6%, while in the control group, it was adequate in 73.4% of respondents. Oxytocin massage and breast care effectively promoted breast milk production, as indicated by the exact p-value of 0.000. There was no difference in the

effect of oxytocin massage and breast care on breast milk production, as shown by the same p-value of 0.245. Thus, it can be concluded that oxytocin massage and breast care can promote breast milk production.

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LITERATURE REVIEW: THE IMPACT OF STUNTING ON THE LEARNING ACHIEVEMENT OF ELEMENTARY SCHOOL CHILDREN

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ABSTRACT

Stunting can impact children's cognitive development by impairing the growth of neuronal cells in the brain. This condition may hinder children's ability to achieve academic success during their primary school years. This study examines the correlation between stunting and academic performance in elementary-aged children. A systematic literature review was conducted, involving the search for relevant articles and journals through the Google Scholar and PubMed databases. The inclusion criteria for this review encompassed nationally and internationally accredited references pertinent to the topic, published within the past five years. One article indicated no significant relationship between stunting and the academic performance of elementary school students. However, other studies identified a correlation between stunting and academic performance, with varying significance levels. Both internal and external factors influence academic achievement. Internal factors include students' learning motivation, concentration, parental involvement, and environmental conditions. Statistical analysis confirms a relationship between stunting and children's academic achievement.

Keywords: elementary school, learning achievement, stunting, stunting effect

INTRODUCTION

Indonesia is currently facing a double nutritional burden, which is common in several low—or middle-income countries. The double nutritional burden is a state of malnutrition that includes malnutrition and excess macro and micronutrients throughout life in populations, communities, families, and even individuals. (Shrimptom, 2012). Double nutritional burden is also defined as the co-existence of dietary deficiencies and excesses in communities in the same population (Djauhari, 2017).

The concept of the double burden of malnutrition was first introduced about a decade ago and is a global issue affecting both rich and poor countries. In 2020, it was found that 124 out of 143 countries worldwide (86.7%) faced a serious double burden of malnutrition, and 37 of these countries experienced three nutritional problems (stunting in children under five, anemia, and overweight) (Yangambi, 2020).

Stunting is a nutritional status based on Height-for-Age or Length-for-Age indices, which, when measured using anthropometric

standards, fall within The thresholds are defined as a Z-score of less than -2 standard deviations (SD) to -3 SD for stunting, and less than -3 SD for severe stunting (Rahmadhita, 2020). Stunting can also be defined as a condition where a person's height is shorter compared to others of the same age (Sandjojo, 2017).

Based on the Global Nutrition Report data from 2020, children under the age of 5 have a fourfold higher risk of experiencing stunting (Yangambi, 2020). Prolonged malnutrition (chronic) can result in stunting. Stunting is a critical health issue that requires immediate intervention, and it is evident that stunting has become one of the focus areas of the Millennium Development Goals (MDGs) program (Agus Hendra AL Rahmad dan Ampera Miko, 2018).

In 2017, the global prevalence of stunting reached 22.2% of the total population, affecting approximately 150.8 million children under five years old. In that year, stunting affected 29% of children in Africa and 55% of children in Asia. Within Asia, the highest proportion was observed in South Asia (58.7%),

followed by Southeast Asia (14.9%), East Asia (4.8%), West Asia (4.2%), and Central Asia (0.9%). Among Asian countries, Indonesia had the third highest prevalence of stunting, following Timor Leste and India (WHO, 2018). Based on the Indonesian Nutritional Status Study (SSGI) 2021 conducted in 34 provinces, the national stunting rate decreased from 27.7% in 2019 to 24.4% in 2021. Although this prevalence has declined, according to WHO guidelines, it is still classified as high (>20%) and remains a public health issue (Kemenkes RI, 2022).

Various negative impacts can result from stunting conditions. The short-term effects of stunting include brain development disorders, intelligence impairment, physical growth disturbances, and metabolic issues in the body (Kementerian Keuangan Indonesia, 2022). Meanwhile, the long-term impacts that may arise include decreased cognitive abilities and academic performance, as well as reduced immune system resilience and an increased risk of contracting both communicable and non-

communicable diseases. (Pratiwi, Sari and Ratnasari, 2021).

Cognitive abilities are brain-based skills required to perform various types of tasks ranging from simple to complex (Basri, 2018). Other research also mentions that stunting must be addressed as early as possible because it can affect intelligence levels, productivity, and academic achievement in children (Rahmah *et al.*, 2023).

The primary school age is the second golden age for the physical and mental development of children. This period holds a significant influence on their future. Malnutrition conditions such as stunting experienced by primary school-aged children can affect their ability to grasp the material presented in school, which impacts their academic performance (Picauly and Toy, 2013).

Learning achievement can be defined as the outcomes achieved by students based on their cognitive abilities. Learning achievement consists of two words: learning and achievement. In general, learning can be interpreted as the process of behavioral change resulting from an individual's interaction with their

environment to acquire knowledge, skills, and experience. Meanwhile, achievement is the result of an activity that has been carried out or created, either individually or in groups (Rambe, 2019). Learning achievement can also be interpreted as the learning outcomes achieved after going through the teaching and learning process (Giovanni and Komariah, 2020). Achievement in learning is one of the indicators of success or the ability of students to comprehend teaching materials during their education in institutions. One factor influencing learning achievement is the nutritional status of the students.

The purpose of this literature review is to determine the relationship between stunting nutritional status and academic achievement among elementary school students based on previous research findings.

METHOD

This study was conducted using a systematic literature review method with inclusion and exclusion

criteria based on the PICOS approach (Population, Intervention, Comparison, Outcome, and Study type). The literature search in this study utilized online-accessible databases, namely Google Scholar and ScienceDirect. The search in the online databases was conducted by entering specific keywords such as "Impact of Stunting", "Learning Achievement", "Primary School", and "Stunting". The search process in this article follows the PRISMA Flowchart Diagram. The research articles used were those published from the last 5 years. The reason for reviewing articles from the last 5 years is to ensure the currency of data and information relevant to the latest research developments. This is important because recent studies reflect the most current trends, technologies, or findings, providing a more valid and contextual basis for analyzing the topic. Additionally, focusing on articles from this period helps maintain the relevance of the findings to current scientific and practical conditions. Additionally, the articles were open-access.

Table 1. PICOS Criteria

Parameter	Inclusion	Exclusion
Population	Children of primary school age	
Intervention	Stunting	
Outcome	Learning Achievement	
Study Type	Cross-sectional study type	Systematic literature review, literature review, and meta analysis

The search results based on the selected database identified a total of 32 articles from the ScienceDirect database and 80 articles from the Google Scholar database that matched the predefined keywords. All the articles found in both

databases were subsequently assessed for their relevance. The titles and abstracts of all articles were analyzed based on the established criteria. The analysis results showed that 6 articles met the predetermined criteria.

