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FACTORS INFLUENCING THE INCIDENCE OF ANEMIA IN THIRD TRIMESTER PREGNANT WOMEN

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Abstract

Background: Anemia during pregnancy remains a critical contributor to maternal and neonatal morbidity and mortality. Pregnant women affected by anemia are at an elevated risk of experiencing postpartum hemorrhage, a condition that can be life-threatening. The primary cause of anemia in pregnancy is iron deficiency. Preventive strategies can be significantly improved through educational interventions that enhance maternal knowledge and promote positive attitudes toward the importance of adequate nutritional intake during pregnancy. **Method**: This research utilized a quantitative analytic design with a cross-sectional approach. The study examined age**,** parity**,** and adherence to iron supplement consumption as independent variables, while the dependent variable was the occurrence of anemia in the third trimester of pregnancy. A total sampling technique was employed, Primary data were collected through questionnaires, maternal and child health (KIA) records, and laboratory test results. The data collected were analyzed using the Chi-square statistical test. **Result**: Among the participants, 53.3% of pregnant women aged 20–35 years were found to be anemic (n = 16). However, Chi-square analysis indicated no statistically significant association between age and anemia status (p = 0.645). Similarly, analysis of parity revealed a p-value of 0.214, suggesting no significant correlation. In contrast, compliance with iron tablet intake showed a statistically significant relationship with anemia incidence; 60% of non-compliant women (n = 18) were anemic, and the Chi-square test produced a p-value of 0.001, indicating a significant association (p < 0.05). **Conclusion**: The findings suggest that there is no significant relationship between age or parity and the incidence of anemia in third-trimester pregnant women. However, adherence to iron supplementation is significantly associated with anemia status, highlighting the importance of compliance in preventing anemia during pregnancy.

keyword : anemia, age, parity, adherence, Pregnant

INTRODUCTION

Pregnancy anemia is a significant global public health issue, as it can increase the risks of Anemia during pregnancy contributes significantly to adverse health outcomes for both mothers and infants. Expectant mothers with anemia are at increased risk of serious complications, including potentially fatal outcomes experiencing hemorrhage during childbirth, which can result in death. Anemia during pregnancy is widely recognized as a significant risk factor affecting both

maternal and fetal health. Consequently, it demands careful management and attention from all healthcare providers (Nurhaidah & Rostinah, 2021). Anemia during pregnancy is generally caused by iron deficiency, which may occur due to inadequate dietary iron intake, impaired absorption of iron in the gastrointestinal tract, disorders of iron metabolism, or excessive iron loss, such as in cases of bleeding. In addition, anemia may also be caused by chronic blood loss, malnutrition leading to impaired absorption of iron and protein, as well as disorders in the formation of red blood cells by the bone marrow (Astutik & Ertiana, 2018).

The global prevalence of anemia among pregnant women stands at 43.9%. In developing nations, anemia during pregnancy accounts for approximately 40% of maternal mortality (WHO, 2017). In Indonesia, the rate of anemia among expectant mothers is reported at 37.1% (Ministry of Health of the Republic of Indonesia, 2019). Specifically, in East Java in 2020, the incidence of anemia was 19.6% (East Java Health Department, 2020). In Kediri Regency in 2023, there were 2,490 pregnant women suffering from anemia (Kediri District Health Department, 2024). At the Mojo Community Health Center in July 2024, ANC visit data showed 93 pregnant women with anemia, of whom 13 were in the first trimester, 26 in the second trimester, and 54 in the third trimester; many still fell into the category of hemoglobin deficiency, meaning that these pregnant women could range from mild to severe anemia.

Iron deficiency generally arises from multiple causes, such as inadequate dietary intake, blood loss, and impaired absorption of iron. A diet low in iron or with nutritional imbalance may lead to a deficiency of the iron needed during pregnancy. (Darmawati et al., 2018; Kurniati, 2020a). Other factors influencing the occurrence of anemia include previous number of pregnancies (parity), maternal age, education level, and adherence to taking iron supplements. A too-short interval between pregnancies may prevent the body from fully restoring iron reserves before the next pregnancy. High parity is also correlated with increased anemia risk because repeated pregnancies deplete the mother's iron stores. In addition, maternal age and education play key roles in nutritional understanding and the application of supportive dietary patterns during pregnancy (Darmawati, Wardani, et al., 2020).

Prevention of anemia during pregnancy can be improved through educational interventions that increase awareness and promote positive attitudes about the significance of proper nutrition throughout pregnancy. This education is ideally delivered during antenatal care (ANC) visits, which are recommended to occur at least six times during pregnancy (Solehati et al., 2018). Gaining a comprehensive understanding of the factors contributing to anemia in pregnant women is crucial for developing more effective prevention and management approaches. (Ika, Melani & Grisela, 2024). The objective of this research is identify factors that influence the occurrence of anemia in pregnant women during the third trimester, such as compliance with iron supplement intake, age, and parity.

METHOD

This research employed a quantitative analytical design with a cross-sectional approach to examine factors associated with anemia in pregnant women during their third trimester within the service area of Mojo Community Health Center. The study investigates age, parity, and compliance with iron supplementation as independent variables, with anemia status in the third trimester serving as the dependent variable. Conducted in March 2025 in the Mojo Health Center's catchment area in Kediri Regency, the study population included all third-trimester pregnant women in the region, totaling 30 individuals. A total sampling method was applied with, inclusion criteria were third-trimester pregnant women who were willing to be respondents and third-trimester pregnant women who could read and write, Whereas the exclusion criteria are Pregnant women in the third trimester who are unwilling to be respondents. Pregnant women in the third trimester who cannot read and write, encompassing all 30 eligible participants. Primary data were collected through questionnaires, maternal and child health (KIA) records, and laboratory test results. Data analysis was performed using the Chi-square statistical test.

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RESULT AND DISCUSSION

A. RESULT

1. Age, Parity, Compliance of Iron Tablet Consumption and Incidence of Anemia

Variable	Frequency	Percentage (%)
Age :		
<20 and > 35 Years	8	26,7
20 – 35 Years	22	23,3
Total	30	100
Parity :		
Primigravida	9	30
Multigravida	21	70
Total	30	100
Compliance Level of Iron Tablet Consumption:		
Non-adherent	18	60
Adherent	12	40
Total	30	100
Anemia Incidence:		
Non Anemia	8	26,7
Anemia	22	73,3
Total	30	100

Based on Table 1, out of 30 respondents, the majority were aged 20–35 years (73.3%), the majority of the 30 respondents were multigravida (70%). The frequency distribution of the variable 'compliance with iron tablet consumption' shows that out of 30 third-trimester pregnant women, the majority (60%) were non-compliant in consuming iron tablets. the frequency distribution of anemia incidence among third-trimester pregnant women at UPTD Public Health Services Mojo shows that the majority (73.3%) experienced anemia

2. Correlation Between Age, Parity, Compliance with Iron Tablet Consumption and Incidence of Anemia

Variable	Incidence of Anemia		Total	P Value
	Non Anemia	Anemia		
Age:				
<20 dan >35 Years	2	6	8	0,645
20 – 35 Years	6	16	22	
Total	8	22	30	
Parity:				
Primigravida	1	8	9	0,214
Multigravida	7	14	21	
Total	8	22	30	
Compliance with Iron Tablet Consumption:				
Non-adherent				0,001
Adherent	0	18	18	
	8	4	12	

Total	8	22	30

Based on the analysis of Table 2 above, the majority (53.3%) of pregnant women aged 20–35 years who experienced anemia numbered 16. The chi-square test analysis yielded a p-value of 0.645 (> 0.05), indicating that there is no significant relationship between age and the incidence of anemia among third-trimester pregnant women. nearly half (46.7%) of the pregnant women were multigravida and experienced anemia, totaling 14 individuals. The chi-square test analysis yielded a p-value of 0.214 (> 0.05), indicating that there is no significant relationship between parity and the incidence of anemia among third-trimester pregnant women

The Relationship Between Parity and Incidence of Anemia. most of the pregnant women (60%) were non-compliant with iron supplementation and developed anemia, amounting to 18 individuals. The Chi-square test results showed a p-value of 0.001 (< 0.05), demonstrating a statistically significant association between adherence to iron tablet intake and the occurrence of anemia among third-trimester pregnant women.

3. DISCUSSION

The Relationship Between Age and Incidence of Anemia

The study's statistical analysis of the relationship between age and anemia incidence revealed that 53.3% of pregnant women aged 20–35 years (16 individuals) experienced anemia. The Chi-square test produced a p-value of 0.645 (> 0.05), indicating no statistically significant association between age and the occurrence of anemia among third-trimester pregnant women at UPTD Puskesmas Mojo.

The findings of this study align with those of Assegaf et al. (2023), who investigated factors affecting anemia incidence in pregnant women at Kampung Dalem Health Center and found no statistically significant association between age and anemia. Conversely, the results concerning the relationship between parity and anemia differ from other studies that have reported a significant correlation between maternal age and anemia during pregnancy (Amini et al., 2018; Astriana, 2017; S. A. Sari et al., 2021).

Pregnancy in women aged over 35 is generally associated with an increased risk of anemia. This heightened risk is attributed to the decline in reproductive system function and the presence of various age-related conditions, such as bone marrow failure syndrome, chronic kidney disease, nutritional deficiencies, and inflammatory disorders, including those linked to immune system aging (immunosenescence) (Amini et al., 2018; Wu et al., 2020). Consequently, the age range of 20 to 35 years is considered the optimal period for pregnancy. However, anemia can still manifest within this age group due to other contributing factors, as demonstrated in the present study.

The Relationship Between Parity and Incidence of Anemia

According to the analysis shown in Table 6, approximately 46.7% of multigravida pregnant women, totaling 14 individuals, were found to have anemia. The chi-square test yielded a p-value of 0.214, which exceeds the 0.05 threshold, indicating that there is no statistically significant association between parity and anemia incidence among third-trimester pregnant women at UPTD Public Health Sercive

This result aligns with the findings of Assegaf et al. (2023), who investigated factors affecting anemia in pregnant women at Kampung Dalem Health Center and found no significant correlation between gravida status and anemia among pregnant women at Puskesmas Kampung Dalem. However, this result contradicts the research by Romewahni et al. (2024) on the relationship between parity and anemia incidence in third-trimester pregnant women at a health center, which found a significant relationship between parity and anemia incidence in third-trimester pregnant women at Puskesmas Lontar, Kotabaru Regency, in 2024.

According to Wahyuni et al. (2023) as cited in Romewahni et al. (2025), parity is one of the factors influencing anemia incidence. Parity between one and three is considered the safest in terms of maternal and infant health, as well as maternal mortality risk. Conversely, parity of four or more carries a higher risk of anemia. This is due to the increased number of deliveries impacting the mother's health condition, making her more vulnerable to anemia. The risk of anemia in the

first pregnancy can still be minimized with proper obstetric care, while the risk associated with high parity can be prevented through family planning programs.

Mothers with low parity, including primigravida, remain vulnerable to anemia, often due to limited experience and insufficient knowledge about pregnancy, causing the mother to focus more on physical complaints and less on adequately fulfilling iron intake during pregnancy. Meanwhile, mothers with parity greater than three have a higher risk of anemia. This condition can occur because frequent pregnancies with short intervals can deplete the body's iron stores. Additionally, mothers with high parity are also more prone to pregnancy complications.

The Relationship Between Compliance with Iron Tablet Consumption and Incidence of Anemia

The study's statistical analysis examining the association between adherence to iron tablet supplementation and anemia incidence among third-trimester pregnant women at UPTD Puskesmas Mojo revealed that, out of 30 participants, the majority (60%) who were non-compliant developed anemia, totaling 18 individuals. Adherence to iron supplementation significantly influences the occurrence of anemia in pregnant women. The Chi-square test produced a p-value of 0.001 (< 0.05), indicating a statistically significant relationship between compliance with iron tablet intake and anemia incidence in this population.

These findings are in agreement with the study conducted by Rahayu (2022), which identified a significant association between pregnant women's adherence to iron tablet intake and the occurrence of anemia in the third trimester, reporting a p-value of less than 0.001. The results suggest that increased compliance with iron supplementation reduces the risk of anemia among pregnant women.

Additionally, the results of this study align with the research by Nasution (2020), which investigated the relationship between iron tablet (Fe) consumption and anemia incidence among pregnant women in Pagarantonga. That study reported similar findings, with a statistical test yielding a p-value of 0.00. These findings further reinforce the evidence that non-compliance with iron supplementation increases the risk of anemia in pregnant women.

The researcher assumes that the results indicate that compliance with iron tablet consumption plays a crucial role in preventing anemia in pregnant women. Mothers who adhere to the recommended iron tablet intake tend to have better hemoglobin levels because their iron needs during pregnancy are adequately met. In contrast, non-compliant mothers are at greater risk of developing anemia due to insufficient iron supply to meet the increased blood volume and fetal requirements. Thus, poor adherence to iron tablet consumption is regarded as one of the key factors contributing to the occurrence of anemia in pregnant women. Future researchers are expected to be able to conduct more in-depth research to identify other factors that influence the incidence of anemia and can use broader and more in-depth research methods

CONCLUSION AND SUGGESTION

CONCLUSION

Based on the results and discussion, the following conclusions are drawn, the results of the univariate analysis are The majority of respondents fall within the 20–35 years age group. Most respondents are multiparous according to parity distribution. A large portion of respondents demonstrate non-compliance with iron tablet consumption. The incidence of anemia is prevalent among most respondents. The results of the univariate Bivariate are No significant association was found between age and anemia occurrence in pregnant women during the third trimester. Parity showed no significant relationship with anemia incidence in third-trimester pregnant women. There is a significant correlation between adherence to iron tablet intake and the incidence of anemia in pregnant women during the third trimester

SUGGESTION

Healthcare workers are expected to continually enhance education for pregnant women on the importance of nutrition and iron tablet consumption, for pregnant women about the importance of nutrition, iron tablet consumption, and routine monitoring of hemoglobin levels, especially for mothers over 35 years old or with high parity. For future researchers, it is recommended to investigate other

variables that have not been addressed, such as socioeconomic status, history of chronic diseases, or dietary patterns.

DECLARATION:

Conflict of Interest

Authors declare that there is no conflict of interest in this research.

Authors' Contribution

ESN conceptualized the study, developed the methodology, conducted data collection, and was responsible for drafting and revising the manuscript. CD contributed to data collection and participated in the manuscript writing Ethical

Approval

Research Ethics Committee of Bhakti Wiyata Kediri Institute of Health Science no. 54/FKes/EP/2025

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Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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RELATIONSHIP OF FAMILY SUPPORT AND MENSTRUAL KNOWLEDGE TOWARD MENARCHE READINESS

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ABSTRACT

Background: Menarche is the first sign of maturity of the female reproductive organs that requires both physical and psychological readiness. However, in reality, many adolescent girls are not yet physically and mentally prepared when experiencing their first menarche. This lack of readiness often causes problems such as fear, embarrassment, anxiety, and inappropriate behavior in maintaining personal hygiene. It occurs due to limited knowledge about menstruation and the lack of support and open communication from the family, especially the mother. This study aims to analyze the relationship between family support and menstrual knowledge with menarche readiness among elementary school students. **Methods:** This quantitative study employed a cross-sectional design involving 40 female students selected through purposive sampling. Data were collected using a structured questionnaire and analyzed using Fisher's Exact Test ($p < 0.05$). **Results**: The results showed that most female students had suboptimal family support (60%), low knowledge of menstruation (52.5%), and were not ready to face menarche (75%). There was a significant relationship between family support (p-value= 0.001) and knowledge of menstruation (p-value = 0.001) and readiness to face menarche. **Conclusion:** Family support and good knowledge can improve adolescents' physical and mental readiness for menarche. Collaboration between families, schools, and health workers is needed to provide reproductive health education from pre-puberty age.

keywords: Adolescents, Family Support, Menarche Readiness, Menstrual Knowledge

INTRODUCTION

Adolescent reproductive health is a physical, mental, and social condition related to the reproductive system, functions, and processes in adolescents. Adolescence, as a transitional period from childhood to adulthood, is marked by various physical, psychological, and social changes. One of the important stages in puberty is menarche *(Kholifah et al, 2024).* According to the World Health Organization adolescents aged 10-18 years old comprise about one-fifth of the world's population, and the majority of them live in developing countries *(Pomalinggo et al, 2025)*. The incidence of early menarche in this group reaches 14.6%.

Indonesia ranks 15th out of 67 countries in terms of the acceleration of menarche age, which increases by approximately 0.145 years every decade.

Menarche marks the beginning of female reproductive maturity and brings significant changes in the lives of adolescents, both physically and emotionally. However, unpreparedness for menarche can have an impact on reproductive health, such as the risk of urinary tract infections due to poor personal hygiene and psychological disorders in the form of anxiety and fear *(Kusumawaty et al, 2021)*.

Menarche, or the first menstruation, is an important stage in adolescent girls' puberty and marks the maturity of the reproductive organs. However, many adolescents are not ready to face it. Data shows that around 75% of adolescent girls in Indonesia feel afraid when they experience menarche because it is their first experience, and only 45% say they are ready to go through puberty. In addition, 70% of adolescents do not have an adequate understanding of pre-puberty and menarche health education *(Deade et al, 2022)*.

Knowledge about menstruation plays an important role in preparing adolescents to face menarche physically and psychologically. Family support also greatly influences adolescents' perceptions and readiness, as the family is the main source of information and emotional support *(Setyowati et al, 2018)*. Previous studies have shown a significant relationship between family support and menstrual knowledge with readiness to face menarche *(Nurmawati et al, 2019)*, while cultural factors, family openness, and access to information also influence the results *(Qomari et al, 2024)*.

The preliminary study results also indicated that most students did not know the correct steps to take when experiencing menarche and had never received information from their family. Based on this, this study aims to determine the relationship between family support and menstrual knowledge and menarche preparedness in primary school students, which is expected to form the basis for developing strategies for adolescent reproductive health education.