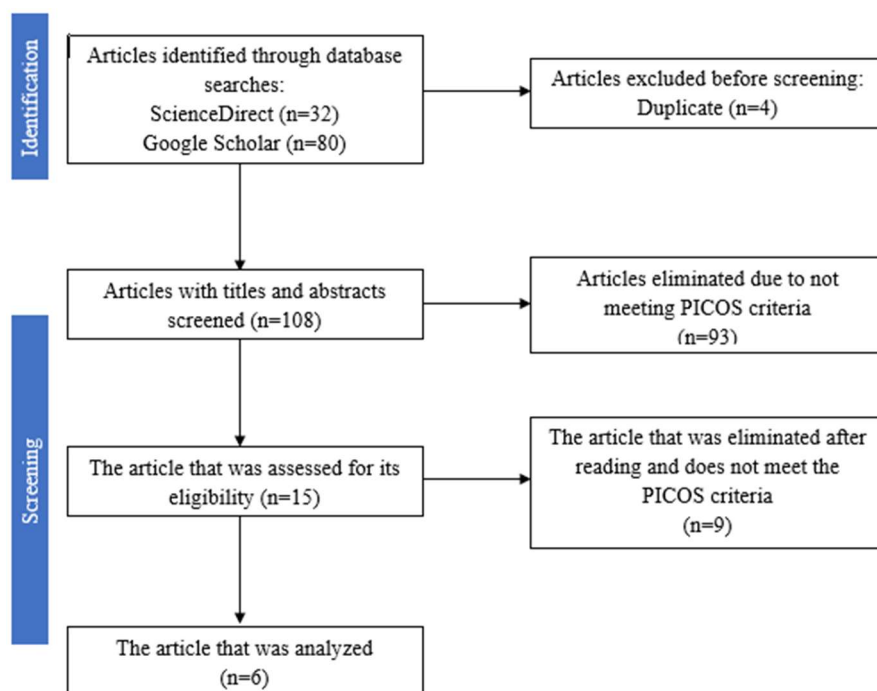


Figure 1. PRISMA Flowchart Diagram

RESULT

Based on the results of the article on the relationship between stunting and elementary school students' academic achievement that the author has gathered, it is found that only one article shows no relationship between stunting and elementary school students' academic achievement. Meanwhile, in other articles, a relationship was found with varying significance levels. There are

several factors influencing students' academic achievement besides stunting. These factors can originate from students' internal and external environments. Internal factors include students' learning motivation, concentration, parental approach, and attention, as well as environmental factors. The relationship between stunting and elementary school students' academic achievement is evidenced by statistical analysis.

Table 2. Literature Review Results

Authors & Year	Title	Method	Result
(Amir <i>et al.</i> , 2020)	<i>Hubungan Stunting dengan Prestasi Belajar Peserta Didik Sekolah Dasar</i>	Cross-sectional Study	Based on the cross-tabulation results of subjects with stunting conditions, both respondents indicated with stunting and those not indicated with stunting tend to have 'very good' learning achievement in all three subjects. Therefore, no significant correlation exists between stunting and academic performance.
(Beckmann <i>et al.</i> , 2021)	Prevalence of Stunting and Relationship between Stunting and Associated Risk Factors with Academic Achievement and Cognitive Function: A Cross-Sectional Study with South African Primary School Children	Cross-sectional Study	There is a relationship between academic achievement in tests conducted on stunted children, with higher results observed in females compared to males. This indicates a link between stunting and academic performance, albeit with a weak level of significance at $r \leq 0.30$.
(Nadirawati, Haniarti, 2019)	Stunting Relationship with the Learning Achievements of Kiru-Kiru Elementary School Children in Soppeng Riaja District Barru	Cross-sectional Study	Based on research conducted on 31 students classified as stunted, 23 students showed poor academic performance. This indicates a correlation between stunting and its impact on students' academic achievement.

(Sarda <i>et al.</i> , 2022)	<i>Hubungan Stunting dengan Prestasi Belajar Siswa di SD Negeri Diule Kecamatan Tolitoli Utara Kabupaten Tolitoli</i>	Cross-sectional Study	Out of 36 students classified with stunted nutritional status, 12 students' academic performance was influenced by their stunting condition, while 24 others were influenced by other factors. Based on the study, it can be concluded that there is a weak correlation between stunted nutritional status and the academic achievement of students at Diule Public Elementary School, Tolitoli Utara Subdistrict, Tolitoli Regency. Therefore, it can be inferred that the issue of stunting is still mild and does not significantly hinder students' learning abilities.
(Anggraini <i>et al.</i> , 2019)	<i>Hubungan Stunting dengan Prestasi Belajar di SD Negeri 03 Bengkulu Selatan</i>	Cross-sectional Study	From the conducted research, it was found that 6 students have stunting nutritional status, with 5 of them having poor learning achievement while 1 student has good learning achievement. Based on the statistical tests conducted, a significant correlation was identified between the incidence of stunting and the academic performance of students at SD Negeri 03 Bengkulu Selatan Elementary School.
(Nurmalasari and Anggunan, 2020)	<i>Hubungan Stunting dengan Kadar Hemoglobin dan Prestasi Belajar pada Anak SD Negeri 13 Teluk Pandan Pesawaran</i>	Cross-sectional Study	The analysis results of the relationship between stunting and students' learning achievement at Teluk Pandan Public Elementary School found that 39 students were classified as stunted. Among these 39 students, 15 (38.5%) exhibited 24 students (61.5%) demonstrated good academic performance, while the remaining students showed poor academic performance. Statistical analysis revealed a significant correlation between stunted growth in students and their academic achievement.

DISCUSSION

In the study titled 'The Relationship between Stunting and Academic Achievement among Elementary School Students,' 355 respondents met the study criteria. Among them, 38 respondents were classified as stunted, with 20 (52.6%) of them being male (Amir *et al.*, 2020).

To examine the relationship between stunting and students' academic performance, researchers used the respondents' report card scores for Mathematics, Indonesian Language, and Physical Education (PJOK), which were analyzed through cross-tabulation

In the cross-tabulation Chi-square test results with a 95% significance level, the probabilities for the subjects of Bahasa Indonesia (p-value=0.374), Mathematics (p-value=0.730), and PJOK (p-value=0.623) indicate no significant relationship between stunting and academic achievement among elementary school students with stunting status at MIN 5 and MIN 9 in Banda Aceh City.

In contrast to previous studies, the article titled 'Prevalence of

Stunting and Relationship between Stunting and Associated Risk Factors with Academic Achievement and Cognitive Function: A Cross-Sectional Study with South African Primary School Children' showed a relationship between academic achievement and tests conducted on children with stunting status. However, the relationship obtained from 'The Flanker Test Performance' showed a weak level of significance ($r \leq 0.30$). This can be seen from the values of $r=0.19$ for female students and $r=0.13$ for male students (Beckmann *et al.*, 2021).

The value indicates a slightly stronger relationship between stunting and academic achievement among female students compared to male students. This study aligns with the research titled "The Relationship between Stunting and Academic Achievement of Students in Public Elementary Schools in Diule District, North Tolitoli Regency." The study involved 36 stunted students (31%) out of a total of 120 sampled students (Sarda *et al.*, 2022).

The cross-tabulation results revealed that 31 students (26%) demonstrated good academic

achievement, comprising those with stunted nutritional status, whereas 5 students (4%) exhibited poorer academic performance from the stunted category. Based on the correlation test results with a significance level of 95%, a correlation coefficient of 0.331 was obtained, indicating a weak relationship between stunted nutritional status and academic performance, as the value falls within the range of 0.20 to 0.399 (Sarda *et al.*, 2022).

The two studies are in line with previous research titled "The Relationship between Stunting and Academic Achievement of Elementary School Children in Slum Areas, Central Jakarta Municipality." This research indicates that the z-score for stunting and child concentration parameters are weakly correlated with children's academic achievement, with an R-value of 0.177 for the stunting parameter (Arfines and Puspitasari, 2017).

Another study indicates that there is a significant relationship between stunting nutritional status and elementary school students' academic achievement. A study titled

"The Relationship between Stunting and Academic Achievement of Elementary School Children in Kiru-Kiru Public Elementary Schools, Soppeng Riaja Subdistrict, Barru Regency" confirms a significant association. It reports that out of 31 stunted respondents, 8 (25.8%) showed good academic performance, while 23 (74.2%) exhibited poor academic performance (Nadirawati, Haniarti, 2019).

The reviewed studies consistently explore the relationship between stunting and academic performance in elementary school students, all employing a cross-sectional design. Several studies, such as those by Beckmann *et al.* (2021) and Anggraini *et al.* (2019), found a significant, albeit weak, correlation between stunting and learning outcomes. However, other research, like Amir *et al.* (2020), indicated no meaningful relationship, suggesting that stunted students can achieve good academic performance. Additionally, environmental factors and gender differences contributed to variations in findings. For instance, Beckmann *et al.* (2021) noted that female students performed better than

males, while Sarda et al. (2022) identified other external factors influencing academic achievement beyond stunting.

These discrepancies may stem from differences in sample size, geographic and socio-economic contexts, or methods of data collection. Such variations highlight the complexity of the stunting-education relationship and suggest that stunting alone may not be the sole determinant of academic success. Policymakers and researchers should consider these nuances when designing interventions, as strategies must address broader socio-environmental factors alongside nutritional improvement to effectively enhance students' learning outcomes.

The study titled "The Relationship between Stunting and Learning Achievement in Public Elementary School 03, South Bengkulu" showed cross-tabulation results indicating that 5 out of 6 stunted children (83.3%) have poor learning achievement, while the remaining 16.7% have good learning achievement. After analyzing using the Chi-square test, a p-value of 0.016

was found, which is less than the significance level α . Other studies have also indicated a significant relationship between stunting and students' learning achievement in elementary schools.

The study titled "The Relationship between Stunting and Learning Achievement of Elementary School Children in Kiru-Kiru, Soppeng Riaja Subdistrict, Barru District" found a significant relationship, with 8 stunted respondents (25.8%) having good learning achievement and 23 stunted respondents (74.2%) having poor learning achievement (Anggraini *et al.*, 2019). In conclusion, based on the statistical test results, there is a correlation between stunting incidence and academic achievement.

In the article titled "The Relationship between Stunting, Hemoglobin Levels, and Learning Achievement in Students at SD Negeri 13 Teluk Pandan Pesawaran," the analysis revealed that out of 39 stunted students, 15 had poor learning achievements while 24 had good learning achievements. Statistical analysis yielded a p-value of 0.026 ($p < 0.005$), indicating a significant

association between stunting status and learning achievement (Nurmalasari and Anggunan, 2020).

Stunting represents a manifestation of growth impairment in children. When stunting occurs, it can disrupt the body and the development of various parts of the child's body. One crucial area requiring optimal growth is the brain, which houses millions of nerve cells crucial for a child's cognitive responses. Therefore, stunting plays a significant role in a child's academic achievement (Picauly and Toy, 2013).

The research conducted by Dezi Ilham and Wilda Laila (2017) is consistent with these three studies. Out of a total of 12 stunted students, 9 students (75%) had low learning achievements, while 3 students (25%) had high learning achievements. After conducting a Chi-square statistical test, a p-value of 0.026 was found, indicating that the occurrence of student stunting is associated with student learning achievements at SDN 09 Nanggalo in 2017 (Ilham and Laila, 2018). Another study indicated that stunting significantly correlates with the level of intellectual intelligence among newly enrolled

elementary school children in Nanggalo District, Padang City, as evidenced by bivariate analysis with $p < 0.05$ ($p = 0.013$) (Ginting and Pandiangan, 2019). Another research also demonstrated that poor dietary patterns increase the risk of declining academic performance by 0.828 times (Saniarto and Panunggal, 2013).

CONCLUSION

This literature review indicates that children with stunted growth tend to achieve lower learning outcomes compared to children with normal nutritional status. Therefore, there is a need for monitoring the nutritional intake of pregnant women and children, as well as identifying factors to prevent stunting, to optimize children's learning achievements during their critical early years (elementary school age).

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THE RELATIONSHIP BETWEEN EATING HABITS, MENSTRUATION DURATION, AND NUTRITIONAL STATUS WITH ANEMIA INCIDENCE IN ADOLESCENT GIRLS AT MAN 1 OGAN ILIR

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ABSTRACT

The prevalence of anemia in adolescent girls is 32%, which affects their health, such as immune system strength and physical productivity, making the body vulnerable to health problems. Respondents sometimes eat three times a day (57%), eat green vegetables (52%), eat breakfast before activities (46%), eat breakfast, lunch and dinner (52%), consume instant noodles (66%). This study aims to determine the relationship between eating habits, nutritional status, and menstruation duration with anemia incidence. This study uses a cross-sectional method with a sample of 100 eleventh-grade female students at MAN 1 Ogan Ilir. Data were collected using a questionnaire, biomedical data using an Hb meter (*easytouch*), stadiometer, and digital scales. Analysis. Data analysis was performed univariate and bivariate using the chi-square statistical test. The results showed that there variable of diet there is a relationship with the incidence of anemia in adolescent girls of ($p = 0,013$; $PR = 11,707$; $95\% CI = 1,437-95,361$). It is recommended for adolescent girls to have a healthy diet such as eating green vegetables, fruits and animal protein, having breakfast before going to school, reducing fast food consumption, and taking IFA (Iron and Folic Acid) supplements which can help increase Hb levels and prevent anemia.

Keywords: Eating Habits, Menstruation Duration, Nutritional Status, Adolescent Girls, Anemia

INTRODUCTION

Anemia is a common problem in adolescent girls, caused by a lack of essential nutrients for hemoglobin (Amalia & Meikawati, 2024). Formation Iron deficiency can inhibit hemoglobin synthesis, which negatively affects energy, endurance, and thinking ability, and can affect learning achievement and can increase susceptibility to infection due to lack of oxygen needed by the muscles and brain (Junita & Wulansari, 2021). According to the 2018 Riskesdas statistics, the prevalence of anemia in adolescent girls aged 15-24 years is 48.9% (Nasruddin et al., 2021). This result shows that adolescent girls are a demographic group vulnerable to anemia, which is caused by irregular eating habits and nutritional deficiencies (Apriyanti, 2019). Other factors that may contribute to anemia include heavy menstrual bleeding, iron deficiency, nutritional status, parental education level, economic conditions, and menstruation duration (Muhayati & Ratnawati, 2019).

Three important nutritional factors that affect the body are type, frequency, and quantity. A poor diet

can affect a person's nutritional state, it is caused by the food and drinks consumed. Poor diet such as frequent consumption of foods high in sugar, fast food, fried foods, and sugary drinks, so that the nutrient content of foods consumed in adolescent girls can affect the absorption of iron in the body (Sumantari et al., 2018). In addition, not eating enough vegetables and fruits can affect the body because it lacks fibre, vitamins and minerals. Teenagers also often skip breakfast, which can cause the body to feel weak, not concentrated, so that it has an impact on productivity. Skipping breakfast causes excessive hunger during the day, which leads to irregular eating patterns and consuming high-calorie foods (Nurjannah & Putri, 2021).

Several factors can contribute to the incidence of anemia, one of which is menstruation duration. Adolescent girls typically experience menstruation that lasts 3-7 days with heavier bleeding and a normal menstrual cycle of 21-35 days. If menstrual bleeding lasts longer than 7 days, it can lead to iron deficiency (Permatasari et al., 2020). When iron and red blood cells continue to

decrease during menstruation, the body's organs and tissues do not receive enough oxygen, causing symptoms such as weakness, fatigue, dizziness, and a decrease in concentration for studying and other physical activities. Adolescent girls need more iron intake than adolescent boys due to monthly (Barbara & Karlina, 2019).

Nutrients are one of the components in the formation of haemoglobin, the quality of food consumed is closely related to nutritional status, which can contribute to its decline. If the food consumed is highly nutritious, a person's nutritional status is likely to be good. On the other hand, consuming food with low nutritional value can lead to issues such as malnutrition and anemia (Indrawatiningsih et al., 2021). Lack of nutrients such as vitamin B12 results in adolescent girls not fulfilling the food substances needed in the body, so if it occurs for a long time it will cause Hb levels to decrease and experience anaemia. Most adolescents maintain a normal Body Mass Index (BMI) due to parental supervision over their eating

habits and food choices. Adolescents with good nutritional awareness tend to have a positive attitude towards their food. Adolescents with low BMI are often associated with various factors, including irregular eating habits and poor nutritional understanding (Qomarasari & Mufidaturrosida, 2022).

According to the study by (Sari, 2020), the prevalence of regular menstrual habits was 63.6%, poor nutritional status was 50.5%, and non-anemia prevalence was 57.6%, indicating a correlation between menstrual habits, nutritional status, and anemia incidence. Similarly, (Tarigan et al., 2023) reported that the chi-square test results showed a correlation between menstrual cycle and anemia prevalence in adolescent girls ($p = 0.001$). The duration of menstruation can affect the number of red blood cells; prolonged menstruation leads to increased blood loss, which could potentially cause anemia in women. A study by (Marlena et al., 2023) in Ogan Komering Ilir Regency found a statistical correlation between eating habits and anemia prevalence in adolescent girls. The odds ratio (OR)

analysis resulted in an OR value of 3.553, indicating that adolescent girls with irregular eating habits are 3.553 times more likely to experience anemia compared to those with regular eating habits (Fatimah et al., 2024).