METODS

This study is an observational analytical study with a quantitative approach and cross-sectional design that aims to determine the relationship between family

support and menstrual knowledge on menarche readiness among elementary school students. The theory underlying this study is that readiness for menarche is influenced by internal factors such as menstrual knowledge and external factors such as family support. The study population consisted of 111 female students in grades III-VI, with a sample size of 40 students selected using purposive sampling based on inclusion and exclusion criteria. Data collection was conducted directly using a structured questionnaire that had been tested for validity and reliability. The independent variables in this study were family support and menstrual knowledge, while the dependent variable was readiness for menarche. The data were analyzed univariately to see the frequency distribution and bivariately using Fisher's Exact Test with a significance level of $p < 0.05$. This study has obtained ethical clearance from the Ethics Committee of the Faculty of Medicine, Airlangga University (130/EC/KEPK/FKUA/2025).

RESULT AND DISCUSSION

Table 1: General Data on Demographic Characteristics of Respondents

General Demographic Data	N	%
Class		
III	9	22,5
IV	15	37,5
V	8	20
VI	8	20
Total	**40**	**100**
Age		
9 years	8	20,0
10 years	15	37,5
11 years	11	27,5
12 years	6	15,0
Total	**40**	**100**
Residence Data		
Parents	34	85
Father	1	2,5
Mother	4	10
With Other Guardians	1	2,5
Total	**40**	**100**
Parents Education Level		
Elementary School	4	10
Junior High School	12	30
Senior High School	21	52,5

	n	%
D3/S1/S2/S3	3	7,5
Total	**40**	**100**
Information Source		
Parents	22	34,9
Siblings	12	19
Peers	14	22,2
Teachers	15	23,8
Total	**63**	**100**
Number of Information Sources		
0 Source	10	25
1 Source	4	10
2 Source	15	37,5
3 Source	5	12,5
4 Source	6	15
Total	**40**	**100**

Table 2: Identification of Research Variables

Family Support	**n**	**%**
Optimal	9	22,5
Fairly Optimal	7	17,5
Less Than Optimal	24	60,0
Menstrual Knowledge	**n**	**%**
Good	6	15,0
Fair	13	32,5
Poor	21	52,5
Menarche Readiness	**N**	**%**
Ready	10	25,0
Not Ready	30	75,0
Total	**40**	**100,0**

Based on the results of a study of 40 elementary school girls, it was found that most of the respondents were in fourth grade (37.5%) and most were 10 years old (37.5%). Most of the girls lived with their parents (85%) and had parents with a high school education (52.5%). The main source of information obtained by respondents about menstruation was from their parents (55%), followed by teachers and peers. Overall, the results of the study show that most students have less than optimal family support (60%), low knowledge of menstruation (52.5%), and low

readiness to face menarche (75%). These data reflect that many students are not yet physically and psychologically ready to face menarche due to a lack of support and adequate information from their immediate environment.

Family support is an important factor that influences a child's readiness to face menarche. Families, especially mothers, play a major role in providing emotional support, explanations, and practical guidance about menstruation. However, the results of this study show that informational support from parents is still low, so children do not fully understand the changes in their bodies and how to take care of themselves. This condition can trigger anxiety and fear when facing their first menstruation. These results are in line with the findings of *Arista et al, (2022)* and *Pomalinggo et al, (2025),* which show that good family support plays a role in shaping emotional readiness and positive attitudes towards menarche.

In addition to family support, knowledge about menstruation also has a significant relationship with readiness for menarche. Most female students do not understand the basic concepts of menstruation, the signs of puberty, and the importance of maintaining personal hygiene during menstruation. Low knowledge causes adolescents to have negative perceptions, such as feeling ashamed, afraid, or considering menstruation to be embarrassing. This is in line with research *Qomari et al, (2024)* and *Mahmudah et al, (2021)* which states that lack of knowledge will hinder adolescents' mental readiness and cause anxiety during menarche.

Good knowledge can shape adolescents' cognitive and emotional readiness to accept biological changes positively. Lack of understanding also affects personal hygiene behaviors, such as rarely changing sanitary pads or not maintaining genital hygiene, which can increase the risk of infection *(Nurhayati et al, 2022).* Age and cognitive development also play a role, as most respondents are still in early adolescence and their ability to understand physiological concepts is not yet fully mature.

In addition, schools also play an important role in providing reproductive health education. However, the results of the study show that there are no specific learning programs on menarche in the schools where the study was conducted, so students' knowledge is still limited. This supports the findings *Anwar et al, (2017)* which emphasize the importance of reproductive health education from pre-puberty

age. Families and schools should work together to provide accurate and continuous information so that adolescents are more thoroughly prepared.

Readiness for menarche is not only determined by knowledge, but also by psychological readiness, which is influenced by the social environment. Many female students still feel embarrassed or afraid to talk about menstruation. *Mahmudah et al, (2021)* explains that adolescents who are not psychologically ready tend to experience stress and anxiety during their first menstruation. *Novita et al, (2020)* also mentions that some adolescents show negative attitudes towards menarche due to feelings of disgust or embarrassment. This psychological unpreparedness can affect daily behavior, such as reluctance to talk to parents or not practicing proper self-care during menstruation.

Overall, the results of this study confirm that family support and menstrual knowledge are two major factors that play a role in shaping readiness for menarche. Good family support helps build a sense of security and confidence, while sufficient knowledge enhances physical and mental readiness. Therefore, collaboration between families, schools, and health workers is necessary in providing reproductive health education from an early age. Thus, adolescent girls can face menarche with better understanding, readiness, and a positive attitude.

Table 3: The Relationship of Family Support to Menarche Preparedness

Family Support	Preparedness for Menarche				Total		Value-p	Coefficient Contingency (C)
	Ready		Not Ready					
	n	%	n	%	n	%		
Optimal	9	100	0	0	9	100		
Fairly Optimal	1	14,3	6	85,7	7	100	<0,001	0,685
Less Than Optimal	0	0	24	100	24	100		
Total	**10**	**25**	**30**	**75**	**40**	**100**		

The research results indicate a significant relationship between family support and preparedness for menarche ($p < 0.05$). The majority of students with suboptimal family support tended to be less prepared to face menarche compared to students who received optimal family support. This finding demonstrates that family support plays an important role in helping children understand and accept the physical and psychological changes that occur during puberty.

The results of this study are in line with the findings of *Pomalinggo et al (2025)* and *Arista et al (2022),* which show that adolescents who do not receive family support tend to be unprepared for menarche. Families, especially mothers, play an important role in guiding and reassuring children as they face the changes of puberty. Low family support can cause anxiety, confusion, and even fear in children, while optimal support can foster a sense of security, self-confidence, and a positive attitude toward menstruation.

Research *Abdiana et al. (2023)* also reinforces these findings, showing that even though some mothers have sufficient knowledge about menstruation, children may still be unprepared if their mothers are not actively involved in their lives. Emotional closeness between mothers and children is a key factor in the success of family support in preparing children for menarche. In other words, parental knowledge alone is not enough without warm interaction and communication.

In addition, parents' level of education also influences the quality of support provided. Parents with higher levels of education tend to have broader knowledge, open communication patterns, and the ability to convey relevant information about reproductive health *(Pomalingo et al, 2025).* Good knowledge enables parents to provide accurate explanations about the menstrual process, so that children can understand that menarche is a natural biological event and a sign of a girl's maturity.

Thus, it can be concluded that family support has a significant contribution in shaping adolescents' readiness to face menarche. Good support is not only in the form of providing physical needs such as sanitary pads, but also includes informational, emotional, and motivational support. Efforts to improve the readiness of adolescent girls should be carried out through an active family approach, by establishing open communication, providing accurate education in accordance with health guidelines, and fostering a positive perception of menstruation. Optimal family support will help students face menarche with greater readiness, confidence, and without fear or anxiety.

Table 4: The Relationship of Menstrual Knowledge to Menarche Preparedness

Menstrual Knowledge	Preparedness for Menarche				Total		Value-p	Coefficient Contingency (C)
	Ready		Not Ready					
	n	%	n	%	n	%		

Good	5	83,3	1	16,7	6	100		
Fair	4	30,8	9	69,2	13	100	<0,001	0,531
Poor	1	4,8	20	95,2	21	100		
Total	**10**	**25,0**	**30**	**75,0**	**40**	**100**		

The results showed a significant relationship between menstrual knowledge and readiness for menarche (p < 0.05). Most students with poor knowledge tended to be less prepared for menarche than students with good knowledge. This confirms that knowledge is an important factor that influences adolescent girls readiness for their first menstruation.

Female students who have good knowledge about menstruation are better able to understand the physical and psychological changes that occur, enabling them to prepare themselves mentally and physically more effectively. These results are in line with research *Simon et al, (2021)* showing that adequate knowledge improves readiness for menarche. Understanding the menstrual process, signs of puberty, and how to maintain personal hygiene plays an important role in forming a positive attitude towards the changes occurring in the body.

The low level of knowledge among elementary school girls is caused by limited reproductive health education from both families and schools. Most respondents are still in the early stages of cognitive development, so their understanding of complex information is still limited *(Sudirman et al, 2024)*. In addition, some parents still consider that providing information about menstruation to elementary school-aged children is too early *(Sudirman et al, 2024)*. As a result, children do not gain sufficient understanding from an early age and experience anxiety when menarche occurs.

The research results also indicate that the primary sources of information about menstruation for students came from their parents, followed by teachers, peers, and social media. Nevertheless, the information provided by parents generally consisted of personal experiences and was not fully compliant with scientific standards or official reproductive health guidelines. This shows that although students have received information, the source is not always valid or based on correct health policy.

The lack of educational programs in schools is also an important factor affecting the low level of knowledge among female students. Reproductive health material is only provided to a limited extent in sixth grade, while female students in grades three to five have not yet received any education related to puberty and menstruation. In fact, pre-puberty is the ideal time to provide comprehensive reproductive health education. In accordance with Government Regulation of the Republic of Indonesia Number 28 of 2024 Article 103 paragraph (3), basic education units are required to provide reproductive health education, including understanding about puberty and menstruation. The discrepancy between implementation in schools and this policy indicates the need for an evaluation of the curriculum and learning strategies to ensure they are in line with national regulations.

Insufficient knowledge not only impacts mental preparedness but also emotional response and behavior. Adolescents with low knowledge levels tend to feel fear, anxiety, and shame when facing their first menstruation *(Usman et al, 2022).* Furthermore, a minimal understanding of personal hygiene can increase the risk of reproductive tract infections *(Nurhayati et al, 2022).* Thus, good knowledge not only shapes psychological preparedness but also plays a role in maintaining adolescents' reproductive health.

Efforts to increase knowledge must be conducted continuously through school- and family-based education. In this study, education was provided in the form of illustrated counseling, question and answer sessions. Similar activities can be used as a reference by the school through collaboration with health personnel, community health centers, and parents. Integrating reproductive health education starting at the prepubertal age will help students understand the menstrual process, reduce fear, and increase physical and mental preparedness for menarche.

CONCLUSION AND SUGGESTIONS

This study shows that there is a significant relationship between family support and menstrual knowledge on readiness for menarche among elementary school girls. Most girls who have suboptimal family support and low menstrual knowledge tend to be unprepared for menarche. Family support, especially from

mothers, plays an important role in providing information, emotional support, and practical guidance so that children feel safe and confident in facing the changes of puberty. Meanwhile, good knowledge about menstruation helps female students understand the biological process and maintain proper personal hygiene. Therefore, collaboration between families, schools, and health workers is needed to provide reproductive health education from pre-puberty age so that adolescent girls can face menarche with optimal physical and psychological readiness.

DECLARATION

Conflict of Interest

The authors declare that there is no conflict of interest in this study. This research was conducted in accordance with the principles of transparency and scientific integrity.

Authors' Contribution

All authors contributed equally at every stage of the research, including conceptual design, data collection and analysis, as well as the writing and editing of the final manuscript. This collective contribution reflects a collaborative effort that supported the success of the study.

Ethical Approval

This study has obtained ethical approval from the Ethics Committee of the Faculty of Medicine, Airlangga University, with approval number 130/EC/KEPK/FKUA/2025. The research was conducted in accordance with the applicable ethical principles of research.

Funding Source

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Data Availability

The data supporting the research findings are available upon reasonable request. This aims to promote transparency and enable other researchers to verify and further develop the study.

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RISK FACTORS OF ANEMIA IN ADOLESCENT GIRLS IN WETLAND AREAS: A STUDY IN SOUTH KALIMANTAN

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Abstract

Background: Anemia in adolescent girls is a global and national public health problem that is receiving increasing attention due to the high nutritional needs during growth and iron loss during menstruation. Preliminary data from wetland areas, particularly in Sungai Alang Village, Banjar Regency, shows a prevalence of anemia of 23.54%. This study aims to analyze risk factors associated with anemia in adolescent girls, including age, education level, nutritional knowledge, dietary behavior, and nutritional status based on Mid-Upper Arm Circumference (MUAC) and Body Mass Index (BMI). **Method:** This study used an observational analytical design with a cross-sectional approach in 50 adolescent girls aged 12–24 years selected through purposive sampling. Data were obtained through questionnaires and hemoglobin level measurements using an Hb meter. Analysis was performed using Spearman's rho correlation test and multivariate linear regression. **Result:** The results showed a prevalence of anemia of 34%, exceeding the threshold for a moderate public health problem according to the WHO. Bivariate analysis found a significant negative correlation between age and Hb levels ($r=-0.405$; $p=0.004$) and a significant positive correlation between MUAC and Hb levels ($r=0.373$; $p=0.008$). Meanwhile, knowledge, BMI, and dietary behavior did not show a significant correlation. Multivariate analysis identified age ($\beta=-0.459$; $p=0.000$), MUAC ($\beta=0.599$; $p=0.000$), and BMI ($\beta=-0.354$; $p=0.033$) as significant independent predictors. **Conclusion:** The results confirmed that anemia in adolescent girls is influenced by physiological factors and anthropometric status, while knowledge and dietary behavior do not play a direct role. Therefore, preventive interventions need to be carried out holistically through supplementation, targeted nutrition education, and other supporting health programs.

Keywords: anemia, adolescent girls, nutritional status, risk factors. wetlands

INTRODUCTION

Anemia, defined as a condition in which blood hemoglobin concentration falls below normal, is a global public health issue affecting billions of people, with the greatest burden in low- and middle-income countries (Yosephin & Maigoda,

2019). According to WHO (2019), approximately 30% of non-pregnant women and 37% of pregnant women aged 15–49 years are anemic, with Southeast Asia bearing a significant burden, affecting around 244 million women and 83 million children. In Indonesia, anemia prevalence among peri-urban women increased from 21.6% in 2018 to 22.3% in 2019, with higher rates in rural than urban areas (WHO, 2019). Adolescent girls represent a particularly vulnerable group due to combined physiological, nutritional, and behavioral factors (Bei et al., 2025).

During adolescence, rapid growth elevates the body's demand for iron and other nutrients to support blood volume expansion and lean body mass, while menstruation contributes to regular iron losses of 15–20 mg per cycle (Dewi et al., 2025). These demands often exceed dietary intake, particularly among girls with unhealthy eating habits. Many adolescents consume nutrient-poor fast food or follow restrictive diets, resulting in insufficient intake of iron, folate, and vitamin B12, all crucial for hemoglobin synthesis (Andriani et al., 2024). This problem is worsened by environmental and socioeconomic conditions, especially in "food swamps," where unhealthy, cheap foods are more available than nutritious ones, limiting healthy dietary choices for low-income families (Martin et al., 2025).

The wetland environment, such as in Sungai Alang Village, introduces unique additional risk factors. Wetlands, characterized by high humidity and water-saturated soil, are breeding grounds for parasites and disease vectors. Parasitic infections like hookworm and *Trichuris trichiura* contribute to anemia through chronic intestinal blood loss or impaired nutrient absorption (Maudita et al., 2025). Similarly, malaria, prevalent in tropical wetlands, causes anemia by destroying red blood cells. These biological risks make anemia in wetlands more complex compared to urban settings, where nutritional and behavioral factors predominate.

Although research on adolescent anemia exists, studies focusing on rural or unique ecological environments like wetlands remain limited. Most evidence comes from urban or institutional contexts, leaving a knowledge gap. Given the high anemia prevalence in Sungai Alang Village, South Kalimantan Provinse, Indonesia. This study aims to analyze demographic, anthropometric, knowledge, and dietary factors associated with hemoglobin levels among adolescent girls in wetland areas.

METHOD

This study used an observational analytical design with a cross-sectional approach to analyze the relationship between age, educational status, anemia status, Chronic Energy Deficiency status, knowledge level, nutritional status, and dietary behavior in adolescent girls. The study location was Sungai Alang Village, Banjar Regency, South Kalimantan, Indonesia, which has wetland characteristics.

The study population was all adolescent girls living in Sungai Alang Village. A sample of 50 adolescent girls aged 12–24 years was selected using a purposive sampling method. Inclusion criteria were adolescent girls residing in the study area and willing to participate. Exclusion criteria were not applied. This sample size was deemed adequate for initial analysis to identify key relationships between study variables.

The tools used in this study included a portable Hb meter to measure hemoglobin levels, a digital scale to measure body weight, a mid-upper arm circumference (MUAC) tape measure, and a structured questionnaire for data collection. The study materials consisted of questionnaire sheets and medical consumables, such as capillary blood lancets and alcohol swabs.

Data were collected through structured interviews and physical measurements. The questionnaire was used to obtain data on demographic characteristics (age, educational status), knowledge of anemia, and dietary behavior. Nutritional status was measured using Body Mass Index (BMI) and Mid-Upper Arm Circumference (MUAC). Hemoglobin (Hb) levels were measured using a portable Hb meter from capillary blood samples. Anemia was classified according to WHO standards, with adolescent girls with hemoglobin levels less than 12 g/dL being categorized as anemic. Bivariate data analysis used the Spearman's rho correlation analysis, while multivariate analysis used linear regression tests.