Adolescent girls often face social pressure to maintain an ideal body shape. However, in an effort to lose weight, adolescents reduce their food intake, leaving the body deficient in iron, vitamins and minerals. An unbalanced diet such as foods high in sugar, fat, and a lack of consuming vegetables, fruit, and other proteins will cause iron and protein deficiencies, which play an important role in the formation of red blood cells and growth (Marfiah et al., 2023). Iron deficiency can lead to anaemia, which is characterised by weakness, fatigue and difficulty concentrating. In addition, protein is also important for the growth and repair of body tissues, so if its intake is deficient, it can inhibit growth, reduce endurance, and cause muscle and skin disorders (Rorimpandei et al., 2020).

According to statistics from the Health Office of Ogan Ilir

Regency, the prevalence of anemia in 2018 was 410 individuals (2.3%) and increased to 965 individuals (5.5%) in 2019. Causes of anemia in adolescent girls include low-protein diets that do not meet iron intake, monthly menstruation resulting in significant blood loss, and the risk of giving birth to children with growth restrictions later in life (Rahmadaniah & Rahmadayanti, 2021). Given the increasing number of cases in Ogan Ilir from 2018 to 2019, the researcher conducted a study at MAN 1 Ogan Ilir in 2024 to determine whether there is a relationship between eating habits, menstruation duration, menstrual cycles, and nutritional status. This study aims to determine the number of anemia cases among adolescent girls at MAN 1 Ogan Ilir.

METHODS

The sample for this study was an analytical observational analysis using a *cross-sectional* study design. The population taken using purposive sampling technique amounted to 100 female students from class XI at MAN 1 Ogan Ilir. The inclusion criteria of the study were those who had experienced menstruation, were

willing to become respondents, and the exclusion criteria were respondents who refused to fill out the questionnaire. The characteristics of the respondents included age, majors of respondents (health, social science, economics, engineering), father's education, mother's education, father's occupation, mother's occupation, family income, and consumption of Iron Tablets (TTD). The variables used in this study were eating habits, nutritional status, menstruation duration, and menstrual cycle with the incidence of anemia. The measurement tools used were a hemoglobin (Hb) meter (*easytouch*), a *stadiometer*, and a digital scale, and the tool has been calibrated so that it can reduce bias in these measurements. Data was collected by filling out a questionnaire that had been tested on a similar population by respondents, in filling out the questionnaire, it was also explained in advance how to fill it in and accompanied by researchers and enumerators. Hemoglobin measurement (to measure blood Hb level), Height and Weight (to calculate body mass index) that adjusts BMI/U to age and gender, to

be more accurate for adolescents under 18 years old (Kemenkes, 2020). For the anemia variable, two categories were used: no anemia ($Hb > 12 \text{ g/dL}$) and anemia ($Hb < 12 \text{ g/dL}$) (WHO, 2011). Eating habits obtained using a questionnaire with 11 questions eating habits were calculated using the mean, where a good eating pattern was defined as $\geq 30,75$ and a poor eating pattern was $< 30,74$ (Suryanti et al., 2017). Menstrual duration and nutritional status were obtained using a questionnaire with 3 questions, menstruation duration was classified as normal (3-7 days) or abnormal (< 2 days or > 7 days) (Listiana, 2016). Menstrual cycle was classified as normal (21-35 days) and abnormal (< 21 days or > 35 days) (Suhariyati et al., 2020). Nutritional status is obtained from calculating the age of respondents using standard deviation, namely nutritional status (BMI) was categorized as follows: undernutrition ($BMI < -2 \text{ SD}$), normal nutrition ($-2 \text{ SD to } +1 \text{ SD}$), overweight ($+1 \text{ SD to } +2 \text{ SD}$), and obesity ($> +2 \text{ SD}$) (Kemenkes, 2020) The analysis in this study used univariate analysis to identify frequency distribution, and

bivariate analysis to evaluate the relationship between dependent and independent variables using *chi-square* testing. Health Research Ethics Committee of 417/UN9.FKM/TU.KKE/2024.

RESULT AND DISCUSSION

Table 1. Respondent Characteristics, Anemia Incidence, Eating Habits, Menstruation Duration, and Nutritional Status

Variable	Frekuensi (n= 100)	Persentase (%)
1. Respondent Age		
15 years	27	27
16 years	63	63
17 years	10	10
2. Respondent Major		
Health	35	35
Social Science	22	22
Economics	22	22
Engineering	21	21
3. Father's Education		
Didn't finish Elementary School	1	1,0
Elementary School	30	30
Junior High School	14	14
Senior High School	41	41
College/University	14	14
4. Mother's Education		
Didn't finish Elementary School	1	1,0
Elementary School	30	30
Junior High School	11	11
Senior High School	46	46
College/University	12	12
5. Father's Occupation		
Farmer	25	25
Merchant	11	11
Agricultural laborer/worker	18	18
Civil Servants/PPPK	6	6
Private company employees	14	14
Military/Police Member	1	1
Others....	25	25
6. Mother's Occupation		
Housewife	70	70
Farmer	8	8,0
Merchant	9	9,0
Civil Servant/PPPK	9	9,0
Military/Police Member	1	1,0
Others....	3	3,0
7. Family Income (UMK Ogan Ilir)		
< Rp 3.456.874	77	77
≥ Rp 3.456.874	23	23
8. Anemia Incidence		
Anemia	11	11
Non anemia	89	89

Variable	Frekuensi (n= 100)	Persentase (%)
9. Eating Habits		
Good (\geq mean, mean: 30,75)	59	59
Poor ($<$ mean, mean: 30,74)	41	41
10. Nutritional Status		
Undernutrition: -3 SD to <-2 SD	5	5
Normal nutrition: -2 SD sd +1 SD	82	82
Overnutrition: +1 SD sd +2 SD	4	4
Obesity: >2 SD	9	9
11. Menstruation Duration		
Normal (3-7 days)	80	80
Abnormal (>7 days)	20	20
12. Menstrual Cycle		
Normal (21-35 days)	52	52
Abnormal (>35 days)	48	48
13. Iron Tablet Consumption		
Yes	56	56
No	44	44

Source: Research Data, 2024

Based on Table 1, the respondents' age was predominantly 16 years (21%), with the majority of respondents majoring in health (35%), the majority of respondents did not experience anemia (89%). The majority of respondents had a good eating pattern (59%), the majority had

good nutritional status (82%), the majority experienced a normal menstruation duration (3-7 days) (80%), the majority had a normal menstrual cycle (21-35 days) (52%), and the majority of respondents consumed Iron Tablets (18.7%).

Table 2. Frequency Distribution of Eating Habits Among Adolescent Girls at MAN 1 Ogan Ilir

No	Statement	Always	Often	Sometimes	Never
1.	I eat a main meal 3 times a day.	21%	21%	57%	1,0%
2.	I follow a weight loss diet to maintain my body shape*	18%	8%	25%	49%
3.	I consume fruits rich in Vitamin C (pineapples, watermelons, and others	24%	47%	28%	1,0%
4.	I eat rice with iron-rich side dishes (meat, fish, organ meats, eggs) every day	28%	41%	31%	0%
5.	I eat breakfast before starting activities in the morning, such as going to school	30%	19%	46%	5,0%
6.	I eat rice with green vegetables (spinach, broccoli, mustard greens) every day	16%	30%	52%	2,0%
7.	I eat protein sources like tofu and tempeh	26%	41%	32%	1,0%
8.	I eat rice with fish	26%	46%	27%	1,0%

9.	I consume instant noodles every day*	10%	17%	66%	7,0%
10.	I eat rice with eggs	18%	36%	45%	1,0%
11.	I eat vegetables for breakfast, lunch, and dinner	13%	31%	52%	4,0%

Source: Research Data 2024 (negative statements*)

Based on table 2, respondents stated that they only sometimes eat three meals a day (57%), sometimes eat breakfast before morning activities such as school (46%), sometimes eat rice with green vegetables (spinach, broccoli, mustard greens) every day (52%), sometimes eat rice with eggs (45%), sometimes eat vegetables at breakfast, lunch, and dinner (52%).