RESULT AND DISCUSSION

Descriptive Characteristics of the Sample

Table 1. Descriptive Characteristics of the Sample

Variable	Category	Frequency	Percentage
Age	Children	5	10.0
	Adolescents	23	46.0

	Early Adults	22	44.0
	Total	50	100.0
Educational Status	High Education	26	52.0
	Low Education	24	48.0
	Total	50	100.0
Anemic Status	Anemic	17	34.0
	Not Anemic	33	66.0
	Total	50	100.0
CED Status	Risk Of CED	28	56.0
	Not Risk Of CED	22	44.0
	Total	50	100.0
Knowledge Level	Good	31	62.0
	Poor	19	38.0
	Total	50	100.0
Nutritional Status	Underweight	18	36.0
	Overweight	2	4.0
	Obesity	3	6.0
	Total	50	100.0
Dietary Behavior	Good Diet Behavior	10	20.0
	Bad Diet Behavior	40	80.0
	Total	50	100.0

Of the 50 adolescent girls who participated in the study, 34% (17 people) were found to have anemia, while 66% (33 people) did not suffer from anemia. This proportion shows a significant prevalence, falling into the category of moderate public health problems according to WHO criteria (20.0-39.9%) (Utami et al., 2023). The age distribution in the sample shows that 46% of adolescent girls are in the "Adolescent" age group (12-18 years), followed by 44% in the "Early Adult" group (19-24 years) and 10% in the "Children" group (<12 years). The level of knowledge about anemia was found to be good in the majority of subjects (62%), while 38% had an inadequate level of knowledge. This result contrasts with dietary behavior, where the majority of subjects (80%) reported having poor dietary behavior, while only 20% had good dietary behavior. In terms of nutritional status, based on BMI, 54% of subjects had normal nutritional status. However, the majority of subjects (56%) were in the category at risk of Chronic Energy Deficiency (CED) based on LILA, which indicates a long-term nutritional deficit.

Analysis of the Results Research Variables

Table 2. Spearman Rank Correlation Matrix

Variable	Age	Hb	MUAC	Knowledge	BMI	Diet
Age	1	−.405**	.177	.615**	.315*	−.521**
Hb		1	.373**	−.228	−.105	.055
MUAC			1	.326*	.581**	−.021

Knowledge	1	.264	–.556**
BMI		1	.070
Diet			1

r = Spearman correlation coefficient
*p < 0.05 = *; p < 0.01 = ***

Table 2 shows the Spearman's rho correlation analysis conducted to test the relationship between the research variables. The results showed a significant correlation between several variables. Specifically, hemoglobin (Hb) levels showed a significant negative correlation with age (r=-0.405, p=0.004). This finding indicates that hemoglobin levels tend to decrease with age in adolescent girls. Conversely, hemoglobin levels showed a significant positive correlation with MUAC (r=0.373, p=0.008), indicating that the better the long-term nutritional status, the higher the hemoglobin levels. Significant correlations were also found among the predictor variables. Age was strongly positively correlated with knowledge (r=0.615, p<0.001) and BMI (r=0.315, p=0.026), but strongly negatively correlated with dietary behavior (r=-0.521, p<0.001). Knowledge also correlated positively with MUAC (r=0.326, p=0.021) and strongly negatively with dietary behavior (r=-0.556, p<0.001). On the other hand, there was no significant association between hemoglobin levels and knowledge, BMI, or dietary behavior in this bivariate analysis.

One of the most complex findings of this study is that although dietary knowledge and behaviors correlated with other variables (such as age), neither directly predicted hemoglobin levels in multivariate analysis. This may seem contradictory, given that descriptive data indicate that 80% of adolescents have poor dietary behaviors. To understand this, it is important to consider the public health behavior model.

Knowledge (as measured in this study) can be considered a predisposing factor, influencing intentions and attitudes (Reni, 2021). However, for knowledge to translate into lasting behavior, other factors, such as an enabling environment and reinforcing factors, must be present (Nuraini et al., 2022).

In the context of Sungai Alang Village, although adolescents may have good knowledge about nutrition, this knowledge may not translate into better dietary behaviors due to inhibiting factors. These could include economic constraints, limited availability of nutritious food, or a preference for cheap, non-nutritious

foods. Other studies have shown that an unsupportive environment or the prevalence of "food swamps" can hinder healthy food choices. Therefore, while adolescents may know what foods to eat to prevent anemia, they may not have the ability or access to consume them consistently. Poor anthropometric status, as demonstrated by the LILA, is a manifestation of chronic nutritional deficits, which may not be remedied by short-term improvements in knowledge alone.

Multivariate Linear Regression Analysis for Hemoglobin Predictors

Table 3. Multivariate Linear Regression Analysis

Predictors	B	SE	β	t	p-value	95% CI for B
Constant	12.692	2.212	—	5.739	<0.001	8.232 – 17.152
Age	–0.293	0.078	–0.459	–3.770	<0.001	–0.451 – –0.135
MUAC	0.466	0.119	0.599	3.913	<0.001	0.226 – 0.706
BMI	–0.261	0.118	–0.354	–2.202	0.033	–0.499 – –0.022

Dependent Variable = Hemoglobin (Hb).
B = Unstandardized coefficients; SE = Standard Error; β = Standardized coefficients.

Table 3 describes the factors that independently predict hemoglobin levels, multivariate linear regression analysis was performed. The final, most relevant model (Model 3) showed that age, MUAC, and BMI were significant predictors. Dietary knowledge and behavior, which were not significant in the initial models, were removed from the final model. The analysis results showed that age ($\beta = -0.459$, $p < 0.001$), MUAC ($\beta = 0.599$, $p < 0.001$), and BMI ($\beta = -0.354$, $p = 0.033$) were significantly associated with hemoglobin levels. Standardized beta coefficients indicated that MUAC had the strongest positive impact on Hb levels, followed by age with a strong negative impact. BMI also showed a significant negative impact, although with a smaller beta coefficient than MUAC.

Multivariate analysis showed that age, MUAC, and BMI were the strongest independent predictors of hemoglobin levels. The inverse relationship between age and Hb levels is a particularly important finding. Although older adolescents may have better nutritional knowledge, their physiological needs are also higher. With increasing age, adolescent girls experience more established menstrual cycles, leading to regular and cumulative blood and iron losses over time (Wibisono, 2024). These losses can lead to chronic iron deficits if nutritional intake is insufficient to compensate. This aligns with research showing that daily iron requirements increase substantially with the onset of menarche (Simanjuntak, 2025).

The findings regarding MUAC and BMI confirm that the anemia occurring in this community is primarily nutritional in origin. MUAC is an excellent indicator of chronic nutritional status or long-term energy reserves. The strong positive correlation with hemoglobin levels suggests that adolescents with better energy reserves also have higher Hb levels. These results align with other studies confirming the association between MUAC and anemia in (Arisani et al., 2024). Similarly, BMI was a significant predictor, suggesting that weight status, both underweight and overweight, may be a risk factor for anemia (Hastuty et al., 2025). While these findings may seem contradictory, several studies have shown that overweight adolescent girls have lower hemoglobin levels, possibly due to obesity-related inflammatory processes that can impair iron metabolism (Putri et al., 2023). These findings emphasize that malnutrition, in its various manifestations, is a major cause of anemia in this community.

The high prevalence of anemia in this study, compared to other regions, may be largely explained by environmental factors unique to wetlands that were not measured. Areas with high humidity and poor sanitation are ideal environments for the transmission of parasitic infections, including soil-transmitted helminths and schistosomiasis. These infections cause chronic blood loss and nutrient malabsorption, which directly contribute to anemia. These findings are consistent with other studies in Indonesia and developing countries that have identified parasitic infections as strong predictors of anemia, particularly among rural populations. Furthermore, wetland environments can increase the risk of vector-borne diseases, such as malaria, which directly damage red blood cells and cause anemia (Adeliana, 2024). Therefore, it is possible that the high prevalence of anemia in Sungai Alang Village is not only caused by nutritional factors, but also by the burden of underlying infectious diseases that were not measured in this study.

CONCLUSION AND SUGGESTION

This study confirms that anemia is a significant public health problem among adolescent girls in Sungai Alang Village, Banjar Regency, with a prevalence of 34% found in the sample. Comprehensive data analysis indicates that the factors most strongly associated with hemoglobin levels are age, MUAC, and BMI. The

inverse relationship between age and hemoglobin levels highlights the cumulative burden of menstruation and unmet iron needs during adolescence. MUAC and BMI, as indicators of nutritional status, convincingly confirm that anemia in this region is primarily a chronic nutritional problem. Although dietary knowledge and behavior did not emerge as direct predictors in the multivariate model, these data highlight that these factors may play an indirect role, mediated by nutritional status.

DECLARATION

Conflict of Interest

There is no conflict of interest in this research.

Authors' Contribution

The authors' contributions include: research design (FY, SAS, MIS); research instrument development (VYA, IHN); data collection and analysis (FY, SAS, MIS, VYA, IHN, HF, IPS); and manuscript preparation and review (IPS, HF).

The initials are as follows: Fahrini Yulidasari (FY), Siti Aisyah Solechah (SAS), Muhammad Irwan Setiawan (MIS), Vina Yulia Anhar (VYA), Ihya Hazairin Noor (IHN), Izal Puji Santoso (IPS), Husnul Fatimah (HF).

Ethical Approval

This research has been approved by the ethics committee of the DPD PPNI Banjarbaru, with No. 204/EC/KEPK-DPDPPNI/VII/2025

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Data Availability

The data used and/or analyzed in this study are available from the corresponding author upon request to the respondents. The raw data of this study cannot be

published publicly due to ethical constraints and respondent confidentiality. However, the data are accessible from the corresponding author by applying the principle of anonymity.

Acknowledgements

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ASSOCIATION BETWEEN HISTORY OF LOW BIRTH WEIGHT (LBW) AND STUNTING INCIDENCE AMONG CHILDREN AGED 24–60 MONTHS

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Abstract

Background: Stunting is a chronic growth disorder caused by prolonged malnutrition and recurrent infections. One of the main risk factors for stunting is a history of Low Birth Weight (LBW). This study aims to determine the relationship between LBW history and the incidence of stunting among children aged 24–60 months in the working area of Balen Public Health Center, Bojonegoro Regency, in 2025. **Method:** This research used a case-control study design with a quantitative approach. The population consisted of all children aged 24–60 months in the area. Sampling was conducted using total sampling for the case group and purposive sampling for the control group. Data were collected through measurements and interviews using a structured questionnaire, and analyzed using the Spearman Rho test. **Result:** The results showed a significant relationship between LBW history and stunting, with a p-value of 0.044 ($p < 0.05$). Children with a history of LBW were at higher risk of experiencing stunting compared to those born with normal birth weight. **Conclusion :** In conclusion, LBW history is a significant risk factor for stunting. Preventive efforts should include prenatal monitoring, maternal nutrition education, and early intervention for LBW infants to reduce the risk of stunting.

keywords : Stunting, Low Birth Weight (LBW), Children Under Five

INTRODUCTION

Stunting is a growth disorder in children characterized by a height lower than the standard for their age, caused by chronic malnutrition and recurrent infections. According to the World Health Organization (WHO), a child is classified as stunted if their height-for-age or length-for-age is below -2 standard deviations (SD) based on the WHO growth curve. This condition can occur from pregnancy to the age of two years, particularly during the critical period of the first 1,000 days of life (0–24 months). It is influenced by maternal nutrition during pregnancy and the child's nutritional intake after birth, both of which affect physical growth, brain function, immunity, and long-term metabolism (Agusanty, n.d.)

Stunting has become a major public health problem in Indonesia due to its negative impact on body function, increased disease risk (Mugianti et al., 2018) , and long-term consequences on human resource quality. WHO and the Indonesian Ministry of Health (2022) emphasize the importance of prevention through nutritional interventions and integrated health policies. Based on the 2022 Indonesia Nutritional Status Survey (SSGI), the prevalence of stunting in East Java reached 19.2%, while the 2023 Bojonegoro Health Profile reported a rate of 2.28%. In the working area of Balen Public Health Center, there were 62 stunting cases (5.2%) and 58 infants with low birth weight (LBW) (7.6%) (Bojonegoro, 2023)

Low Birth Weight (LBW), defined as infants born weighing less than 2,500 grams regardless of gestational age, is one of the main factors contributing to stunting (Ministry of Health RI, 2020). LBW infants are more vulnerable to growth disorders due to insufficient protein intake from breast milk and immature oromotor function. Jdih.Kemkes.Go.Id (2022) reported that extrauterine growth failure accounts for approximately 20% of stunting cases in Indonesia. (Irwansyah et al., 2016) found that LBW infants have a fourfold higher risk of stunting, which aligns with findings by Danaei et al. (2016), who identified LBW as a dominant factor in stunting cases across 137 developing countries.

Various government initiatives have been implemented to reduce stunting, such as providing a minimum of 90 iron tablets during pregnancy, improving maternal nutrition, promoting early initiation of breastfeeding (EIBF), exclusive breastfeeding, complementary feeding (MP-ASI), basic immunization, and regular growth monitoring at community health posts (Nur & Rahman, 2023). In Bojonegoro Regency, the *KELANTING* (Grandmothers Caring for Stunting Class) program has also been introduced to enhance family involvement in nutrition education and parenting (Azizah Nur & Muhidayati Wiwik, 2024). However, the results have not been optimal, indicating the need for further research on the relationship between LBW and stunting to better understand prenatal factors affecting child growth and to provide a scientific basis for more effective intervention strategies.

METHOD

This study employed an analytical observational research design with a case-control approach. The research was conducted in the working area of Balen Public Health Center, Bojonegoro Regency, from March to April 2025. The objective of this study was to determine the relationship between a history of low birth weight (LBW) and the incidence of stunting among children aged 24–60 months.

The study population consisted of all children aged 24–60 months living in the Balen Public Health Center area. The case group comprised children diagnosed with stunting (height-for-age < -2 SD), while the control group included children with normal nutritional status (height-for-age ≥ -2 SD). Sampling for the case group was conducted using total sampling, whereas purposive sampling was used for the control group. The selection of respondents was based on specific inclusion and exclusion criteria.

The independent variable in this study was the history of low birth weight (LBW), while the dependent variable was the incidence of stunting among children aged 24–60 months. The instruments used included observation sheets, structured questionnaires, and anthropometric measuring tools such as a microtoise to assess children's height. Data were collected through direct interviews with the parents and height measurements in the field, supported by secondary data from maternal and child health (MCH) books and health center records.

The collected data were analyzed quantitatively. Univariate analysis was performed to describe respondents' characteristics, while bivariate analysis was conducted to determine the relationship between LBW history and stunting using the Spearman Rho test with a significance level of $\alpha = 0.05$. Data processing was carried out using the Statistical Package for the Social Sciences (SPSS) version 25.0.

RESULT AND DISCUSSION

The study, conducted from March to April 2025 in the working area of Balen Public Health Center, Bojonegoro Regency, involved 54 respondents, consisting of 27 stunted children (50%) as the case group and 27 non-stunted children (50%) as the control group.

1. **The Relationship Between Low Birth Weight (LBW) History and Stunting Incidence Among Children Aged 24–60 Months.**

Table 1. 1 Frequency Distribution of Respondent Characteristics Based on the Age, Gender, history of exclusive breastfeeding, and height of Children Under Five in the Working Area of Balen Public Health Center, March–April 2025

| | | Group | | | | F | % |
| | | Case | | control | | | |
		F	%	F	%		
Age	24-36	9	33,3	12	44.4	21	38.9
	37-48	7	25,9	10	37	17	31.5
	49-60	11	40,7	5	18,5	16	29.6
	Total	27	100.0	27	100.0	54	100.0
Gender	Male	15	55,6	11	40,7	26	48.1
	Female	12	44.4	16	59,3	28	51.9
	Total	27	100.0	27	100.0	54	100.0
Exclusive Breastfeeding	Exclusive Breastfeeding	23	85.2	19	70.4	42	77.8
	Non-exclusive Breastfeeding	4	14.8	8	29.6	12	22.2
	Total	27	100.0	27	100.0	54	100.0
Height (cm)	71-80	6	22.2	0	0	6	11.1
	81-90	15	55.6	9	33.3	24	44.4
	91-100	6	22.2	16	59.3	22	40.7
	101-110	0	0	2	7.4	2	3.7
	Total	27	100.0	27	100.0	54	100.0

Source : Primary Data, 2025

Based on Table 1.1, it is known that in the case group, nearly half of the children were aged 24–36 months, totaling 9 children (33.3%), and aged 49–60 months, totaling 11 children (40.7%). Meanwhile, in the control group, nearly half of the children were aged 24–36 months, totaling 12 children (44.4%), and aged 37–48 months, totaling 7 children (25.9%).

The majority were male, totaling 15 children (55.6%). Meanwhile, in the control group, the majority were female, totaling 16 children (59.3%).

Almost all respondents in both the case group and the control group in this study were given exclusive breastfeeding. In the case group, there were 23 children (85.2%), and in the control group, there were 19 children (70.4%).

The majority had a height of 81–90 cm, totaling 15 children (55.6%). Meanwhile, in the control group, the majority had a height of 91–100 cm, totaling 16 children (59.3%).

2. The Relationship Between Low Birth Weight (LBW) History and Stunting Incidence Among Children Aged 24–60 Months.

Table 1. 2 Distribution of the frequency of the relationship between low birth weight (LBW) history and stunting incidence among toddlers in the working area of Balen Public Health Center, March–April 2025.

LBW History	Stunting Incidents				F	%
	Stunting		Not Stunting			
	F	%	F	%		
LBW	6	11.1	1	1.9%	7	13.0
No LBW History	21	38.9	26	48.1	47	87.0
Total	27	50.0	27	50.0	54	100.0
Spearman Rho Test			$\rho = 0,044$			

Source : Primary Data, 2025

Based on Table 1.2, it is known that 6 respondents (11.1%) had a history of low birth weight (LBW) and also experienced stunting, while 1 respondent (1.9%) had a history of LBW without stunting. On the other hand, 21 children (38.9%) did not have a history of LBW but experienced stunting, and 26 children (48.1%) neither had a history of LBW nor experienced stunting.

Data analysis was conducted using the Spearman Rho statistical test and calculated with SPSS version 26.0 at a significance level of $\alpha = 0.05$, yielding a ρ value of 0.044. Since the ρ value < 0.05, H1 is accepted, indicating that there is a significant relationship between a history of LBW and the occurrence of stunting in children aged 24–60 months in the working area of Balen Community Health Center.

3. OR Analysis (Odds Ratio)

Table 1. 3 Analysis of the strength of the relationship between low birth weight (LBW) history and stunting incidence among toddlers in the working area of Balen Public Health Center, March–April 2025.