Table 3. Analysis of the Relationship Between Eating Habits and the Incidence of Anemia Among Adolescent Girls at MAN 1 Ogan Ilir

Eating Habits	Anemia		Non-Anemia		Total	PR	95% CI	p-value
	n	%	n	%				
Poor	10	19,6	41	80,4	100%	11,707	1,437-95,361	0,013
Good	1	2,0	48	98,0	100%			

Source: Research Data, 2024

Based on table 3, there were 10 respondents (19,6%) with anemia but had a poor eating habits and 1 respondent (2,0%) with anemia but had a good eating habits. In addition, there were 41 respondents (80,4%) with no anemia but poor eating habits, and 48 respondents (98,0%) with no anemia but good eating habits. The results of bivariate analysis showed that the *p-value* (0,013) <0.05, indicating that there is a relationship between eating habits and the incidence of anemia among adolescent girls at MAN 1 Ogan Ilir. Adolescent girls with poor eating habits are 11,7 times more likely to experience anemia compared to those with good eating habits.

Table 4. Analysis of the Relationship Between Nutritional Status and the Incidence of Anemia Among Adolescent Girls at MAN 1 Ogan Ilir

Nutritional Status	Anemia		Non-Anemia		Total	PR	95% CI	p-value
	n	%	n	%				
Abnormal	1	5,6	17	94,4	100%	2,361	0,283-19,720	0,683
Normal	10	12,2	72	87,8	100%			

Source: Research Data, 2024

Based on table 4, there is 1 respondent (5,6%) with anemia but had abnormal nutritional status and 10 respondents (12,2%) with anemia but had normal nutritional status. In addition, there were 17 respondents (94,4%) with no anemia but had abnormal nutritional status and 72 respondents (87,8%) with no anemia but had normal nutritional status. The results of bivariate analysis prove that the *p*-

value (0,683) > 0,05, meaning that there is no significant relationship between nutritional status and the incidence of anemia among adolescent girls at MAN 1 Ogan Ilir. Adolescent girls with abnormal nutritional status are at 2,3 times greater risk of experiencing anemia compared to those with normal nutritional status.

Table 5. Analysis of the Relationship Between Menstrual Duration and the Incidence of Anemia Among Adolescent Girls at MAN 1 Ogan Ilir

Menstrual Duration	Anemia		Non-Anemia		Total	PR	95% CI	p-value
	n	%	n	%				
Abnormal	4	20,0	16	80	100%	2,607	0,681-9,980	0,223
Normal	7	8,8	73	91,3	100%			

Source: Research Data, 2024

Based on table 5, there are 4 respondents (20%) with anaemia who had abnormal menstrual duration, and 7 respondents (8.8%) with anemia who had normal menstrual duration. In addition, there were 16 respondents (80%) with no anaemia who had abnormal menstrual duration and 73 respondents (91,3%) with no anemia who had normal menstrual duration. The results of bivariate analysis show

a *p-value* (0,223) > 0,05, meaning that there is no significant relationship between menstrual duration and the incidence of anemia among adolescent girls at MAN 1 Ogan Ilir. Adolescent girls with abnormal menstrual duration are at 2,6 times greater risk of experiencing anemia compared to those with normal menstrual duration.

Table 6. Analysis of the Relationship Between Menstrual Cycle and the Incidence of Anemia Among Adolescent Girls at MAN 1 Ogan Ilir

Menstrual Cycle	Anemia		Non-Anemia		Total	PR	95% CI	p-value
	n	%	n	%				
Abnormal	4	8,3	44	91,7	100%	0,584	0,160-2,138	0,618
Normal	7	13,5	45	86,5	100%			

Source: Research Data, 2024

Based on table 6, there are 4 respondents (8,3%) with anemia who had abnormal menstrual cycles and 7 respondents (13,5%) with anemia who had normal menstrual cycles. In addition, there were 44 respondents (91,7%) with no anemia who had an abnormal menstrual cycle and 45 respondents (86,5%) with no anemia who had a normal menstrual cycle. The results of bivariate analysis showed a *p-value* (0,618) > 0,05, meaning that there is no significant relationship between menstrual cycle and the incidence of anemia among adolescent girls at MAN 1 Ogan Ilir. Adolescent girls with an abnormal menstrual cycle are at 0,5 times greater risk of experiencing anemia compared to those with a normal menstrual cycle.

The results of the analysis indicate that there is a relationship between eating habits and the incidence of anemia among adolescent girls at MAN 1 Ogan Ilir ($p = 0.013$). These results are consistent with a study conducted at SMA Murni Padang, which found a *p-value* of 0.028, meaning there is a relationship between the incidence of anemia and eating habits (Manila, 2021). Similarly, research conducted on school-age children aged 6-18 years obtained a value ($p = 1,153$) which means that there is a relationship between diet and the incidence of anaemia in adolescent girls (Verma et al., 2004). Eating habits anemia because adolescent girls do not consume green vegetables, and skip breakfast in the

morning, the habit of adolescents who often eat fried foods, fast food, and sweet drinks, then the iron needs in the body are not fulfilled so that adolescents experience anemia (Margiyanti, 2021).

Eating habits have a significant impact on nutritional intake. A person who eats three meals a day but with a frequency and types of food that are deficient in essential nutrients can influence the occurrence of anemia (Anwar et al., 2021). The income level of parents is a factor that affects diet, the lower the income of parents, the need for nutritionally balanced food is limited, resulting in low nutritional content, for example instant noodles and fried foods (Stabell et al., 2021). From the research data, the majority of respondents reported eating main meals three times a day occasionally, at 57%. This suggests that improving regular eating habits is important. An unbalanced diet can adversely affect adolescent health and increase the risk of anemia in these girls. Poor eating habits lead to a deficiency of essential nutrients, such as iron and protein (Putri et al., 2022). This condition needs serious attention

because anemia can negatively impact health, concentration, and the productivity of adolescents. Therefore, efforts to improve adolescents' eating habits through nutrition education, school interventions with the provision of nutritious food, and regular health screenings to detect anemia early are necessary (Armah et al., 2021).

The results of the analysis show no relationship between nutritional status and the incidence of anemia among adolescent girls at MAN 1 Ogan Ilir ($p = 0.683$). These results are consistent with a study conducted at a high school in Badung Regency, which found a p-value of 0.301, indicating no relationship between anemia and nutritional status (Putra, 2019). The nutritional status of adolescents is fulfilled because the body receives adequate and balanced nutrition in accordance with the needs of energy, growth, and daily activities. Adequate protein consumption from sources such as eggs, meat, tofu and beans also plays a role in muscle and tissue building, as well as body development. In addition, calorie intake in accordance

with individual needs helps maintain energy for daily activities (Noviyanti et al., 2024).

Nutritional status does not necessarily have a direct correlation with anemia, as anemia is not only influenced by nutritional status. A person with good nutritional status can still experience anemia if the nutritional intake required for hemoglobin (Hb) formation is insufficient. Additionally, anemia can also be caused by chronic infections, bleeding such as heavy menstruation in adolescent girls. Therefore, nutritional status is not always related to anemia (Contesa et al., 2022).

Good nutritional status will support optimal growth and development, especially in adolescents who are experiencing a period of rapid growth. With adequate and balanced nutritional intake, the body can obtain the energy needed to carry out daily activities and improve concentration. In addition, good nutritional status also plays a role in maintaining healthy bones, muscles and other organs, reducing the risk of health problems such as anaemia, obesity or metabolic disorders. A diet rich in carbohydrates, proteins and

healthy fats, vitamins and minerals, ensures that all body functions can run optimally. Thus, adolescents with good nutritional status tend to have better academic performance, high stamina, and maximised physical growth (Kim et al., 2014).

Nutritional status is not necessarily directly related to anaemia because anemia is not only influenced by nutritional status. A person with a good nutritional status can still experience anemia if the intake of nutrients needed for the formation of hemoglobin (Hb) is not sufficient. Even if a person has an overall good nutritional status, anemia can still occur if the intake of certain nutrients needed in the formation of aemoglobin (Hb) is insufficient (NR, 2023). For example, adolescent girls with good nutritional status may still develop iron deficiency anaemia if their intake of iron, which is essential in the formation of haemoglobin, is insufficient (Habtegiorgis et al., 2022). In addition, anaemia can also result from chronic infections, bleeding such as heavy menstruation in adolescent girls, hence nutritional

status is not always related to Hb formation (Putra, 2019).

The findings indicate no correlation between the length of menstruation ($p = 0.223$) and the menstrual cycle ($p = 0.618$) and the occurrence of anemia in teenage females at MAN 1 Ogan Ilir. This aligns with a research conducted at SMK Islam Jepara, which revealed a p-value of 0.749, indicating no correlation between anemia and the menstrual cycle (Himawan et al., 2020). Similarly, a study conducted in North West Ethiopia stated that 44% of adolescents who experienced a normal menstrual cycle (Mengistu et al., 2019).

The duration and cycle of menstruation are not related to anemia incidence in adolescent girls. This may be because 56% of the respondents have the habit of taking blood addition tablets. With adequate nutritional intake, the body is able to maintain normal hemoglobin levels, thus preventing anemia and boosting the immune system. Additionally, 89% of the adolescent girls at MAN 1 Ogan Ilir had normal hemoglobin levels due to their consumption of iron supplements, which helped

replace lost blood during menstruation, form hemoglobin, and produce red blood cells. If iron supplements are consumed regularly, the body can counter the effects of blood loss during menstruation, especially if the menstrual cycle lasts longer. This highlights the importance of iron consumption for adolescent girls (Jalambo et al., 2018). Other factors such as the intake of a balanced diet and nutrients, such as iron, vitamin B12, folic acid, and vitamin C, can help the body produce healthy red blood cells and cope with the blood loss that occurs during menstruation. Maintaining an iron-rich diet can help with blood loss and prevent anaemia (Anggreiniboti, 2022).

CONCLUSION

The research findings concerning teenage females at MAN 1 Ogan Ilir indicate a correlation between dietary practices and the prevalence of anemia. An imbalanced diet, characterized by insufficient iron and critical nutrients, may increase the risk of anemia. This underscores the need of enhancing good and nutritious dietary practices for

teenage females to avert anemia, since iron is vital for hemoglobin and red blood cell synthesis. The limitations of this research include its reliance on a cross-sectional design, inadequate anemia diagnosis, and the exclusive focus on hemoglobin levels without considering other factors such as iron status, infections, and others. Future research can add other influential factors such as iron status, infection and chronic diseases, these factors in order to get a more accurate understanding, and can analyse the effect of diet in depth in addition to observing the relationship between diet and the incidence of anaemia, further researchers can examine the type of food consumed, the frequency of eating, and the intake of iron and vitamin C which can help iron absorption.

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TREND AND SPATIAL ANALYSIS OF DIABETES MELLITUS DISEASE 2019-2023 IN YOGYAKARTA CITY

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ABSTRACT

Diabetes is a non-communicable disease that can cause complications. It is characterized by elevated blood sugar levels. This study aimed to map out the trends and characteristics of diabetes mellitus (DM), especially type 2 DM, in Yogyakarta City in 2019-2023. This study employed a quantitative descriptive methodology, utilizing a cross-sectional approach. Data on patients with diabetes mellitus were obtained from the Yogyakarta City Health Office. The population of this study was all data of patients with type 2 DM who visited the health center in Yogyakarta City. Total sampling was used to select research participants. The study was conducted in May-June 2024. Descriptive analysis was processed using SPSS 26, while area mapping used the QGIS application version 3.36.1. The spatial analysis used in this research is spatial descriptive analysis. Based on gender, people with type 2 diabetes mellitus in the city of Yogyakarta in 2019-2023 were female. Type 2 diabetes occurred in people over 45 years of age. Between 2019 and 2023, there was a rise in type 2 diabetes cases. Geographically, Danurejan District had the highest prevalence of type 2 diabetes in 2019 and 2023, whereas Gedong Tengen District had the highest prevalence in 2020–2022. Promotion of a healthy diet, regular exercise, early screening, and diabetes education in Indonesia is necessary.

Keywords: Trends, Spatial Analysis, Diabetes Mellitus

INTRODUCTION

Diabetes is a condition where blood sugar levels exceed normal limits. It is a non-communicable disease that can cause complications (Antar *et al.*, 2023). Diabetes is usually divided into type 1 diabetes, type 2 diabetes, diabetes caused by other factors, and gestational diabetes (American Diabetes Association, 2021).

In 2021, there were 537 million diabetics worldwide. In the event that this illness is poorly treated, the number of individuals with diabetes is predicted to climb to 643 million by 2030 and, if current trends continue, to 783 million by 2045 (IDF Diabetes Atlas, 2021). High blood glucose levels caused by abnormalities in insulin secretion or action, or both, are known as type 2 diabetes. Organs involved in type 2 DM are muscle, brain, and liver (insulin resistance), pancreas (beta cell failure), fat tissue (increased lipolysis), pancreatic alpha cells (hyperglucagonemia), gastrointestinal (incretin definition), and kidney (increased glucose absorption) (Tim Penyusun Buku Pedoman Pengelolaan dan

Pencegahan Diabetes Melitus Tipe 2 di Indonesia 2019, 2019). In Indonesia, the prevalence of DM is 2%, DIY is 3.11%, and Yogyakarta City is 4.79%. Yogyakarta City has a higher prevalence of DM than DIY and even Indonesia (Dinas Kesehatan Kota Yogyakarta, 2023).

Geographic analyses by linking health, population and environmental data can be used by researchers to evaluate and quantify relationships between health-related variables and environmental risk factors at different geographic scales (Fletcher-Lartey and Caprarelli, 2016). Geographic analyses can use Geographic Information Systems (GIS), which is a technology that combines geographic aspects with data analysis techniques (Erkamim, Mukhlis and Adiwarmam, 2023). There are several reasons why GIS is needed, including: to measure the mapping of access to services for patients and their potential density, to see the mapping interaction between facilities and patients, to help determine the most suitable environment and reduce the impact on the environment, to see the level of disease in an area, to define the

geographical unit of health services, for planning the location and allocation of health service resources to provide maximum health services (Wang, 2020).

Previous research on the mapping of patients with DM disease has been conducted in Yogyakarta City, but the study was only conducted in one village and focused on DM cases with TB complications (Rohman and Catharina, 2019). Therefore, our study aimed to analyze the demographics of people with type 2 diabetes mellitus in Yogyakarta City based on age and gender over the past 5 years and shows a spatial analysis of areas based on prevalence with mapping using Geographic Information Systems. In order to serve as a resource for preventing the incidence of diabetes and its complications in the area, the study's results are anticipated to give an overview of the population with diabetes in the Yogyakarta City area as well as a map of the areas with the highest concentration of cases.

METHOD

This is a descriptive quantitative study, and the research

sample was drawn using the total sampling technique. The total sample was 50176 who were diabetics since 2019-2023. The study was carried out in Yogyakarta City, which covers 32.82 square kilometers, or 1.03% of the total area of Yogyakarta Special Region Province. Yogyakarta City's Badan Pusat Statistik (BPS) provided population data by village to assess the prevalence of type 2 diabetes cases (BPS, 2024).

The number of type 2 diabetes mellitus cases is secondary data obtained from the Yogyakarta City Health Office. The data set is in electronic form, namely all types of diabetes that were examined at the health centers in the Yogyakarta City area in 2019-2023. The code used for diabetes uses ICD-10 (International Statistical Classification of Diseases and Related) where the coding is carried out by the World Health Organization and the code for type 2 DM is E11 (WHO, 2019).