LBW History	Stunting Incidents				F	OR (Odd Ratio)
	Stunting		Not Stunting			
	F	%	F	%		
LBW	6	22.2	1	3,7	7	7,429
No LBW	21	77.8	26	93,3	47	

Source : Primary Data, 2025

Based on Table 1.3, it is known that among the 7 respondents with a history of low birth weight (LBW), 6 children (22.2%) experienced stunting, whereas among the 47 children without a history of LBW, 21 children (77.8%) experienced stunting. The calculation showed an Odds Ratio (OR) of 7.429. This means that children with a history of LBW have approximately 7.429 times higher likelihood of experiencing stunting compared to children born with normal birth weight. These findings indicate a strong relationship between a history of LBW and the occurrence of stunting.

This study was conducted in the working area of the Balen Public Health Center, Bojonegoro Regency, from March to April 2025, involving 54 respondents. The findings revealed a significant association between a history of low birth weight (LBW) and the incidence of stunting among children aged 24–60 months (p = 0.044; OR = 7.429). Children with a history of LBW were at a higher risk of experiencing stunting compared to those with normal birth weight. These results emphasize that birth conditions play a crucial role in determining a child's growth and development during early childhood.

Low birth weight, defined as a birth weight of less than 2,500 grams, is commonly caused by inadequate maternal nutrition, poor maternal health, or pregnancy complications (Kemenkes RI, 2010). Infants born with LBW typically have immature organ systems, including the digestive tract, which leads to suboptimal nutrient absorption (Badjuka, 2020). Consequently, these children are more vulnerable to growth retardation, delayed cognitive development, and increased neonatal morbidity and mortality (Oktarina, 2012) (Azriful et al., 2018).

The present findings are consistent with studies by (Azriful et al., 2018), (Khasanah, 2020) and (Maineny et al., 2022), which identified LBW as a major

risk factor for stunting across various regions in Indonesia. The Ministry of Health of Indonesia (2020) has also highlighted that LBW infants are more prone to stunting due to impaired nutrient absorption and reduced immune function. Similarly, (Maineny et al., 2022)(Supriyanto et al., 2018) reported that children with LBW were six times more likely to experience stunting compared to those with normal birth weight (OR = 6.16).

Several maternal and perinatal factors contribute to LBW, including prematurity, high parity, and inadequate maternal nutrition during pregnancy (Fathiyati & Fairuza, 2020)(Karisma et al., 2022). Excessive physical activity during pregnancy and limited access to maternal and child health services further exacerbate the risk (Kemenkes RI, 2010). Therefore, LBW prevention should be a national health priority within stunting reduction strategies in Indonesia.

Nevertheless, the study also found that not all children with a history of LBW developed stunting, while some children with normal birth weight did. This indicates that postnatal factors—such as inadequate dietary intake, recurrent infections, incomplete immunization, poor sanitation, and unfavorable environmental conditions—also contribute significantly to stunting (WHO, 2015). Hence, stunting is a multifactorial condition influenced by both biological and environmental determinants.

Wulandari et al., 2024 reinforced this perspective by demonstrating that even LBW infants who received exclusive breastfeeding remained at high risk of stunting without additional nutritional interventions. Similarly, (Sumiyati, 2022) reported that LBW infants were 5.76 times more likely to experience stunting than those with normal birth weight, while exclusive breastfeeding only partially reduced this risk. These findings underscore the importance of regular growth monitoring and targeted nutritional supplementation for LBW infants.

Stunting prevention should begin during the preconception period by ensuring optimal maternal nutritional status and continuing through pregnancy with regular antenatal care. Specific nutritional interventions such as iron and folic acid supplementation, combined with sensitive interventions like improved sanitation and maternal health education, should be implemented in an integrated manner

(Kemenkes RI, 2018). Such efforts not only prevent LBW but also reduce the risk of stunting later in childhood.

In conclusion, this study reaffirms that LBW is a key determinant of stunting but not the sole causative factor. Effective prevention requires multisectoral collaboration among government agencies, healthcare providers, and communities to strengthen maternal and child nutrition programs. Sustainable efforts to improve maternal nutrition and raise awareness about the importance of the first 1,000 days of life are essential to breaking the LBW–stunting cycle and enhancing the quality of human resources in Indonesia.

CONCLUSION AND SUGGESTION

Based on the results of the study involving 54 respondents conducted from March to April 2025, it can be concluded that the number of children under five with a history of low birth weight (LBW) was higher in the case group than in the control group, totaling 6 children (22.2%). In addition, nearly half of the stunting cases occurred among children aged 24–36 months, with a total of 9 children (33.3%). The study also revealed a significant relationship between a history of LBW and the incidence of stunting among children aged 24–60 months in the working area of Balen Public Health Center.

The findings of this study are expected to serve as a valuable source of information for midwifery education institutions, particularly for students interested in conducting quantitative research on stunting in children under five using a case-control approach. For the community of Balen Village, it is recommended to pay greater attention to maternal and child health and nutrition, especially during the first 1,000 days of life, to prevent LBW and stunting through balanced nutritional intake. Furthermore, future researchers are encouraged to further explore the relationship between birth weight and stunting by considering other relevant variables, expanding the study area, increasing the sample size, and extending the research duration to obtain more comprehensive and in-depth results

DECLARATION

Conflict of Interest

There is no conflict conflict of interest in this study.

Authors' Contribution

The author contributed to the preparation of the article starting from research design, data collection, data processing, and analysis.

Ethical Approval

This research has received an ethical clearance letter from the Rajekwesi Bojonegoro College of Health Sciences, which ensures that all protocols comply with ethical guidelines (034/KEPK/LPPM.STIKes.R/VII/2025)

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Data Availability

The data supporting the findings of this study are available upon reasonable request from the corresponding author, with restrictions due to participant confidentiality

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LECTURE AND INTERACTIVE DISCUSSION STRATEGIES ON EARLY MARRIAGE AND TEENAGE PREGNANCY EDUCATION

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Abstract

Background: Early marriage and teenage pregnancy pose serious problems in Indonesia. One in five women worldwide marry before the age of 18, and in Indonesia, approximately 1.22 million teenage girls marry under the age of 18. Low levels of knowledge, education, economic status, and customs greatly encourage early marriage and teenage pregnancy. This highlights the need for effective educational strategies to increase knowledge and awareness among teenagers. This study aims to analyze the effect of using lectures with interactive discussions in educating adolescents about early marriage and teenage pregnancy on their knowledge. **Method:** This study used a quantitative approach with a pre-experimental one group pretest-posttest design method. All grade X students of State Islamic Senior High School 1 Blitar, East Java Indonesia were included in the study population with a sample of 95 students selected through cluster sampling. Data were collected using a 23-question questionnaire related to early marriage and teenage pregnancy. Data were analyzed using the Wilcoxon Signed Rank Test. **Result:** The results from the Wilcoxon Signed Rank Test showed a p value of 0.000 (<0.05) which means there is a significant difference in student knowledge before and after the intervention. The percentage of students with good knowledge category increased from 46% before the intervention to 77% after the intervention. **Conclusion:** The combination of lecture and interactive discussion methods effectively improved students' understanding of early marriage and teenage pregnancy.

keyword : lecture, interactive discussion, knowledge, early marriage, teenage pregnancy

INTRODUCTION

Adolescence is a critical transitional phase characterized by rapid physical, psychological, and social development, making adolescents vulnerable to risky behaviors, particularly related to reproductive health. WHO (2019) defines adolescence as individuals aged 10–19 years, while the Indonesian Ministry of Health Regulation No. 25/2014 classifies adolescents as those aged 10–18 years, and BKKBN (2017) defines them as individuals aged 10–24 years who are unmarried. Limited reproductive health knowledge and low awareness increase

adolescent's susceptibility to early sexual activity, leading to teenage pregnancy and early marriage, conditions known to adversely affect health, education, and future socioeconomic prospects *(Choirunisa, 2023; Putra et al., 2024).* **Although** the 2030 Sustainable Development Goals (SDGs) prioritize eliminating child marriage, this issue remains a global concern, with approximately 650 million women worldwide marrying before the age of 18 *(UNICEF, 2018).* **Indonesia ranks** among the countries with the highest burden of child marriage, with an estimated 1.22 million girls marrying under age 18 and higher prevalence observed in rural areas and provinces such as West Java, East Java, and Central Java (UNICEF, BPS, & PUSKAPA, 2020; BPS, 2024). In East Java, 20.15% of girls marry between 16–18 years and 2.29% marry before 16, while Blitar Regency remains one of the regions with the highest early marriage cases, where 22.89% of women marry at 17–18 and 16.85% marry before age 17, frequently driven by premarital pregnancy (BPS, 2023; SindoNews, 2023). Teenage pregnancy further increases risks of obstetric complications, premature birth, neonatal morbidity, psychological distress, school dropout, and long-term socioeconomic disadvantage (WHO, 2024; UNICEF, 2024). These conditions highlight the urgent need for effective educational interventions aimed at improving adolescent's reproductive health knowledge to prevent early marriage and teenage pregnancy, particularly in high-risk areas such as Blitar.

The world of education has also been affected by this phenomenon. Cases of early marriage at MAN 1 Blitar have led to female students dropping out of school, largely due to limited knowledge of reproductive health (Fikriah, 2024). This shows that knowledge is very important in changing the attitudes and behaviors of adolescents. Knowledge is defined by Ridwan et al. (2021), as the result of a learning process that involves acquiring concepts and information through education, experience, and interpersonal communication to obtain an accurate understanding. The extent to which a person can make the right decisions is influenced by their level of knowledge, which consists of know, comprehension, and application. Education, information media, socio-culture, experience, age, and age are some of the components that influence knowledge *(Notoatmodjo, 2022).*

Therefore, the less knowledge adolescents have about reproduction, the more likely they are to marry prematurely.

Lectures and interactive discussions are two common approaches to health education. Lectures allow information to be conveyed systematically to a wider audience, but often make participants passive and bored (Pakpahan et al., 2021). On the other hand, interactive discussions encourage students to think critically, express their opinions about solutions to problems, and actively exchange ideas (Brookfield, 2015). According to Vygotsky's constructivist theory, social interaction, the exchange of ideas, and active discussion in discussions help students build knowledge more significantly than just receiving it passively (Muwakhidah, 2020; Tohari et al., 2024). Therefore, it is considered more effective to use a lecture approach with interactive discussions to improve adolescents' understanding of the issues of early marriage and adolescent pregnancy.

Based on these conditions, this study aims to evaluate how the use of lecture techniques with interactive discussions impacts student's knowledge at MAN 1 Blitar, East Java Indonesia on how to prevent early marriage and teenage pregnancy. This study is expected to help develop better methods for teaching adolescent health in schools and assist local and national government efforts to reduce early marriage rates.

METHOD

This study used a quantitative approach with a pre-experimental one group pretest-posttest design. The research was conducted at State Islamic Senior High School 1 Blitar, located in Blitar Regency, East Java, Indonesia, in June 2025. The research population consisted of all 395 tenth grade students at MAN 1 Blitar in the 2024/2025 academic year. A sample of 95 respondents was selected using cluster sampling based on inclusion criteria, including being under 19 years of age, being present during the study, and having never received education about early marriage and teenage pregnancy. The exclusion criteria included students who were over 19 years of age, were not present during the study, and had received education about early marriage and teenage pregnancy.

The research instrument used a questionnaire with 23 questions to measure knowledge about the definition, causes, and effects of early marriage and teenage pregnancy. Data were collected in three stages, a pretest to measure initial knowledge, the intervention session, and a posttest to assess knowledge after the intervention. The intervention consisted of a 30-minute lecture and a 30-minute small-group interactive discussion. The lecture provided structured educational material on early marriage and teenage pregnancy, including definitions, causes, consequences, and preventive strategies, delivered through slide-based teaching and a brief question-and-answer session. After the lecture, students were divided into 15 groups of 6–7 members for a guided discussion using case scenarios related to early marriage and adolescent pregnancy, during which they collaboratively identified contributing factors and appropriate preventive actions, documented key points, and presented their conclusions. The researcher then provided feedback and summarized the essential learning points. Knowledge scores were evaluated based on the number of correct answers and categorized as good (76–100), fair (56–75), and less (<56), and data were analyzed using the Wilcoxon Signed Rank Test.

RESULT AND DISCUSSION

1. Respondent Characteristics Data

Table 1. Distribution of respondent characteristics

Description	Frequency (n)	Percentage (%)	Mean	SD
Age				
a. 15 years	3	3		
b. 16 years	71	75	16,2	0,49
c. 17 years	20	21		
d. 18 years	1	1		
Total	95	100		
Gender				
a. Boy	35	37	-	-
b. Girl	60	63		
Total	95	100		

Based on table 1, most respondents were girls (63%) and the mean age of participants was 16.2 years (SD = 0.49).

2. Descriptive Statistical Analysis of Respondent's Knowledge Before (Pretest) and After (Posttest) Education through Lecture Method with Interactive Discussion

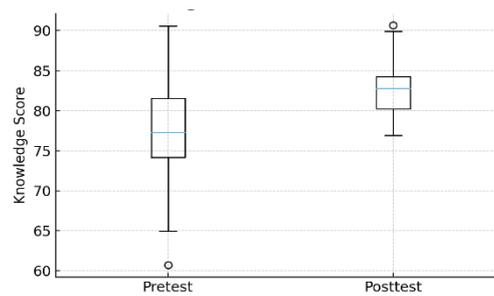Figure 1. Box plot of pretest and posttest knowledge scores among students

Figure 1 illustrates the distribution of student's knowledge scores before and after the educational intervention. The median score increased from 78.2 in the pretest to 82.6 in the posttest, while the interquartile range decreased from 9 to 4, indicating a more consistent and uniform improvement in student's knowledge levels following the intervention.

3. The Effect of Lecture Methods with Interactive Discussions on Knowledge about Early Marriage and Teenage Pregnancy

Table 2. Distribution of respondent's knowledge before and after education

Knowledge Category	*Pretest* n (%)	*Posttest* n (%)
Good	44 (46%)	73 (77%)
Fair	50 (53%)	22 (23%)
Less	1 (1%)	0 (0%)
Total	**95 (100%)**	**95 (100%)**
Wilcoxon Sign Rank Test **p= 0,000**		

Based on table 2, before the intervention, most respondents had a fair level of knowledge (53%). After the lecture and interactive discussion, the majority of students shifted to the good knowledge category (77%). The Wilcoxon Signed Rank Test indicated a significant increase in knowledge scores (p = 0.000), demonstrating a significant difference between pretest and posttest results. These findings indicate that the lecture method combined with interactive discussion effectively improved student's knowledge regarding early marriage and teenage pregnancy at MAN 1 Blitar.

4. Analysis of Respondent's Knowledge Domain Outcomes Before and After Education through Lecture Method with Interactive Discussion

Table 3. Respondent's knowledge domain achievement before (pretest) and after (posttest) education

Knowledge Domain	Question Number	*Pretest* n (%)	$\overline{X}\%$	*Posttest* n (%)	$\overline{X}\%$	Difference $(\overline{X}\%)$

Know	1	70 (74%)		79 (83%)		
	2	63 (66%)	72%	83 (87%)	85%	+13%
	3	69 (73%)		81 (85%)		
	4	69 (73%)		82 (86%)		
Comprehension	5	73 (77%)		78 (82%)		
	6	76 (80%)		78 (82%)		
	7	65 (68%)		70 (74%)		
	8	73 (77%)		76 (80%)		
	9	73 (77%)		83 (87%)		
	10	73 (77%)		77 (81%)		
	11	72 (76%)		85 (89%)		
	12	65 (68%)	75%	74 (78%)	80%	+5%
	13	72 (76%)		75 (79%)		
	14	77 (81%)		86 (91%)		
	15	69 (73%)		76 (80%)		
	16	71 (75%)		73 (77%)		
	17	71 (75%)		73 (77%)		
	18	71 (75%)		74 (78%)		
	19	69 (73%)		72 (76%)		
Application	20	71 (75%)		81 (85%)		
	21	71 (75%)	74%	79 (83%)	83%	+9%
	22	64 (67%)		77 (81%)		
	23	74 (78%)		79 (83%)		

Table 3 shows an increase in all domains, including know (+13%), comprehension (+5%), and application (+9%) with the largest increase in the know domain.

This finding shows that the combination of lecture method with interactive discussion helped respondents in recalling information and understanding the material provided. This is in line with Vygotsky's theory of social constructivism, which states that social interaction and discussion shape knowledge. During the discussion process, individuals can compare perspectives, clarify misconceptions, and create new understandings based on correct information (Schunk, 2020).

According to Piaget's theory of constructivism, learning occurs through the mechanisms of assimilation and accommodation. This process involves adjusting an individual's cognitive structure to new information. In this study respondents were encouraged to reconsider their understanding of early marriage and teenage pregnancy through cognitive conflict from interactive discussions. Knowledge change becomes more significant and lasting in the presence of such mechanisms (Dong et al., 2024; McLeod, 2024).

Before the intervention, most respondents (53%) were in the adequate knowledge category and only 46% had good knowledge. This shows that adolescents still have limited information about early marriage and teenage pregnancy. This condition is in line with the research by Sharma et al. (2023), which reported that high school adolescents still have low knowledge about reproductive health because the topic is not discussed in depth at school. In addition, Handayani in Neraca (2023) mentioned that reproductive health education has not been optimally integrated into the school curriculum, so that adolescents obtain partial and superficial information.

After being educated using the lecture method with interactive discussions, there was an increase in the proportion of good knowledge to 77%, and no respondents with poor knowledge were found. These results are consistent with the findings of Putri et al. (2025), who stated that interactive discussion-based learning can significantly improve adolescents' knowledge because it stimulates active participation and reflective understanding. Similarly, Salsabila (2023) showed that reproductive health education using a two-way approach is more effective than a one-way lecture method, as students can participate directly and confirm any misunderstandings.

The results of this study are also in line with Millanzi et al. (2022) and Texeira et al. (2024), who found that interactive learning methods based on problem-based learning can significantly improve adolescents' knowledge and skills related to reproductive health. Alekhya et al. (2023) added that school-based health education for adolescent girls improves health literacy, learning motivation, and awareness of the risks of early pregnancy. Thus, lectures combined with interactive discussions can create an active learning environment that strengthens knowledge absorption and retention.

Based on the perspective of learning theory, these findings reinforce Vygotsky's concept of the Zone of Proximal Development (ZPD), in which effective learning occurs when students are guided by more competent

educators or peers. Lectures serve as scaffolding that provides a conceptual framework, while interactive discussions allow students to construct knowledge through exploration, negotiation of meaning, and clarification of misconceptions (Brooks, 1999).