Prevalence classification was measured using the equal count (quantile) mode in QGIS which was used to classify the data into 3 groups: low, medium, and high with almost the same number of features in each

group.

Descriptive data processing was performed using SPSS 26.0 for univariate analysis, while mapping of type 2 diabetes mellitus cases based on prevalence per village used the QGIS application version 3.36.1. The Ahmad Dahlan University Research Ethics Committee has given ethical approval with the number 012404086 for this research.

Table 1 shows the frequency distribution of people with type 2 diabetes based on age and gender. Women suffer from type 2 diabetes more than men. Based on age, most people with DM are aged >45 years.

RESULTS AND DISCUSSION

Table 1. Characteristics of People with Type 2 Diabetes Mellitus in Yogyakarta City 2019-2023.

Year	Sex		Age	
	Male	Female	≤ 45	> 45
	N (%)	N (%)	N (%)	N (%)
2019	3,591 (37.90)	5,883 (62.10)	817 (8.62)	8,657 (91.38)
2020	3,522 (38.75)	5,567 (61.25)	764 (8.40)	8,328 (91.60)
2021	3,942 (39.37)	6,070 (60.63)	911 (9.09)	9,101 (90.91)
2022	3,929 (38.31)	6,326 (61.69)	875 (8.53)	9,380 (91.47)
2023	4,388 (38.67)	6,958 (61.33)	980 (8.64)	10,366 (91.36)

Source: Secondary Data of Yogyakarta City Health Office, 2024

The number of type 2 DM cases tends to increase since 2019-2023 as shown in Figure 1.

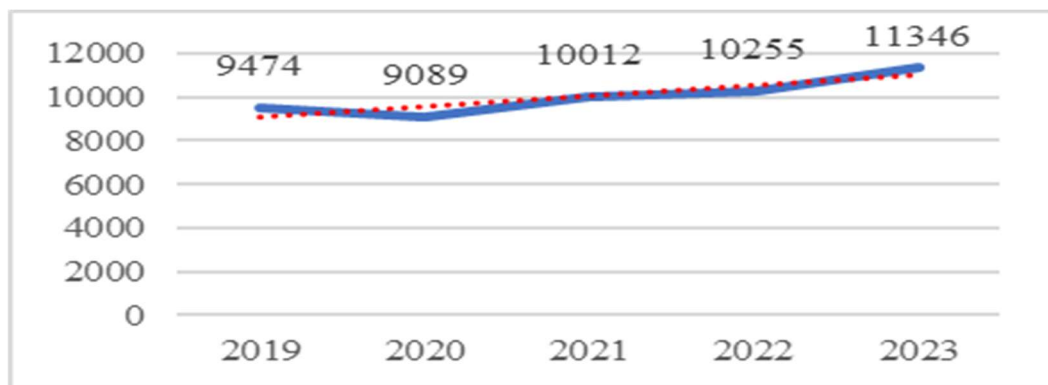


Figure 1. Trend of Type 2 DM Disease in Yogyakarta City 2019-2023

The distribution based on the prevalence of type 2 DM in each sub-district in Yogyakarta City is shown in Table 2. In 2019-2023, Sub-district

Danurejan and Gedong Tengen were the sub-district with the highest prevalence of type 2 DM.

Table 2. Prevalence Rate of People with Type 2 DM in 2019 -2023 in Yogyakarta City Based on Sub District

NO	SUB-DISTRICT	2019	2020	2021	2022	2023
1.	Danurejan	3.21	3.43	3.48	3.75	4.19
2.	Gedongtengen	3.17	3.49	3.99	3.81	3.82
3.	Gondokusuman	1.90	2.02	2.30	2.37	2.60
4.	Gondomanan	2.28	2.71	3.08	3.38	3.72
5.	Jetis	2.54	2.61	2.99	3.38	3.83
6.	Kotagede	2.98	2.73	2.80	2.90	3.30
7.	Kraton	2.00	1.97	2.50	2.62	3.07
8.	Mantriaron	2.42	2.51	2.44	2.47	2.78
9.	Mergangsan	2.37	2.63	3.00	2.86	3.19
10.	Ngampilan	1.96	2.27	2.66	2.60	3.30
11.	Pakualaman	2.84	3.01	3.09	3.35	3.38
12.	Tegalrejo	2.64	2.59	2.79	2.76	2.97
13.	Umbulharjo	1.37	1.77	1.99	1.95	2.22
14.	Wirobrajan	2.28	2.38	2.51	2.47	2.76

SPATIAL ANALYSIS

Five subdistricts—Danurejan, Gedong Tengen, Kotagede, Pakualaman, and Tegalrejo—have a high prevalence of Type 2 diabetes in 2019 (Figure 2).

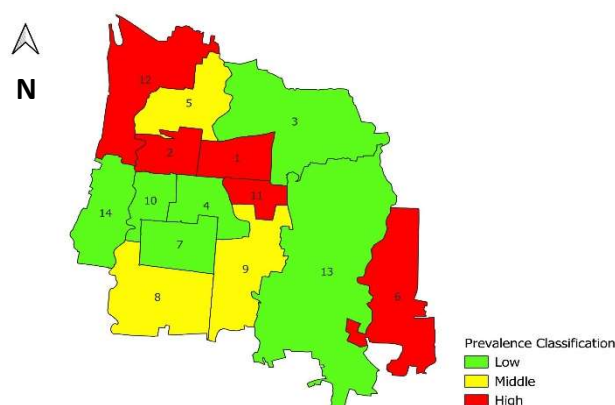


Figure 2. Mapping Based on DM Disease Prevalence in 2019 in Yogyakarta City

Gedong Tengen, Danurejan, Pakualaman, Kotagede, and Gondomanan are

the five districts with the highest rates of Type 2 DM in 2020 (Figure 3).

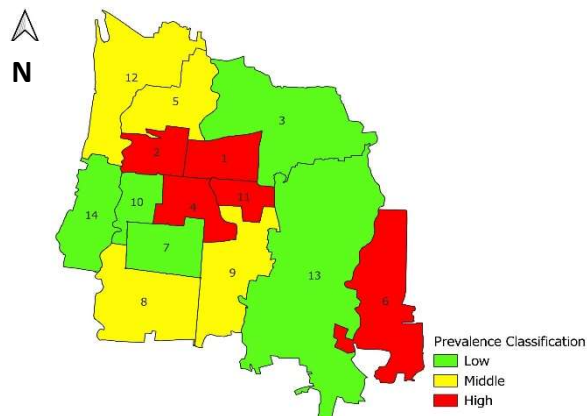


Figure 3. Mapping Based on DM Disease Prevalence in 2020 in Yogyakarta City

Gedong Tengen, Danurejan, Pakualaman, Gondomanan, and Mergangsan are the five sub-districts where Type 2 DM is most prevalent in 2021 (Figure 4).

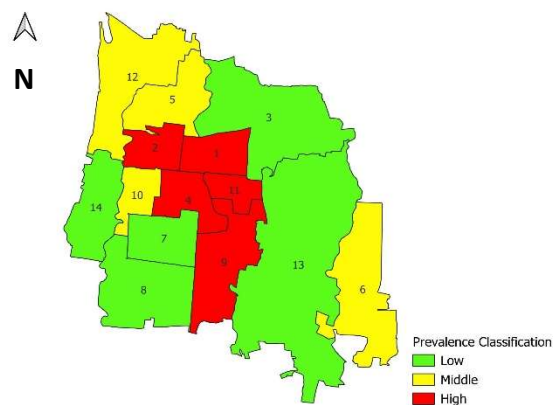


Figure 4. Mapping Based on DM Disease Prevalence in 2021 in Yogyakarta City

Gedong Tengen, Danurejan, Jetis, Gondomanan, and Pakualaman are the five districts with the highest frequency of Type 2 DM in 2022 (Figure 5).