Although knowledge improvement has increased significantly, 23% of respondents are still in the adequate category. This variation may be due to differences in cognitive capacity, attention span, motivation, and learning experiences of each individual (He et al., 2025). According to Ausubel in Schunk (2020), meaningful learning occurs when learners are able to relate new knowledge to existing concepts. Students with low metacognitive abilities tend to find it difficult to build these conceptual connections, resulting in suboptimal knowledge improvement.

This study was conducted in a madrasah environment that is highly sensitive to reproductive health issues. The results of Shibuya et al. (2023) study, show that a value- and culture-based approach is very important for health education to be accepted in religious environments. In this study, the interactive discussion method proved to be effective because it provided space for students to relate scientific information to the religious and cultural values they adhere to, without causing social resistance.

CONCLUSION AND SUGGESTION

There was a difference in the respondent's level of knowledge before and after being educated about early marriage and teenage pregnancy through lectures with interactive discussions. The respondent's level of knowledge after the intervention (posttest) increased to 77% in the good category with a median value of 82.6, compared to the student's level of knowledge before the intervention (pretest), which was only 46% in the good category with a median value of 78.2. These findings indicate that providing education using lectures with interactive discussions is effective in increasing student's knowledge about early marriage and teenage pregnancy.

DECLARATION

Conflict of Interest

The author has no relationship, involvement, or conflict of interest with any organization or institution that could influence the content or topic of this article.

Authors' Contribution

During the research and writing process of this article, the first author served as the principal investigator and was responsible for conceptualizing, collecting data, analyzing, and drafting the manuscript. The second and third authors acted as academic advisors and provided guidance, critical observation, and approval.

Ethical Approval

This study has received approval from the Health Research Ethics Committee of Airlangga University Medicine number 142 /EC/KEPK/FKUA/2025.

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Data Availability

Regarding the confidentiality and privacy of research participants, data supporting the research findings can be accessed upon reasonable request by the correspondent author.

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THE EFFECT OF LOW IMPACT AEROBIC EXERCISE ON WEIGHT REDUCTION IN PROGESTIN ONLY CONTRACEPTION INJECTION WOMEN

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Abstract

Background: Injectable contraceptives stimulate appetite, increase weight, and can cause menstrual irregularities, including missed periods for three consecutive months, menorrhagia, and spotting. Several factors can contribute to weight gain, including an unhealthy lifestyle. Weight control involves maintaining food intake, rest patterns, and activity patterns through exercise, including physical activity such as sports or aerobics. The purpose of this study was to determine the effect of low-impact aerobic exercise on weight loss in 3-month injectable contraceptive acceptors in the Baureno Health Cente r work area. **Metode:** This research design used one group pretest posttest design. In this design there is only one group, the initial test (Pretest) and the last is given a final test (Posttest), The population women used progestin in injection in the Baureno Health Center East Java Indonesia work area is 18 people, the measuring instrument to identify weight loss using a digital scale. In this study, low impact aerobic exercise was done for 30 minutes twice a week for 8 weeks. **Results:** most of them were 49.0-58.0 kg, 10 respondents (55.6%), while almost half of them had a body weight of 60.0-69.3 kg, 7 respondents (38.9%) and a small number of respondents with a body weight of >70 kg, only 1 respondent (5.1%). of this study using statistical tests with Paired T-Test with a value of ρ value = 0.000 <α = 0.05 indicate that there is an effect of the implementation of low impact aerobic exercise on the weight progestin only contraception women **Conclusion:** There is an effect of low impact aerobic exercise on weigh loss in progestin only contraception women. Low impact aerobic exercise can be an alternative to manage weight in 3-month injection KB acceptors. Therefore, it is necessary to hold routine weekly exercise activities.
Keywords: Low Impact Aerobic Exercise, Weight loss, Three-month injection KB acceptors.

INTRODUCTION

Family planning occurs when the mother, child, father, and other involved families adjust the number of births to prevent them from being born too close together and causing harm (BKKBN, 2011). Injectable contraception is a type of contraception administered by intramuscular injection into the gluteus maximus muscle . There are two types of injectable contraception: one-month and three-

month. One injectable contraception lasts three months and uses Depo, Medroxy, Progesterone, Acetate (DMPA) (Awaliyah et al., 2023). It is a hormonal contraceptive injection that contains only progesterone. The use of hormonal contraception can have both positive and negative effects on various female organs, both reproductive and non-reproductive. Injectable contraception stimulates appetite, increases body weight, and can cause irregular menstrual patterns, including missed periods for three consecutive months, menorrhagia, and spotting.

Based on data from the Bojonegoro City Health Office in 2023, the number of injectable contraceptive users was 96,330. Meanwhile, at the Baureno Community Health Center, the number of injectable contraceptive users was 3,353. Meanwhile, in Sembunglor Village, the number of injectable contraceptive users was 120, with 106 users of the 3-month injectable contraceptive and 14 users of the 1-month injectable contraceptive. More than half of the 3-month injectable contraceptive users experienced weight gain, 67 (63%).

The use of hormonal contraceptive methods can have both positive and negative impacts on various female organs, both reproductive and non-genetic. Injectable contraceptives stimulate appetite, increase weight, and can cause irregular menstrual patterns (Rapi, 2024). Weight gain was reported as the most important reason for discontinuing contraception by 40% of women who received progestin contraception injections (Hasanah et al., 2024). Factors related to a person's physical condition are physiological factors. This includes eating patterns, when a person consumes certain types of food, and the types of activities they engage in. Many of us know that exercise has a significant impact on lowering fat and cholesterol levels. We need to adopt a healthy lifestyle in addition to exercise; an unhealthy lifestyle can lead to overweight or obesity (Rubiyatno et al., 2023). In addition to physical activity, a person also needs to maintain a healthy diet.

Weight control through the digestion of substances the body does not need can help prevent obesity (Rubiyatno et al., 2023). Weight control includes maintaining food intake, rest patterns, and activity patterns through exercise, physical activity such as sports or aerobics. Aerobic exercise is ideal for reducing fat tissue mass and losing weight. Doing aerobic exercise for 30 minutes twice a week for 8 weeks can reduce body weight by 1.42 kg (Pangan et al., 2017).

In this study, researchers provided aerobic exercise interventions to reduce weight in 3-monthly injectable contraceptive users who experienced weight gain. Low-impact aerobic exercise was performed for two months, once a week on Wednesdays and Sundays, from April to June.

Based on the background above, the researcher is interested in conducting a study "The Effect of Low Impact Aerobic Exercise on the Body Weight progestin only contraception injection s in the Baureno Community Health Center Work Area in 2025".

METHOD

This study used a quantitative approach with a pre-experimental method. The population was 106 participants using progestin only contraception womenmethod in the Baureno Community Health Bojonegoro East Java Indonesia. Purposive sampling was used, a non-random sampling technique in which researchers select samples based on specific considerations. This study employed a one-group pretest-posttest design. Only one group was given a pretest, followed by treatment, and then a posttest. Data collection took place from April to June 2025. The population of 106 participants was divided into two groups, each based on two criteria: inclusion and exclusion criteria.

The intervention consisted of low-impact aerobic exercise twice a week, on Wednesdays and Thursdays. The measuring instrument in this study was a digital scale. The exercise was led by a low-impact aerobic instructor, with the goal of weight loss and improved health.

RESULTS AND DICUSSION

Table 5.1 *Frequency Distribution of Respondents Based on Age, Weight, and Education*

		f	%
Age	30-38	11	61.1
	40-49	7	38.9
	Total	18	100.0
		f	%
Weight	49.0-58.0	10	55.6
	60.0-69.3	7	38.9

		f	%
	>70	1	5.6
	Total	18	100.0
		f	%
Education	Elementary School	1	5.6
	Junior High School	4	22.2
	Senior High School	10	55.6
	Bachelor degree	3	16.7
	Total	18	100.0

Source: Primary Data Questionnaire 2025

Based on the research results, it can be seen that the distribution of respondents based on age who participated in low impact aerobic exercise was mostly aged 30-38 years, 11 respondents (61.1%), and the number of respondents was almost half, aged 40-49 years, as many as 7 respondents (38.9%).

Based on the research results, it can be seen that the distribution of respondents based on their body weight who participated in low-impact aerobic exercise training *impact*most of them were 49.0-58.0 kg, 10 respondents (55.6%), while almost half of them had a body weight of 60.0-69.3 kg, 7 respondents (38.9%) and a small number of respondents with a body weight of >70 kg, only 1 respondent (5.1%).

Based on the research results, it can be seen that the distribution of respondents based on education who participated in low-impact aerobic exercise training *impact*a small portion of those with elementary school education, 1 respondent (5.6%), while a small portion of those with junior high school education were 4 respondents (22.2%), the majority of those with high school education were 10 respondents (55.6%), and a small portion of those with bachelor's degree (S1) education were 3 respondents (16.7%).

Table 5.2 Frequency Distribution of Respondents Based on Body Weight Before Exercise *Low Impact Aerobics*

Body Weight Before Exercise	Frequency	Presentation (%)
49 kg	1	5.6
50 kg	2	11.2
52 kg	1	5.6
54 kg	1	5.6
55 kg	1	5.6
56 kg	2	11.2

58 kg	2	11.2
60 kg	2	11.2
63 kg	1	5.6
69 kg	4	22.4
72 kg	1	5.6
Total	18	100%

Source: Primary Data Questionnaire 2025

Table 5.3 Frequency Distribution of Respondents Based on Body Weight After Exercise *Low Impact Aerobics*

Weight After Exercise	Frequency	Presentation (%)
47 kg	1	5.6
49 kg	2	11.2
52 kg	2	11.2
53 kg	1	5.6
54 kg	1	5.6
55 kg	1	5.6
56 kg	1	5.6
57 kg	1	5.6
59 kg	2	11.2
63 kg	1	5.6
68 kg	2	11.2
69 kg	2	11.2
72 kg	1	5.6
Total	18	100%

Source: Primary Data Questionnaire 2025

Based on the research results, it shows that after conducting a normality test using Shapiro Wilk, it shows that all data is normally distributed (>0.05).

Table 5.5 *Statistical Test Before and After Exercise*

Exercise	N	Weight Minimum	Weight Maximum	Average Weight	Std. Deviation
Before Practice After Practice	18	49.0	72.0	59.4111	7,525
	18	47.4	71.5	58.2888	7,770

Source: Primary Data Questionnaire 2025

Table 5.5 Based on the research results, it can be seen that the highest body weight before low impact aerobic exercise was 72.0 kg while the lowest body weight was 49.0 kg. The highest body weight after low impact aerobic exercise was

71.5 kg while the lowest body weight was 47.4 kg with an average body weight after exercise being 58.28 kg.

Table 5.6 Paired t-test results

Exercise	N	Average Change in Weight	Standard Deviation	T	P Value
Before and After Practice	18	1,128	0.162	6,968	0.000

Source: Primary Data Questionnaire 2025

Table 5.6 shows that after conducting a paired t-test, the average value of weight change was 1.128 ± 0.687 and a p-value of 0.000 or <0.05 was obtained, meaning there was an effect after doing gymnastics exercises.

Discussion

In this study, the highest weight of respondents before participating in low-impact aerobic exercise was 72.0 kg, while the lowest weight was 49.2 kg with an average weight before exercise of 59.41 kg. After undergoing low-impact aerobic exercise for 8 weeks with a total of 16 sessions, there was a decrease in body weight in the 3-month injectable contraceptive acceptors. The highest body weight after exercise was recorded at 71.5 kg. The lowest body weight was 47.4 kg and the average body weight after participating in exercise was 58.28 kg.

Based on the results of the paired t-test, the average weight before exercise was 59.41 kg and after exercise 58.28 kg, the weight change value was $1,128 \pm 0.687$. Data analysis from the Pairet T-test statistical test carried out using the SPSS software application to determine the influence between the independent and dependent variables, the results of the calculation obtained a p value of 0.000, which means the p value in this study is smaller than the significance level α (0.05) or below 0.05. Thus, the alternative hypothesis (H1) is accepted and the null hypothesis (H0) is rejected. Therefore, there is an effect of the implementation of low impact aerobic exercise on weight changes in progestin only contraception injection women in the Baureno Health Center work area Bojonegoro East Java Indonesia.

Based on the results of an 8-week study with a total of 16 training sessions and movement durations of 30-60 minutes, the results showed that low-impact aerobic exercise had a significant effect on weight loss in patients receiving progestin injectable contraception. The activities carried out by mothers receiving progestin injectable contraception who participated in low-impact aerobic exercise significantly increased weight loss. Energy expenditure results from burning fat which is processed into energy, thus reducing the percentage of body fat. The principle of training is the result of movements combined with rhythm. The movements performed require energy derived from ATP (Adenosine Triphosphate), which is stored in the muscles, converted into energy, and used for physical activity.

Physical activity is often identified through exercise for health purposes, often reflecting a person's lifestyle. Optimal health can be achieved through exercise, with frequency, intensity, duration, and type tailored to one's abilities (Bayudamai & Yuliastrid, 2022). Gymnastics is a deliberate, systematic, and purposeful exercise designed to harmonize and develop a harmonious individual. Gymnastics is enjoyed at all levels of society, regardless of age, gender, or status. The lively exercise, accompanied by music, adds enthusiasm to the sport, and gymnastics has become increasingly popular among various groups (Supriady & Schiff, 2021)

Exercise encompasses all systematic activities that can stimulate and motivate physical, mental, and social well-being. Fitness occurs when exercise becomes a part of one's life. Numerous benefits can be achieved from this activity, including improved heart function, increased muscle strength, fat burning, and many other physical benefits (Supriady & Schiff, 2021). Aerobic exercise is a popular form of exercise. This exercise is typically performed at a low intensity but is typically performed over a long period of approximately 30-60 minutes (Hita, 2020)

Aerobic exercise is one of the many popular forms of exercise. The value of exercise has become increasingly well-known due to advances in science and technology. It encompasses everyone from different socioeconomic backgrounds, from the working class to the wealthy. Aerobic exercise is considered a form of

recreational exercise. Aerobic exercise has a reputation for being an engaging and accessible sport for all ages, from mothers to teenagers. Aerobic exercise is systematically designed and organized, making it easy to perform. Aerobic exercise is suitable for beginners. When a person's body composition, showing the proportions of muscle, bone, fat, and fluid, results in a balanced, ideal, and attractive appearance (Norita et al., 2024)

This research aligns with the results of a study conducted by (Dmpa et al., 2023) using 19 samples, which stated that regular low-impact aerobic exercise by those taking progestin contraceptive injection will provide benefits, weight loss. The weight of those taking the contraceptive injection successfully decreased after engaging in low-impact aerobic exercise.

The results of this study are supported by research by (Rapi, 2024), who stated that there is a correlation between aerobic exercise and weight loss in those who use progestin injectable contraceptives. This weight loss occurs due to aerobic exercise, where the calorie-burning effect in the body results in a reduction in fat and influences weight loss. Doing aerobic exercise for 60 minutes twice a week for 8 weeks can reduce body weight by 2.05 kg. Statistical test results show a difference in changes in body fat percentage between samples with high and low exercise frequencies. Thus, there is a difference in changes in body fat percentage and body weight based on aerobic exercise frequency.

In Lindawati et al.'s 2024 concluded that low-impact aerobic exercise significantly influences weight loss, including in those using progestin only contraception. Regular low-impact aerobic exercise contributes to weight loss because it can gradually increase calorie and fat burning.

CONCLUSION AND SUGGESTION

It can be concluded in this study that there is The effect on weight loss after 8 weeks of low impact aerobic. It is hoped that This low-impact aerobic exercise can be done as a routine weekly activity and can be an alternative for managing weight in those who accept progestin only contraception.

DECLARATION

Conflict of Interest

The author declares that there is no conflict of interest in the research, writing, or publication of this article.

Author Contribution

All authors contributed to this research. The first author conceived the idea, collected the data, and wrote the manuscript. The other authors assisted with the analysis, compilation of the results, and revision of the article until it was ready for publication.

Ethical Approval

This study has received ethical approval from the Baureno Community Health Center ethics committee. All respondents received clear information about the study and signed an informed consent form. the ethical number in this research is (No.032/KEPK/LPPM.STIKes.R/VII/2025)

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Data Availability

The data used in this study has not been published publicly. However, it can be provided upon request by future researchers. Please contact the author for access.

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FROM KNOWLEDGE TO CARE: UNDERSTANDING MENSTRUAL HYGIENE PRACTICES AMONG PUBLIC HEALTH STUDENTS

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Abstract

Background: Menstrual disorders vary among adolescents between 23% and 76% which can negatively impact adolescents' health, academic success, and extracurricular activities. Knowledge and menstrual hygiene practices are important factors that influence seeking health services. This study aimed to assess students' knowledge and menstrual hygiene practices at the Faculty of Public Health, University of Jember, and to analyze the correlation between the level of knowledge and menstrual hygiene practices and the menstrual cycle of Public Health students. **Method:** This cross-sectional study was performed on female students at the Faculty of Public Health, University of Jember, classes of 2021, 2022, and 2023. This study was conducted from June to August 2024. A total of 150 public health students were recruited by simple random sampling. The public health students were interviewed using the questionnaire, and the data were analyzed using univariate and bivariate analyses using the chi-square test. **Result:** The study found that more than half (65,3%) of female students had poor knowledge about menstrual hygiene, while only 54,7% demonstrated good menstrual hygiene practices. The analysis showed no correlation between the knowledge levels and menstrual hygiene practices with the menstrual cycle among public health students at the University of Jember. **Conclusion:** These findings underscore the low level of knowledge and menstrual hygiene practices among the respondents, emphasizing the urgent need for action and the urgency of enhancing awareness about adopting good menstrual hygiene practices, organizing meetings with the female students, and the importance of community support in addressing this issue

Keywords: awareness; hygiene; knowledge; practice; public health students

INTRODUCTION

Menstruation is a biological process that women naturally experience. However, in reality, the menstrual cycle is often accompanied by disorders that arise before and during the menstrual period (Adriani et al., 2025). These disorders can manifest as excessive or insufficient blood flow, as well as abnormal duration of menstruation, such as hypermenorrhea, where bleeding lasts more than eight

days, and hypomenorrhea, where bleeding is very light and lasts for a shorter duration than usual (Jusni & Arfiani, 2022). These irregularities are often accompanied by pain during menstruation and symptoms of premenstrual syndrome (PMS), which, if not properly managed, can have profound impacts on the physical and mental health of adolescents (Sonata & Sianipar, 2023).