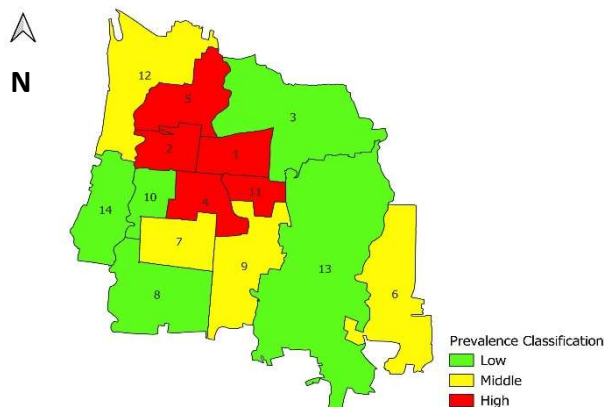


Figure 5. Mapping Based on DM Disease Prevalence in 2022 in Yogyakarta City

Danurejan, Jetis, Gedong Tengen, Gondomanan, and Pakualaman are the five sub-districts where Type 2 DM is most prevalent in 2023 (Figure 6).

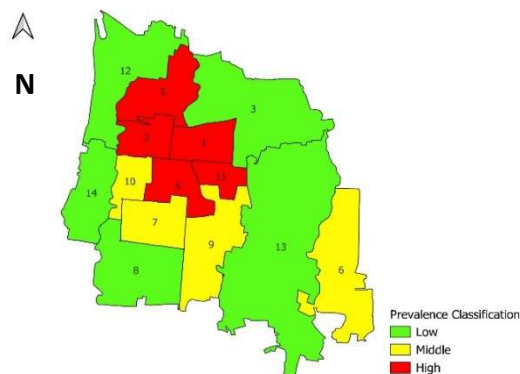


Figure 6. Mapping Based on DM Disease Prevalence in 2023 in Yogyakarta City

DISCUSSION

The majority of Yogyakarta City's type 2 diabetes patients in 2019–2023 were female, according to the data in Table 1. After adjusting for age, ethnicity, occupation, household income, and obesity, women have a five times higher risk of acquiring type 2 diabetes than males (2023), according to study results by Barcia et al (García, Montañó and Figueroa, 2023). Women made up 56% of the population overall, according to Ghassab et al. (2023). A basic logistic regression model's results indicate that the incidence of type 2 diabetes is significantly correlated with age, high blood pressure, abdominal obesity, cholesterol, high blood pressure, and triglycerides in both men and women

(Ghassab-Abdollahi *et al.*, 2023). The prevalence is higher in women (15.5%) than in men (11.8%).

Due to the enormous hormonal changes that women undergo during their life, they are more likely to develop type 2 diabetes. Insulin resistance may rise as a result of these hormonal shifts. Insulin resistance during pregnancy is influenced by a wide range of factors, including obesity, placental hormones, bad food, inactivity, and genetic and epigenetic contributions (Kampmann *et al.*, 2019). The most frequent pregnancy complication, gestational diabetes mellitus, is linked to type 2 diabetes risk as well as ethnic characteristics. Type 2 diabetes is twice as likely to strike pregnant

women who develop the disease 24.4% of 765 women with a history of gestational diabetes went on to develop type 2 diabetes as a result of their gestational diabetes (Bower *et al.*, 2019). In young women, the rate of type 2 diabetes is higher, while men have a higher prevalence in middle age (Huebschmann *et al.*, 2019). Hormonal changes in women at menopause are also followed by the risk of diabetes mellitus (Cappola *et al.*, 2023; Karvonen-Gutierrez, Park and Kim, 2016).

The incidence of diabetes is influenced by unchangeable characteristics such as age, gender, and length of type 2 diabetes mellitus (Zahrotunnisa Arizky and Kurniasari, 2023). The results of the study in Table 1 consistently from 2019 to 2023 show that the most common people with type 2 diabetes are those aged more than 45 years. Numerous physiological and pathological mechanisms cause the body's tissues and organs to deteriorate with age.

One of the main causes of resistance to insulin is these age-related alterations in adipose tissue (Zhao and Yue, 2024). In Australia, almost 1 in 5 Australians (19%) aged 80-84

years live with diabetes and is almost 30 times higher than those aged under 40 years (0.7%) (Australian Institute of Health and Welfare, 2024). In line with the research of (Yan *et al.*, 2023) that the prevalence of diabetes and prediabetes is higher in the elderly compared to the middle-aged group.

Based on Figure 1, the number of type 2 DM cases in 2020 had decreased by 4.24% from 2019 as a result of the COVID-19 pandemic that first appeared in Indonesia in 2020. The COVID-19 pandemic disrupted clinical care for type 2 diabetes which led to a decrease in primary healthcare visits (Hooker *et al.*, 2022). During the COVID-19 pandemic there are restrictions on community activities (lockdown), which increases stress and results in weight gain (Ruissen *et al.*, 2021). Physical activity and exercise are beneficial, safe and effective activities for diabetes management, and can be widely used during the COVID-19 outbreak. Physical activity/exercise is recommended during and after the COVID-19 outbreak, to improve diabetes management, as well as to prevent an increase in the global burden of

COVID-19, diabetes and other non-communicable diseases. (Marçal *et al.*, 2020).

In mapping areas based on sub-district (Figure 1-5), from 2019-2023 there were 2 sub-districts with the highest prevalence. Danurejan sub-district has a prevalence of type 2 DM cases of 3.21 per 100 population in 2019 and 4.19 per 100 population in 2023. The highest prevalence of type 2 DM in 2020-2022 was in Kemantren Gedong Tengen. The Danurejan and Gedong Tengen areas are located in the middle of the city center which allows residents to access a variety of ready-to-eat foods that contain high levels of sugar, foods with refined carbohydrates, fast food, and sugary drinks at affordable prices. This can cause people to have less access to healthy food, which can affect the occurrence of DM. The Danurejan area is located in the center of the city which has more access to health facilities, so more cases of diabetes are detected.

The neighborhood environment significantly influences the development of diabetes risk factors, morbidity and mortality throughout a person's life. The social,

economic and physical environment of a neighborhood influences individual and community health risks (Mujahid *et al.*, 2023). Diabetes is an increasing health problem in low- and middle-income countries (Zhou *et al.*, 2016). Environmental conditions also affect the incidence of type 2 DM. People who live in a green environment have a lower risk of type 2 diabetes (Astell-Burt, Feng and Kolt, 2014). The prevalence of diabetes mellitus cases in urban communities is higher than rural communities due to lifestyle factors (Zhao *et al.*, 2023).

Yogyakarta City is an area that has many open spaces and sports facilities that allow its citizens to do physical activity as an effort to prevent type 2 DM. Modernization and the development of technology make the residents of Yogyakarta City do not do much physical activity or better known as sedentary lifestyle, namely non-active physical activities such as playing mobile phones, lying down, surfing social media, watching television, and playing video games (on behalf of SBRN Terminology Consensus Project Participants *et al.*,

2017). All sub-districts in the city of Yogyakarta have health facilities that are evenly distributed. However, some residents lack access to health care facilities due to economic problems. In general, in the period 2017-2021 the poverty line in Yogyakarta City has increased (BPS Kota Yogyakarta, 2022). On average, the cost of health care for people with diabetes is 2.3 times more expensive than people without diabetes (American Diabetes Association, 2018).

CONCLUSION

The results above show that women are the most people with type 2 diabetes mellitus in the Yogyakarta City area in 2019-2023. Based on age, most are over 45 years old. The disease trend of type 2 DM cases has increased from 2019-2023. Based on region, the highest prevalence of type 2 DM in 2019 and 2023 was in Danurejan sub-district and in 2020-2022 was in Gedong Tengen sub-district.

The shortcomings of this study are the limitations of the variables studied because it uses secondary data. There is a lack of data

on factors that influence the incidence of diabetes mellitus such as smoking habits, lifestyle, comorbidities, health-seeking behavior, and physical activity. Future research is expected to integrate primary data collection, examine rural-urban disparities, or conduct longitudinal studies to track individual cases over time.

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