The prevalence of menstrual disorders among adolescents is relatively high, ranging from 23% to 76% (Dhar S et al., 2023), and this has been shown to have a significant impact on their academic life. As many as 35.5% of female medical and health sciences students at the University of Gondar, Ethiopia, experienced a decline in academic performance due to excessive menstrual pain (Minichil et al., 2020). In addition, menstrual disorders also decrease learning concentration, disrupt study time, cause absenteeism, and reduce active participation of adolescent girls in class (Hashim et al., 2020). As a result, the quality of life and productivity of adolescent girls are disrupted, and they tend to prefer resting or succumbing to pain rather than engaging in daily activities optimally.

Disorders such as dysmenorrhea and PMS not only hinder physical activities but also significantly affect the mental condition of teenage girls, including an increased risk of anxiety and depression. A study on medical students in Pakistan showed a significant relationship between stress before exams and the severity of PMS symptoms that negatively impacted academic performance (Bukhari et al., 2024). Menstrual disorders also lead to absenteeism, decreased concentration, and low participation in classes, which ultimately results in a decline in overall academic achievement (Maity et al., 2022). In addition, another study revealed that severe dysmenorrhea has a significant impact on the decline in quality of life and learning ability of female students, necessitating attention from educational institutions and healthcare providers. Support in the form of education, medical management, and menstruation-friendly policies is crucial for improving well-being and academic performance (Belayneh et al., 2023).

Knowledge and practices of menstrual hygiene are important aspects that influence adolescents' behavior in seeking health services. Although menstruation is a standard physiological process, many adolescent girls lack adequate understanding of menstrual hygiene management. These hygiene practices include

actions to maintain the cleanliness of the genital area during menstruation to prevent infections. Research in Indonesia shows that 5.2% of adolescent girls experience post-menstrual complaints related to poor genital hygiene (Marlina et al., 2021). Low knowledge and limited access to basic facilities such as clean water and sanitary products are the main factors leading to poor menstrual hygiene practices (Qolbah et al., 2023).

In addition, a lack of knowledge also poses a significant barrier for adolescents in accessing appropriate healthcare services. Many adolescents face obstacles in obtaining accurate information and find it difficult to access affordable and youth-friendly healthcare services (Febriana et al., 2022). When experiencing symptoms such as severe menstrual pain, hormonal disturbances, or reproductive tract infections, less informed adolescents tend not to seek medical assistance. In contrast, adolescents with sufficient knowledge are quicker to recognize abnormal symptoms and are more active in utilizing healthcare services. Good knowledge effectively prevents risks and negative impacts on adolescents' reproductive health directly and indirectly (Febriana et al., 2022). Therefore, knowledge plays a central role in shaping adolescents' healthy behavior towards their reproductive health (Atik et al., 2021).

The lack of knowledge affects the decision to seek healthcare services and influences adolescents' daily personal hygiene practices. Adolescents with low knowledge tend to have poor personal hygiene behaviour because the information they receive is incomplete or incorrect (Nyamin & Sundah, 2020). The disparity in access to information and the lack of formal education regarding reproductive health exacerbate this situation, resulting in adolescents being unable to manage menstrual issues independently and appropriately. Therefore, further studies need to be conducted to identify and analyze the correlation between knowledge and personal hygiene practices among public health students concerning the menstrual cycle. This study aims to evaluate the level of knowledge and menstrual hygiene practices among female students of the Faculty of Public Health at Jember University. In addition, this research analyzes the relationship between the level of knowledge about menstruation and menstrual hygiene behavior and the regularity of the menstrual cycles experienced by the female students. In other words, this

study focuses on assessing how well students understand and apply hygiene during menstruation and to what extent that knowledge and practice are related to their menstrual cycle conditions.

METHOD

This research used a cross-sectional study design conducted on female students of the Faculty of Public Health at the University of Jember. The research was carried out from June to August 2024. One hundred fifty public health female students were selected as respondents using a simple random sampling technique. The inclusion criteria were as follows: active students in the Faculty of Public Health, University of Jember, for the 2021-2023 period, and students who had menstrual cycle tracking apps on their cell phones or other tracking devices for a minimum of six months prior to the time of research. Data collection was conducted through interviews using a pre-prepared, structured questionnaire related to characteristics, socio-demographics, knowledge of menstruation, hygiene practices during menstruation, and the menstrual cycle. The data obtained were then analyzed using univariate analysis to describe the frequency distribution and bivariate analysis to examine the relationship between variables, with the chi-square test used as the statistical test. Ethics approval was gained from the Faculty of Dentistry, University of Jember, number 2724/UN25.8/KEPK/DL/2024.

RESULT AND DISCUSSION

The characteristics of the respondents are descriptions or general overviews regarding the background of the respondents who participate in a research study. In this study, the characteristics of the respondents are classified based on the name of the study program, age, and cohort of the respondents.

Table 1. Characteristics of Female Students at the Faculty of Public Health, University of Jember, Class of 2021-2023

Characteristics	n	%
Age (years old)		
18	6	4
19	35	23,33
20	60	40
21	41	27,33
22	7	4,66
23	1	0,66
Academic years		
2021	42	28
2022	54	36
2023	54	36
Study Program		
Public Health	103	68,7
Nutrition	47	31,3

Table 1 showed that the respondents in this study came from two study programs, Public Health and Nutrition. Most respondents were students from the Public Health study program, totaling 103 individuals or 68.7% of the 150 total respondents. Meanwhile, 47 individuals, or 31.3% were from the Nutrition study program. The data show that most respondents were between 19 and 21 years old, with the highest distribution at age 20, totaling 60 individuals (40%). This was followed by 41 respondents aged 21 (27,33%) and 35 respondents aged 19 (23,33%). Meanwhile, only six respondents were 18 years old (4,0%), seven respondents were 22 years old (4,66%), and the oldest respondent was 23 years old, totaling just one person (0.66%). The majority of respondents were from the 2022 class, with a total of 54 individuals (36%), followed by the 2023 class with 54 individuals (36%), and the 2021 class with 42 individuals (28%).

Table 2. Distribution of Menstruation Knowledge among Female Students of the Faculty of Public Health, University of Jember, Class of 2021-2023

Menstruation knowledge	n	%
Poor	98	65.3
Good	52	34.7

Category	Correct		Incorrect	
	n	%	n	%
Definition of Menstruation	103	68.7	47	31.3
Menstruation normally occurs in women	81	54	69	46
Physical activity can reduce pain during menstruation	76	50.7	74	49.3
Genetic influence on the timing (earliness or delay) of menstruation	112	74.7	38	25.3
Normal interval of the menstrual cycle	107	71.3	43	28.7
Process of menstruation	106	70.7	44	29.3
PMS is a collection of unpleasant symptoms experienced by women during menstruation	49	32.7	101	67.3
PMS symptoms are only psychological and do not include physical symptoms	107	71.3	43	28.7

Category	Correct		Incorrect	
	n	%	n	%
In women, the duration of menstruation is usually constant	91	60.7	59	39.3
The menstrual cycle is the interval between the first day of one menstruation and the first day of the next menstruation	63	42	87	58
Adequate consumption of iron-rich foods without other nutrients during menstruation	115	76.7	35	23.3
It is recommended to change sanitary pads every 4 hours during menstruation	149	99.3	1	0.7
Menstrual blood that comes out in clots is considered normal	122	81.3	28	18.7

Table 2 showed that the majority of female students have poor knowledge about menstruation, question regarding the knowledge of female students with the highest urgency is the question about genetic influence on the timing of menstruation (74.7%), PMS is a collection of unpleasant symptoms experienced by women during menstruation (67.3%), PMS symptoms are only psychological and do not include physical symptoms (71.3%), normal interval of menstrual cycle (71.3%), and adequate consumption of iron-rich foods without other nutrients during menstruation (76.7%).

Menstrual knowledge refers to women's understanding and skills to comprehend biological processes, maintain reproductive health, and prevent potential complications. Based on the study results, the aspect of knowledge with the highest urgency and the most significant percentage of errors was understanding Premenstrual Syndrome (PMS), at 67.3%. This finding indicates that most female students at the Faculty of Public Health, University of Jember (classes of 2021–2023) did not correctly understand PMS, with most not knowing that PMS occurs before menstruation begins, not during menstruation. This lack of understanding did not directly affect menstrual cycle regularity, as the analysis results showed no association between menstrual knowledge and cycle regularity in this study. More than half (65.3%) of respondents had poor knowledge of menstrual hygiene.

Although insufficient knowledge can influence inappropriate individual behavior, it does not directly impact menstrual cycle regularity.

This study's low level of knowledge (65.3% categorized as poor) indicates the need for more effective educational interventions. Febriana and Mulyono (2022) emphasize the importance of informational and emotional support from families in shaping adolescents' reproductive health behavior. In the context of university students, such support can be extended through peer-education approaches and healthy campus programs. This model has been proven effective in improving reproductive health literacy in various studies (Atik & Susilowati, 2021; Marlina et al., 2021). The utilization of digital technology is also an important strategy.

Table 3. Distribution of Hygiene Practice among Female Students of FKM UNEJ Class of 2021-2023

Hygiene practices	n	%
Poor	68	45.3
Good	82	54.7

Category	Correct		Incorrect	
	n	%	n	%
Signs of severe vaginal discharge	131	87,3	19	12,7
Meaning of personal hygiene during menstruation	32	21,3	118	78,7
Purpose of personal hygiene during menstruation	27	18,0	123	82,0
Actions taken before washing the intimate area during menstruation	8	5,3	142	94,7
Benefits of washing the face 2–3 times a day during menstruation	13	8,7	137	91,3
Health impact if sanitary pads are not changed regularly	7	4,7	143	95,3
Frequency of bathing per day during menstruation	26	17,3	124	82,7
How to care for the intimate area	88	58,7	62	41,3
Impact of leaving the intimate area damp	7	4,7	143	95,3
Steps to maintain the cleanliness of the genital area	20	13,3	130	86,7
Normal duration of the menstrual period	10	6,7	140	93,3
Frequency of changing sanitary pads in a day	1	0,7	149	99,3
Frequency of menstrual cycle length each month	27	18,0	123	82,0

Category	Correct		Incorrect	
	n	%	n	%
Materials used for sanitary pads	46	30,7	104	69,3
Benefits of good personal hygiene	74	49,3	76	50,7
How to dry cloth sanitary pads	27	18,0	123	82,0
Why the genital area must be kept dry	64	42,7	86	57,3
Washing sanitary pads after use	33	22,0	117	78,0
Washing hair during menstruation	14	9,3	136	90,7
Underwear used during menstruation	35	23,3	115	76,7

Table 3 shows that most respondents had good menstrual care practices, with 82 people (54.7%) classified as having good practices. In the questionnaire, the item with the highest urgency was the question of signs of severe vaginal discharge, meaning that as many as 87.3% of students did not yet know the signs of severe vaginal discharge, 58.7% did not know how to care for the intimate area, and 49.3% did not know the benefits of personal hygiene. This indicates that female students of the Faculty of Public Health, University of Jember (class of 2021–2023) lack knowledge regarding menstrual hygiene, which can affect menstrual care practices.

The results of this study also show that most respondents had good menstrual hygiene practices (96.7%); however, knowledge regarding the signs of severe vaginal discharge remained very low (87.3% answered incorrectly). These findings are consistent with Qolbah et al. (2024), who emphasized that menstrual hygiene practices do not always align with a deep understanding, particularly concerning complications such as reproductive tract infections. Furthermore, the lack of understanding related to PMS and menstrual disorders can also affect the mental health of female students. Bukhari et al. (2024) reported that academic stress can exacerbate PMS symptoms, ultimately impacting academic performance. If knowledge about PMS is inadequate, students tend to ignore these symptoms, which can increase psychological burdens and reduce quality of life (Belayneh et al., 2023).

Based on the results of the univariate analysis of menstrual care behavior, the highest urgency was found in questions related to vaginal discharge, with 87.3%

of female students answering incorrectly. In addition, 58.7% still answered incorrectly regarding how to care for the intimate area, and 49.3% answered incorrectly about the importance of maintaining personal hygiene during menstruation. The subsequent bivariate analysis confirmed that there was no correlation between knowledge and the menstrual cycle, nor between menstrual hygiene practice and the menstrual cycle, indicating that both factors were statistically independent of cycle regularity.

Table 4. Distribution of Menstrual Cycle Among Female Students at the Faculty of Public Health, University of Jember, Class of 2021-2023

Menstrual cycle	n	%
Regular	122	81.3
Irregular	28	18.7

Table 4 showed that the majority of female students experienced regular menstrual cycles, the average length of menstruation for female students was six to eight days, and the average menstrual cycle was twenty-three to thirty days for one cycle.

Table 5. Bivariate Analysis of Stress Levels and Menstrual Cycle of Female Students at the Faculty of Public Health, University of Jember, Class of 2021-2023

Variable	Menstrual cycle				p-value	OR (CI 95%)
	Irregular		Regular			
	n	%	n	%		
Knowledge						
Poor	20	18.3	78	79.7	0.452	1.410
Good	8	9.7	44	42.3		(0.574 – 3.466)
Hygiene practice						
Poor	16	12.7	52	55.3	0.164	1.795
Good	12	15.3	70	66.7		(0.783 – 4.116)

Table 5 shows that there was no correlation between the knowledge and hygiene practices and the menstrual cycle. This is because the significance between the two variables exceeds 0.05.

Menstrual care behavior also showed no significant association with the menstrual cycle, as the cycle is regulated by hormonal factors and complex biological systems rather than daily self-care habits. This finding is consistent with the study by Henaulu et al. (2020), which stated that although poor hygiene during menstruation can lead to health problems, it is not directly related to the regularity

of the menstrual cycle. Research by Larasati (2023) also emphasized that factors such as stress or disrupted sleep patterns can interfere with hormonal regulation and cause irregular menstruation. Furthermore, a broader community-based study conducted in Ethiopia found that only approximately 49% of adolescents demonstrated good menstrual hygiene management, and factors such as age, open communication with parents, and overall menstrual knowledge were significantly associated with better practice, highlighting the role of education and supportive environment, rather than individual hygiene actions, in promoting menstrual health (Worku et al., 2024). Furthermore, future studies may be able to recruit a large sample of university students and assess their beliefs and attitudes about menstrual experiences using a validated instrument.

CONCLUSION AND SUGGESTION

This study found that more than half of the female students at the Faculty of Public Health, University of Jember, have poor knowledge and inadequate practices regarding menstrual hygiene. The results of the analysis indicate that the level of knowledge and menstrual hygiene practices are not related to the regularity of the menstrual cycle. These results indicate a still low understanding and healthy habits related to menstruation among female students. Therefore, concrete steps are necessary to increase awareness and knowledge about the importance of maintaining menstrual hygiene, such as through planned educational programs, regular meetings with female students, and community and family support. Digital media and peer-education approaches can also effectively reach students more broadly and improve reproductive health literacy in public health students.

DECLARATION

Conflict of Interest

The authors declare no potential conflict of interest in the research, authorship, and/or publication of this article.

Authors' Contribution

PDI and DAK conceived the study idea. NZS, HB, and LVI designed the study and planned its implementation. PDI, APW, and NCK collected, prepared, analyzed, and interpreted results. PDI and DAK drafted the manuscript and read the entire manuscript critically. DAK revised the manuscript. All authors read and approved the final manuscript.

Ethical Approval

This research has undergone an ethical test by the Health Research Ethics Commission (KEPK) of the Faculty of Dentistry, University of Jember, with **the N**umber 2724/UN25.8/KEPK/DL/2024.

Data Availability
The datasets used and analyzed during the current study are available from the corresponding author upon request.

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THE CORRELATION BETWEEN KNOWLEDGE AND ATTITUDES OF FEMALE ADOLESCENTS TOWARD BREAST SELF-EXAMINATION

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Abstract

Background: Breast self-examination, known as SADARI, is a self-conducted breast examination to detect any abnormalities in the breasts. In 2020, Indonesia reported 68.858 new breast cancer cases and over 22,000 related deaths (Hamami *et al*.,2022). This study aimed to determine the relationship between knowledge and the attitude of young women regarding breast self-examination (SADARI) among female students at SMA Sekolah Rakyat Bekasi in 2022. **Method:** This study utilized descriptive analytic research with a cross-sectional approach using questionnaires conducted at SMA Sekolah Rakyat, Bekasi Regency. Participants consisted of 82 female adolescent respondents, using primary and secondary data. Purposive sampling technique was used with a total population of 103 and a sample of 82, data collection was carried out by distributing questionnaires. Data then analyzed using univariate and bivariate analysis. This study has a dependent variable of attitude and independent variables of knowledge, family support, and information sources. **Results**: There was a significant relationship between knowledge and the attitude of young women regarding SADARI with a p-value = 0.01 < α = 0.05. There was a significant relationship between family support and the attitude of young women regarding SADARI with a p-value = 0.00 < α = 0.05. There was a significant relationship between information sources and the attitude of young women regarding SADARI with a p-value = 0.00 < α = 0.05. **Conclusion**: knowledge, information source and family support were significantly correlate to the attitude of young women regarding breast self-examination (SADARI).

Keyword: Breast Self-Examination, Knowledge, teenager girl,

INTRODUCTION

Cancer is one of the main causes of death, with 8.2 million people dying from cancer. Breast cancer is a disease with a fairly high prevalence in the world, including in Indonesia. Based on surveys conducted by the WHO, it is stated that 8-9 percent of women experience breast cancer (Zhu *et al.*, 2023). In 2020, Indonesia reported 68,858 new breast cancer cases and over 22,000 related deaths (Hamami *et al.*, 2022)**.** In West Java alone, 6,701 cases were documented in 2018, with the highest incidence occurring among women aged 20–35 years. (*West Java Provincial Health Office (Indonesia) | GHDx*, no date).

Breast self-examination, or *Pemeriksaan Payudara Sendiri (SADARI)* is a self-conducted breast examination to detect any abnormalities in the breasts. The main indication of SADARI is to detect breast cancer by observing the breasts from the front, left side, and right side, looking for lumps, changes in skin color, scaly nipples with discharge of fluid or pus and blood(Kurniasih, Srimulyawati and Asrina, 2024). Performing SADARI is a very important in early detection of tumors or lumps in the breasts, thus increase sense of precaution to breast cancer and preventing cancer progression (Noorhayati Novayanti *et al.*, 2025). Almost 85% of disorders or lumps are found by the women themselves through proper self-examination (Conte *et al.*, 2023). In addition, SADARI is the easiest, fastest, and simplest method that can detect breast cancer early (Yap, Marquez and De La Serna, 2023). Therefore, dissemination of knowledge about breast cancer and education for women to perform breast self-examination (SADARI) is needed (Rezano *et al.*, 2022).

Study conducted by Sinaga and Ardayani in (2016) on the relationship between knowledge and attitudes of young women about early detection of breast cancer through SADARI at SMA Pasundan 8 Bandung, most had less knowledge (77%). The attitude of young women about early detection of breast cancer through SADARI was mostly positive (65%). Therefore, more study on relationship between knowledge and attitudes of female adolescents is need. This study aimed to determine the relationship between knowledge and the attitude of young women regarding breast self-examination (SADARI) among female students at SMA Sekolah Rakyat Regency.

METHOD

This study used a cross-sectional design with a descriptive analytic approach to analyze the relationship between knowledge and attitudes of female adolescent regarding breast self-examination (SADARI) at SMA Sekolah Rakyat, Bekasi Regency. The study was conducted from April to July 2022. Population and Sample; The study population consisted of all female adolescent at SMA Sekolah Rakyat, totaling 103 students (57 tenth-grade students and 46 eleventh-grade students). The study sample was determined using the Slovin formula with a 5%

error rate, resulting in 82 students. The sampling technique used was purposive sampling with proportional allocation based on the number of students in each grade (45 tenth-grade students and 37 eleventh-grade students). Sample selection was carried out using simple random sampling in each grade who met the inclusion criteria (young women aged 15-19 years, students of SMA Sekolah Rakyat, willing to be respondents, tenth and eleventh-grade students) and exclusion criteria (unwilling to be respondents, not present during the study). Research Instruments and Data Collection; Data were collected using a questionnaire consisting of questions to measure knowledge (Guttman scale) and attitudes (Likert scale) regarding SADARI (Opuni and Alhassan, 2023). The questionnaire consisted of 25 questions. The validity test of the knowledge and attitude instruments was carried out using Pearson Product Moment correlation with SPSS version 0.16 (Hidayati, Kusmanto and Kiswantoro, 2023). The validity criterion was r count > r table (with df = N-2 and r table 0.6319 for 10 trial respondents) (Tugiman, Herman and Yudhana, 2022).

Primary data were obtained from questionnaires filled out by respondents, and secondary data were obtained from SMA Sekolah Rakyat documents from 2022. Data Analysis; The data were analyzed quantitatively to examine the relationship between knowledge and attitudes using the Pearson Product Moment correlation test with the help of SPSS version 0.16. With the principle of decision making if the questionnaire is said to be reliable if the Cronbach Alpha value is > 0.6. The data collected from the questionnaire will be processed through several stages as follows editing, coding, scoring, tabulating. Once the total score is obtained, the data is categorized to facilitate interpretation of the results. The Score of Knowledge and attitude statements use a likert scale which is categorized as positive and negative knowledge and attitudes. statements of information sources are categorized as direct and indirect. The family support statement questionnaire was categorized as supportive and non-supportive.When conducting research, researchers need to obtain permission from the research site. After obtaining approval, the research can be conducted, emphasizing the ethical issues that must be considered, including:informed concent, anonymity, confidentiality, and ethical review at KEPK *STIKes Prima Indonesia*.

RESULT AND DISCUSSION

Study conducted at SMA Sekolah Rakyat, Bekasi Regency from April to July 2022 included 82 respondents consist of female adolescent measure knowledge, attitude, source of information and family support toward SADARI in detailed presented in this study as well as correlative study done by statistical analysis.

Knowledge & Attitude among Female Adolescents towards SADARI

Knowledge & attitude among 82 respondent consists of female adolescents toward SADARI summarized in table 1.

Table 1. Distribution of Knowledge & Attitude towards SADARI

Variable	n	%
Knowledge		
Good	38	46.34
Sufficient	20	24.39
Poor	24	29.27
Total	**82**	**100.00**
Attitude		
Positive	29	35.37
Negative	53	64.63
Total	**82**	**100.00**

Table 1 show the knowledge & attitude toward SADARI. This study revealed that the majority of respondents (46.3%, n=38) had good knowledge, followed by those with poor knowledge (29.3%, n=24) and sufficient knowledge (24.4%, n=20) while data attitude towards SADARI revealed that the majority of respondents (64.6%, n=53) had a negative attitude towards SADARI and 35.4% (n=29) had a positive attitude.

Family Support & Information Source Regarding SADARI among Adolescent

Family support & Information Source among 82 female adolescents toward SADARI summarized in table 2.

Table 2. Frequency Distribution of Family Support & Information Source

Family Support	n	%
Supportive	29	35.37
Unsupportive	53	64.63
Total	**82**	**100.00**
Information source	**n**	**%**
Direct	44	53.66
Indirect	38	46.34
Total	**82**	**100.00**

Relationship between Knowledge and Attitude towards SADARI

Relationship between Knowledge and Attitude analyzed using *Pearson chi-square* presented in table 3.

Table 3. Relationship between Knowledge and Attitude towards SADARI

		Attitude		*p-value**
		Positive (n)	Negative (n)	
	Good	15	23	
Knowledge	Sufficient	11	9	0.010
	Poor	3	21	
Total		**29**	**53**	

Pearson chi-square test

Table 3 revealed that knowledge had significant correlation to attitude towards SADARI among female adolescent (p=0.010, however, it is interesting to note that a significant number of students with good knowledge actually had a negative attitude (28%, n=23) compared to those with a positive attitude (18.2%, n=15). This finding indicates that knowledge alone is not sufficient to form a positive attitude towards SADARI.

This finding is consistent Previous research which also found a significant relationship between knowledge and attitude towards SADARI (Husna, Fitri Siregar and Azwar, 2021). However, this study further highlights the discrepancy between knowledge and attitude, emphasizing the need for interventions that not only focus on increasing knowledge but also on affective and psychosocial aspects (Albarracin, Fayaz-Farkhad and Granados Samayoa, 2024). Explains that

knowledge is the basis for the formation of attitudes and behaviors, but other factors such as beliefs, values, and emotions also play an important role (Fabrigar *et al.*, 2006).

Based on the researcher's assumption, it was found that female students who had good knowledge experienced high negative attitudes. This was because female students had good knowledge of the benefits of Breast Self-Examination (SADARI). In addition, the lack of understanding and not having the desire to do Breast Self-Examination (SADARI) and the lack of information from health workers affected female students' knowledge about Breast Self-Examination (SADARI).

Relationship between Family and Attitude towards SADARI

Relationship between family support to attitude analyzed using *Pearson chi-square* with OR presented in table 4.

Table 4. Relationship between Family Support and Attitude towards SADARI

		Attitude		p-value*	OR
		Positive (n)	Negative (n)		
Family Support	Supportive	24	5	<0.001	46
	Unsupportive	5	48		
	Total	29	53		

*Pearson chi-square test

Table 4 revealed that source of family support had significant relationship to attitude regarding SADARI among female adolescent (p<0.001). Respondents who felt supported by their families tended to have a positive attitude regarding SADARI, (OR = 46 in 95% CI: 12-174), indicating that students who were not supported by their families were 46 times more likely to have a negative attitude towards SADARI compared to those who were supported.

This finding underscores the important role of family in shaping young women's attitudes towards health, particularly SADARI. Family support can take the form of informational, emotional, instrumental, and appraisal support (Lembunai Tat Alberta, 2023). Lack of support from family can create negative perceptions and distrust towards SADARI (Akbari, Mohammadi and Hosseini,

2023). Hermanto's (2012) research also found a significant relationship between family support and attitude towards SADARI, reinforcing the findings of this study.

Based on the researcher's assumptions, it was found that female students who were not supported by their families and had negative attitudes experienced high rates. This was due to the lack of experience from the family, which reflected negative attitudes in the female students.

Relationship between Information source and Attitude towards SADARI

Table 5. Relationship between Information Source and Attitude towards SADARI

		Attitude		p-value*	OR
		Positive (n)	Negative (n)		
Information source	Direct	24	20	<0.001	7.9
	Indirect	5	33		
Total		29	53		

Table 5 revealed that source of information source had significant relationship to attitude regarding SADARI among female adolescent (p<0.001), (OR = 7.9 in 95% CI: 2.6-24) indicating that students who received information indirectly were 7.9 times more likely to have a negative attitude compared to those who received information directly.

This shows the importance of credible and interactive information sources in forming positive attitudes. Information obtained indirectly, for example from mass media without adequate explanation, may be less understood and actually cause concern. This finding is consistent with the research of Husna (2021), which also found a significant relationship between information source and attitude towards SADARI.

Based on the researcher's assumptions, it was found that female students who received indirect sources of information had a high negative attitude because the indirect information was only obtained from print media, information media alone, so they did not know the truth.

CONCLUSION AND SUGGESTION

This study, which examined the relationship between knowledge, family support, and information sources with the attitudes of young women towards SADARI at SMA Sekolah Rakyat, Bekasi Regency, yielded several important findings. The majority of students demonstrated a negative attitude towards SADARI, although most possessed a good level of knowledge regarding the procedure. This finding indicates that knowledge alone does not guarantee the formation of a positive attitude. Furthermore, the majority of students felt they lacked support from their families regarding SADARI, indicating a gap in communication and support within the family environment. Most students obtained information about SADARI directly, but this did not necessarily correlate with a positive attitude. Statistical analysis showed a significant relationship between knowledge and attitude towards SADARI, between family support and attitude towards SADARI, and between information source and attitude towards SADARI. Specifically, students who did not receive family support were 46 times more likely to have a negative attitude towards SADARI, and students who obtained information indirectly were 7.9 times more likely to have a negative attitude.

DECLARATION

Conflict of Interest

Authors declare that there is not conflict of interest regarding this research and the article publication.

Authors' Contribution

All authors contributed significantly to the research, analysis, drafting and editing of this article publication.

Ethical Approval

All of protocol applied to this research had been reviewed and approved by STIKes Prima Indonesia Health Research Ethics Committee (No. 137/EC/KEPK/STIKES-PI/VI/2022)

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Data Availability

All data of this research were available in correspondent author upon reasonable request with restrictions due to participant confidentiality

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EFFECTIVENESS OF PEPPERMINT-CITRUS AROMATHERAPY INHALERS IN REDUCING EMESIS GRAVIDARUM AMONG FIRST-TRIMESTER PREGNANT WOMEN

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Abstract

Background: Aromatherapy is recognized as an effective, safe, and natural method for alleviating nausea-vomiting in pregnancy. The most prevalent physiological discomforts encountered during early gestation is nausea and vomiting of pregnancy (NVP), frequently termed "morning sickness." The manifestation of NVP is significantly influenced by fluctuating hormonal levels, particularly an elevation in Human Chorionic Gonadotropin (HCG). This study aimed to analyze the impact of an inhaler stick combining peppermint and citrus aromatherapy on the frequency of these symptoms in first-trimester pregnant women. **Method:** This was one-group pretest-posttest design utilized. The study included 28 first-trimester pregnant women, selected by simple random sampling. Participants used an aromatherapy inhaler stick containing 3 ml peppermint and 1 ml citrus, inhaled three times daily for 10 seconds per inhalation. Nausea-vomiting frequency was measured using the PUQE-24 questionnaire. Data analysis was performed using the Wilcoxon test. **Result:** The demographic analysis revealed that the largest age cohort comprised individuals aged 20–35 years (42.9%), while the majority of respondents were primigravida (42.9%). Regarding the intervention, a significant shift in symptom severity was observed. The Wilcoxon Signed-Rank Test analysis yielded a *p*-value of 0.000 (< 0.05), demonstrating a statistically significant impact of the peppermint and citrus aromatherapy inhaler stick on reducing the frequency of nausea and vomiting among first-trimester pregnant women. **Conclusion :** The use of aromatherapy inhaler sticks combining peppermint and citrus is successful in alleviating nausea and vomiting among women in early pregnancy. This aromatherapy technique offers a safe, natural, and easily applicable non-pharmacological alternative therapy.

Keywords: Emesis Gravidarum, Pregnant Women, Peppermint, Citrus, Aromatherapy

INTRODUCTION

Pregnancy represents a complex biological journey encompassing fetal growth and development within the maternal uterus, commencing from the point of conception through to the onset of labor. This transformative process induces a myriad of physiological alterations throughout a woman's body. While fundamentally a natural biological state, certain gestational conditions can

transition into pathological states, necessitating prompt intervention to avert potential obstetric emergencies for both the mother and the developing fetus. Among the most prevalent physiological discomforts encountered during early gestation is nausea and vomiting of pregnancy (NVP), frequently termed "morning sickness." The manifestation of NVP is significantly influenced by fluctuating hormonal levels, particularly an elevation in Human Chorionic Gonadotropin (HCG). These symptoms typically manifest within the initial three months of pregnancy. Mild presentations of nausea and vomiting are clinically referred to as emesis gravidarum, whereas persistent and severe emesis that compromises a mother's nutritional status and fluid balance is diagnosed as hyperemesis gravidarum (Yuliani et al., 2021).

Globally, the World Health Organization (WHO) reports that approximately 14% of pregnant individuals experience nausea and vomiting during their first trimester. The geographical incidence varies considerably; for instance, rates are documented at.5% in California, 00.8% in Canada, 10% in China, , 0.3% in Sweden, 0.9% in Norway, 1.9% in Turkey, and 2.2% in Pakistan, (Wulandari et al., 2022). Within Indonesia, the reported prevalence stands at 24.7%, with regional figures in East Java ranging from 50% to 90% (Majunkova, 2021). A preliminary investigation involving 10 pregnant women at Plumpang Public Health Center (Puskesmas Plumpang) indicated that all participants were affected by emesis gravidarum. Notably, these women were still relying on conventional pharmacological interventions, such as antihistamines and vitamin B6 prescribed by midwives, to mitigate nausea and vomiting during the first trimester. This suggests a widespread lack of awareness regarding complementary or non-pharmacological therapeutic options among many expectant mothers. Complementary therapies function as adjuncts to standard medical care, aiming to support or enhance existing treatments rather than to replace them entirely. Among these, aromatherapy stands out as a safe and natural complementary approach for alleviating NVP in early pregnancy.

Historically, the management of pregnancy-related nausea and vomiting has involved diverse strategies, including pharmacological agents like antihistamines and vitamin B6. Nevertheless, concerns about potential adverse

effects of medications on the unborn fetus often led pregnant women to actively seek natural, safe, and alternative remedies. Aromatherapy emerges as a compelling non-pharmacological option that aligns with these preferences for its inherent natural and safe qualities in relieving NVP. Essential oils particularly noted for their efficacy include peppermint and citrus, both renowned for their anti-emetic properties. Peppermint contains menthol, a naturally occurring compound with properties that can relax gastrointestinal musculature and diminish hypersensitivity to emetic stimuli (Smith et al., 2020). Conversely, citrus oils emit a refreshing scent capable of reducing stress and uplifting mood, thereby contributing to the suppression of the vomiting reflex (Kim et al., 2021). Aromatherapy can be conveniently administered via inhalation, often utilizing an inhaler stick, which facilitates direct delivery of the aromatic compounds to the central nervous system through the olfactory pathway, ensuring a rapid onset of action in reducing the severity of NVP.

METHOD

An experimental design, featuring a pretest-posttest comparison within a single group, guided this study. The research activities were localized to the Functional Organizational Unit (FOU) Plumpang Public Health Center's service territory, East Java, Indonesia occurring between April and June of 2025. The Cohort Register Book of first-trimester pregnant women within the aforementioned health center's working area, totaling 30 individuals, formed the study's population. Participants were chosen through a simple random sampling method. This study employed a pre-experimental one-group pretest-posttest design involving a population of 30 first-trimester pregnant women within the health center's working area. A sample of 28 participants was selected via simple random sampling based on inclusion criteria that required participants to be in the first trimester (<12 weeks), experiencing active emesis gravidarum, and free from olfactory dysfunction or allergies to essential oils. The intervention utilized an aromatherapy inhaler stick formulated with a blend of 3 ml peppermint and 1 ml citrus essential oils; participants were instructed to inhale the stick for 10 seconds three times daily. The frequency and severity of nausea and vomiting were

measured using the Pregnancy-Unique Quantification of Emesis and Nausea (PUQE-24) questionnaire, and the resulting data were analyzed using the Wilcoxon Signed-Rank Test to determine statistical significance. The Pregnancy-Unique Quantification of Emesis/Nausea (PUQE) questionnaire was the tool employed to collect relevant data. Data preparation involved sequential stages of editing, coding, and tabulating. For the analytical phase, the Wilcoxon Signed Rank Test was applied using SPSS statistical software, version 16.0.

RESEARCH RESULTS

Respondent Characteristics

Table 1. Characteristic Distribution of Respondents

Age Group (Years)	Participants	Percentage (%)
<20 years	8	28,6
20-35 years	12	42,9
>35 years	8	28,6
Parity	**Participants**	**Percentage (%)**
Primigravida	12	42,9
Multigravida	10	35,7
Grande multipara	8	21,4
Total	30	100

The demographic data concerning respondent age reveals that the largest cohort in this study comprised individuals aged 20–35 years, constituting 42.9% of the total participants. The characteristics of respondents based on parity indicate that nearly half of the pregnant women were primigravida, amounting to 42.9%.

Table 2. Frequency of Nausea and Vomiting in First-Trimester Pregnant Women Before Treatment

Emesis Gravidarum Scale	Before Treatment		After Treatment	
	Frequency (f)	Percentage(%)	Frequency(f)	Percentage(%)
Mild	7	25	25	89,3
Moderate	21	75	3	10,7

Prior to the application of the peppermint and citrus aromatherapy inhaler stick, data demonstrates that the majority of first-trimester pregnant women (75%) experienced moderate levels of nausea and vomiting. Following the administration of the peppermint and citrus aromatherapy inhaler stick, observations revealed that

almost all respondents (89.3%) reported a reduction in nausea and vomiting severity to a mild level, with only a small minority (10.7%) remaining in the moderate category.

Table 3. Comparison of Emesis Gravidarum Levels (Pre-Post Intervention)

Emesis Gravidarum	Mild		Moderate		Mean	p-Value
	f	%	f	%		
Pre Test	7	25	21	75	9,50	0,000
Post Test	25	89,3	3	10,7	0,00	

The comparative analysis above illustrates a significant shift. Before the peppermint and citrus aromatherapy inhaler stick intervention, most first-trimester pregnant women (21 respondents or 75%) reported moderate emesis gravidarum, while only a minority (7 respondents or 25%) experienced mild symptoms. Post-intervention, a dramatic change occurred, with only 3 respondents (10.7%) remaining in the moderate category, whereas nearly all participants (25 respondents or 89.3%) reported mild nausea and vomiting. The Wilcoxon test analysis yielded a Z-value of -4.243 with a p-value of 0.000, which is considerably less than 0.05. This finding supports the acceptance of the alternative hypothesis (H_1), thereby confirming that the administration of the aromatherapy inhaler stick combining peppermint and citrus is effective in reducing the frequency of nausea and vomiting among first-trimester pregnant women at the UOBF Plumpang Public Health Center.

DISCUSSION

The primary objective of this study was to evaluate the effectiveness of an aromatherapy inhaler stick containing a blend of peppermint and citrus essential oils in reducing emesis gravidarum among first-trimester pregnant women. The findings demonstrated a statistically significant reduction in the frequency and severity of nausea and vomiting following the intervention. Prior to treatment, the majority of respondents (75%) experienced moderate emesis gravidarum. Post-intervention, a dramatic shift occurred, with 89.3% of participants reporting only

mild symptoms and only 10.7% remaining in the moderate category. The statistical analysis using the Wilcoxon Signed-Rank Test yielded a p-Value of 0.000, confirming the alternative hypothesis that the combined aromatherapy stick is effective.

These results align with the theory that essential oils can modulate physiological responses through the olfactory system. When inhaled, volatile molecules from essential oils travel to the olfactory bulb and stimulate the limbic system, including the amygdala and hippocampus, which regulate emotions and physiological functions such as nausea (Tiran, 2016). Specifically, peppermint (*Mentha piperita*) contains high concentrations of menthol. Menthol acts as a natural antispasmodic by blocking calcium channels in the smooth muscles of the gastrointestinal tract, thereby reducing gastric spasms and the urge to vomit (Amzajerdi et al., 2019). Simultaneously, citrus essential oils, particularly lemon (*Citrus limon*), are rich in limonene. Studies suggest that limonene helps regulate serotonin and dopamine levels in the brain, which are neurotransmitters often implicated in the pathophysiology of nausea (Yavari Kia et al., 2014).

The significant success of this intervention, marked by the decrease of moderate cases from 21 to 3 respondents, can be attributed to the synergistic effect of combining these two oils. While peppermint targets the gastric somatic symptoms (stomach cramping), the citrus component likely addresses the central nervous system triggers and the olfactory sensitivity common in early pregnancy. Furthermore, the use of an inhaler stick offers a portable and non-invasive method of delivery, allowing pregnant women to self-administer the treatment immediately upon the onset of nausea. This ease of use likely improved compliance and efficacy compared to stationary diffusion methods.

In terms of demographic characteristics, the study revealed that the largest age group affected was 20–35 years (42.9%), and the highest prevalence regarding parity was among primigravida women (42.9%). This demographic distribution is consistent with existing obstetric literature. The age range of 20–35 years represents the peak reproductive period where hormone production, specifically Human Chorionic Gonadotropin (hCG) and estrogen, is at its highest

levels. Elevated hCG is strongly correlated with the severity of morning sickness (Niebyl, 2010).

Regarding parity, primigravida women often experience higher rates of emesis gravidarum compared to multigravida women. This is theoretically linked to both physiological and psychological factors; a first-time mother's body is less adapted to the rapid hormonal surge, and higher levels of anxiety regarding the novelty of pregnancy can exacerbate the perception of nausea (Mochtar, 2011; Lacroix et al., 2000). Although grandemultiparas also constituted a portion of the sample (21.4%), the predominance of primigravidas suggests that first-time mothers may benefit most from early non-pharmacological interventions. The psychological burden of a first pregnancy, combined with the physical symptoms, creates a cycle of stress and nausea. The aromatherapy intervention likely served a dual purpose: physiological relief through chemical properties and psychological relief by providing a soothing, control-enhancing mechanism for the mothers.

The study was conducted at the Plumpang Public Health Center, a primary care setting where resources must be efficient and accessible. The intervention required only a simple blend of 3 ml peppermint and 1 ml citrus oil. Current guidelines for managing nausea and vomiting in pregnancy advocate for a step-up approach, starting with dietary changes and non-pharmacological therapies before moving to antiemetic medications, which may carry potential side effects (RCOG, 2016). Aromatherapy is recognized as a safe, complementary therapy that fits into the first line of management for uncomplicated emesis gravidarum.

Based on the results, the peppermint and citrus inhaler stick should be considered a standard recommendation for first-trimester care at the Plumpang Public Health Center and similar facilities. It is cost-effective, easy to manufacture, and empowers women to manage their symptoms independently. However, given that this was a pre-experimental design without a control group, future research should employ a randomized controlled trial (RCT) design to rule out the placebo effect and further validate these findings.

CONCLUSION AND SUGGESTIONS

This study demonstrating a significant impact of the peppermint and citrus aromatherapy inhaler stick on reducing nausea and vomiting frequency in first-trimester pregnancy. The use of aromatherapy inhaler sticks combining peppermint and citrus is successful in alleviating nausea and vomiting among women in early pregnancy. This aromatherapy technique offers a safe, natural, and easily applicable non-pharmacological alternative therapy. The findings of this study contribute to the existing literature on non-pharmacological interventions for emesis gravidarum, serving as a valuable reference for academic development. It is recommended that midwifery practitioners seriously consider integrating the peppermint and citrus aromatherapy inhaler stick into routine care as an effective, accessible method for managing first-trimester nausea and vomiting to enhance maternal well-being. Furthermore, future researchers are encouraged to build upon these foundational results by exploring alternative essential oil combinations, varying dosages, and diverse demographic groups to provide a more comprehensive understanding of this therapeutic approach.

DECLARATION

Conflict of Interest

No conflict interest in this research.

Authors' Contribution

Author 1 (Erna Eka Wijayanti) :

Responsible for the conceptualization of the study, development of the methodology, and writing of the initial manuscript draft.

Author 2 (Umu Qonitun) :

Conducted data analysis, created visualizations, and contributed to the interpretation and discussion of the results

Author 3 (Nur Maziyah Hurin'in) :

In charge of data collection, field data processing, and literature review.

Author 4 (*Violeta Dity Virginia Khoir*) :

Performed manuscript editing, and data validation

Author 5 (*Eva Silviana Rahmawati*) :

Data validation, and overall supervision of the research and publication process.

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IDENTIFICATION OF EFFECTIVENESS OF *CENTELLA ASIATICA* LEAVES AS AN ALTERNATIVE APPROACH TO MANAGING PHYSIOLOGICAL AND PSYCHOLOGICAL CHANGES IN MENOPAUSE : DESCRIPTIVE INITIAL STUDY

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Abstract
Background: Menopause represents a significant health issue affecting millions of women globally, with 75-85% experiencing disruptive symptoms such as hot flashes, sleep disturbances, mood changes, and increased risks of osteoporosis and cardiovascular disease. Centella asiatica contains phytoestrogens and antioxidants that may substitute for estrogen function in the body and help reduce physiological and psychological symptoms during menopause. This study aims to evaluate the effectiveness of Centella asiatica in reducing physiological and psychological symptoms during menopause. **Method:** This study employed a descriptive design. Data were collected cross-sectionally from 85 respondents experiencing physiological and psychological changes associated with menopause, residing in Bireuen District and distributed across 18 community health center service areas. Data collection was conducted from July to September 2025, through random sampling. Data were collected by distributing questionnaires to determine menopausal women understanding of centella asiatica and its effectiveness in reducing menopausal symptoms. **Results:** *Centella asiatica* was found to be effective in alleviating both physiological and psychological changes in menopause. *Centella asiatica* was found to be effective in alleviating various physiological changes associated with menopause. Specifically, it improved skin health and reduced aging-related problems (64.7%), enhanced blood circulation (62.3%), supported cognitive function (51.7%), alleviated bone-related problems (88.2%), and reduced sleep disturbances or insomnia (73.0%). In addition to alleviating physiological changes during menopause, *Centella asiatica* was also effective in reducing psychological symptoms, particularly by decreasing anxiety and stress (68.2%) commonly experienced by women during this transitional period. **Conclusion:** *Centella asiatica* demonstrates effectiveness in mitigating physiological and psychological changes during menopause, and thus may serve as an alternative solution to reduce menopausal symptoms.

Keywords: *Centella asiatica*; elderly; menopause; physiological changes; psychological changes

INTRODUCTION

Menopause is recognized as one of the major issues in reproductive health. A considerable number of women experience anxiety when entering this stage. It is defined as the permanent cessation of the menstrual cycle that occurs naturally,

typically between the ages of 45 and 55, and is confirmed after at least 12 consecutive months without menstruation. Menopause is commonly accompanied by various physiological and psychological changes that may significantly affect women's health and quality of life (Ministry of Health of the Republic of Indonesia, 2022).

According to the World Health Organization (WHO), in 2024 the global elderly population aged 60–64 years reached the highest proportion, with 351.5 million individuals. Data from the United Nations Population Fund (UNFPA) further indicate that the global proportion of people aged 65 years and older nearly doubled to 10.3% in 2024. In Southeast Asia, the elderly population accounted for 8% (142 million individuals), and this figure is projected to triple by 2050. Consistent with WHO's projections on the increasing trend of elderly populations worldwide, Indonesia is among the countries experiencing this demographic shift. Data from Statistics Indonesia (BPS) in 2023 reported that the elderly population in Indonesia constituted 11.75% of the total population, equivalent to approximately 22.6 million individuals. This figure represents an increase of 1.27% compared to the previous year's proportion of 10.48% [2]. In Bireuen District, the elderly population reached 59,623 individuals, comprising 26,524 men and 33,109 women (BPS Bireuen, 2019).

The increasing number of elderly individuals is accompanied by challenges related to degenerative conditions and non-communicable diseases (NCDs), such as diabetes, hypertension, and mental health disorders including depression, dementia, anxiety, and sleep disturbances. If left untreated or without preventive measures, these conditions may develop into chronic and multi-pathological diseases. Consequently, the issue of aging populations requires continuous attention from all countries, as it entails a substantial financial burden and long-term dependency (Pangribowo, 2022).

Centella asiatica (locally known as *daun pegagan*) is a lowland plant that grows abundantly in Aceh and is commonly consumed as a food complement, particularly during the month of Ramadan. This plant contains phytoestrogens and antioxidants that may substitute for estrogen function in the body, thereby helping to prevent osteoporosis, alleviate menopausal symptoms, enhance memory, and

improve sleep quality (Raden, 2011). *Centella asiatica* can be consumed in various forms, including tea, juice, or fresh leaves. Several studies have demonstrated its potential as a phytoestrogen, indicating that it may mimic the effects of estrogen in the body and stimulate collagen production. Furthermore, *Centella asiatica* exhibits molecular mechanisms that may suppress or modulate estrogenic effects.

This study is essential to identify herbal alternatives for managing menopausal symptoms and to develop more effective prevention and treatment strategies for health problems during menopause, thereby reducing reliance on conventional medications for mild symptoms. One of the challenges in improving the health and well-being of the elderly is the lack of adequate and up-to-date data regarding geriatric health issues and the use of herbal treatments as alternative therapies. Surveys and research related to aging remain limited, particularly in Indonesia. Therefore, in order to enhance the quality of life among older adults, especially menopausal women, this study was conducted to identify herbal-based alternative solutions for addressing physiological and psychological changes during menopause.

METHOD

This study employed a quantitative design with a descriptive design using a survey method. Data were collected cross-sectionally from 85 menopausal women who experienced physiological and psychological changes, residing in Bireuen District and distributed across 18 community health center (Puskesmas) service areas, during the period of July to September 2025. The sample size was determined using Slovin's formula with a 95% confidence level, and respondents were selected through random sampling. Inclusion criteria: women aged 45-55 years, confirmed menopause ($\geq$12 months without menstruation), experiencing moderate to severe menopausal symptoms, willing to participate and provide informed consent, exclusion criteria: history of hormone replacement therapy within the past 6 months, severe chronic diseases (uncontrolled diabetes, heart disease, cancer), allergy to Centella asiatica, currently taking medications that may interact with phytoestrogens. Data collection was conducted using a structured questionnaire to assess the use and effectiveness of *Centella asiatica* in reducing physiological and

psychological menopausal symptoms. Data processing and analysis were performed with SPSS software, and the results were presented in frequency distribution tables.

RESULT AND DISCUSSION

Based on the study on the identification of the effectiveness of *Centella asiatica* as an alternative solution for physiological and psychological changes during menopause, the results obtained are as follows.

Table 1. Effectiveness of *Centella asiatica* in Addressing Physiological Changes During Menopause

No	Indicator	N	%
1	Skin problems/aging	55	64.7
2	Blood circulation	53	62.3
3	Cognitive function	44	51.7
4	Bone-related problems	75	88.2
5	Insomnia/ Sleep Disturbances	62	73

Centella asiatica was found to be effective in alleviating various physiological changes associated with menopause. Specifically, it improved skin health and reduced aging-related problems (64.7%), enhanced blood circulation (62.3%), supported cognitive function (51.7%), alleviated bone-related problems (88.2%), and reduced sleep disturbances or insomnia (73.0%).

Table 2. Effectiveness of *Centella Asiatica* on Psychological Changes During Menopause

No	Indicator	N	%
1	Anxiety and stress problems	58	68.2

In addition to alleviating physiological changes during menopause, *Centella asiatica* was also effective in reducing psychological symptoms, particularly by decreasing anxiety and stress commonly experienced by women during this transitional period.

Previous research on the identification of physiological and psychological changes during menopause has shown that most menopausal women experience

sleep disturbances, visual impairment, cardiovascular problems, appetite changes, skin alterations, joint pain, and hot flashes, but do not generally report respiratory or urinary problems. Psychologically, menopausal women were found to experience mood swings, fatigue, low motivation, and memory disturbances (Fitria et al., 2023).

Based on several experimental studies conducted on animal models regarding the effects of *Centella asiatica*, among others: *Centella asiatica* has been demonstrated to act as a phytoestrogen capable of enhancing the thickening and collagen content of the vaginal wall in ovariectomized rats. Oral administration of *Centella asiatica* extract to menopausal Wistar rats (Rattus norvegicus) at doses of 30 mg, 60 mg, and 120 mg/kg body weight per day was shown to increase estrogen-β receptor expression, stimulate proliferation and maturation of the vaginal epithelium, and promote collagen synthesis, thereby resulting in thickening and strengthening of the vaginal wall (Raden, 2011); A study also reported the effect of combining *Centella asiatica* extract with Pluchea indica (beluntas) on estrogen levels in female white rats, demonstrating its potential role in modulating hormonal balance during menopause (Nasiroh, 2015). *Centella asiatica* leaf extract, despite being a source of phytoestrogens, was not found to help maintain calcium and phosphate levels in the bones of ovariectomized rats. Furthermore, no significant differences were observed among various concentrations of *Centella asiatica* extract with respect to their effects on bone calcium and phosphate levels in the ovariectomized rats (Bong, 2019). An experimental study demonstrated that administration of *Centella asiatica* leaf extract at doses of 60 mg/kg BW and 120 mg/kg BW significantly reduced the number of osteoclasts in ovariectomized rats. However, it did not significantly increase the number of osteoblasts. Moreover, administration at a dose of 180 mg/kg BW was found to significantly increase the number of osteocytes following ovariectomy (Karis, 2019).

Plasma estradiol levels can be increased in postmenopausal women through a combination of aerobic exercise and the consumption of *Centella asiatica*. While aerobic exercise reduces fat mass, it does not directly increase estrogen levels; thus, supplementation with *Centella asiatica* alongside exercise may help enhance estrogen production. Estrogen plays a neuroprotective role by reducing β-amyloid

and glutamate toxicity, maintaining neurotrophic components, activating transcription factors, and lowering brain inflammation. Aerobic exercise, meanwhile, improves balance by stimulating proprioceptors in the joints, thereby promoting overall health and activity in postmenopausal women. The combination of aerobic exercise and *Centella asiatica* consumption has been shown to provide beneficial effects for women in the postmenopausal stage (Fitriana, 2024).

There is no standardized dosage of *Centella asiatica* specifically established for menopause; however, animal studies have employed extract doses of 60 mg/kg BW, 120 mg/kg BW, and even up to 700 mg, demonstrating effects on hormone levels and bone health related to menopause. For adults, the commonly reported oral consumption ranges between 60–180 mg of extract per day. In traditional use, 20 fresh *Centella asiatica* leaves are boiled in three glasses of water, then filtered and consumed after cooling (Wicinski et al., 2024).

Centella asiatica does not directly balance hormones in the same way as phytoestrogens; rather, its role is more supportive in promoting overall health during periods of hormonal transition, particularly throughout menopause.

CONCLUSION AND SUGGESTION

The findings of this study demonstrate that *Centella asiatica* is effective in reducing several physiological and psychological symptoms associated with menopause, including skin aging, impaired circulation, cognitive decline, bone problems, and sleep disturbances such as insomnia. In addition to alleviating physiological changes, *Centella asiatica* was also shown to reduce psychological symptoms, particularly anxiety and stress, which are commonly experienced by women during this transitional stage. These results suggest that *Centella asiatica* may serve as a promising alternative approach to mitigating both physiological and psychological changes in menopausal women.

DECLARATION

Conflict of Interest

The authors declare no conflict of interest in this study.

Authors' Contribution

The authors contributed to this research from the initial stages through to article preparation, including study design, data collection, data processing, and analysis.

Ethical Approval

This study did not involve an ethical approval process.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to restrictions due to respondent confidentiality.

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