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Research Article

Effectiveness of Education on Knowledge of Early Detection of Anemia in Pregnant Women

Sunarti Usman[1], Nila Widya Keswara[2]*

[1-2] Bachelor of Midwifery, Faculty of Health Sciences, Institute of Science and Health Technology, Dr. Soepraoen Hospital, Malang

* Corresponding author : nilakeswara35@itsk-soepraoen.ac.id

Abstract. Anemia during pregnancy remains a major public health concern with significant implications for maternal and fetal health. One contributing factor to its high prevalence is the limited knowledge among pregnant women regarding early detection. Health education serves as a crucial promotive-preventive strategy to enhance awareness of anemia's signs, symptoms, and risks. This study aimed to analyze the effectiveness of health education in improving knowledge of early detection of anemia among pregnant women in the Galala Community Health Center working area. A pre-experimental one-group pretest–posttest design with a quantitative approach was employed. The sample consisted of 30 pregnant women selected using total sampling. Respondents received structured health education on early detection of anemia, and their knowledge levels were assessed before and after the intervention using a questionnaire. Data were analyzed using univariate and bivariate methods, with the Wilcoxon signed-rank test applied due to non-normal distribution. Results indicated a significant improvement in knowledge after education ($p = 0.000$), with most respondents shifting from poor or moderate knowledge to good knowledge. The study concludes that health education effectively increases pregnant women's knowledge of anemia detection and should be systematically integrated into antenatal care to prevent anemia and improve maternal health outcomes.

Keywords: Anemia Prevention; Early Detection; Health Education; Maternal Health; Pregnant Women

1. Introduction

Anemia in pregnancy remains a significant public health issue globally due to its widespread impact on the health of mothers and fetuses. Anemia is defined as a condition in which hemoglobin (Hb) levels are below the normal reference value for the stage of pregnancy, resulting in a reduced capacity of the blood to transport oxygen to body tissues. Globally, the World Health Organization reports that the prevalence of anemia in pregnant women aged 15–49 years reached approximately 35.5% in 2023, indicating that more than one-third of pregnant women worldwide still experience this condition despite various prevention programs that have been implemented (WHO, 2023). Anemia in pregnancy not only affects the mother's physical condition, such as fatigue and decreased immunity, but is also associated with an increased risk of pregnancy complications, childbirth bleeding, and fetal growth and development disorders (WHO, 2025).

From a clinical perspective, anemia in pregnant women is most often caused by iron deficiency, although other factors such as infection, chronic inflammation, and inadequate nutritional intake also play a role. In many cases, anemia develops slowly and is accompanied by nonspecific symptoms, so it often goes undetected early on. Delayed detection of anemia can cause Hb levels to decline further towards delivery, ultimately increasing the risk of maternal and perinatal morbidity. Therefore, early detection of anemia through routine Hb testing and pregnant women's understanding of the signs and risk factors for anemia are important aspects of antenatal care (WHO, 2016).

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In Indonesia, anemia in pregnant women remains a health issue that requires serious attention. Data from the 2018 Basic Health Research (Riskesdas) shows that the prevalence of anemia in pregnant women reached 48.9%, which means that nearly half of pregnant women suffer from anemia (Indonesian Ministry of Health, 2018). Although the 2023 Indonesian Health Survey (SKI) reported a decrease in prevalence to around 27.7%, this figure is still relatively high and indicates that anemia remains a relevant maternal health issue (Indonesian Ministry of Health, 2023). This condition indicates that the interventions that have been carried out so far, such as the provision of Iron-Folic Acid Tablets (IFAT), have not been fully optimal in reducing the burden of pregnancy anemia.

One of the main challenges in preventing anemia is the low level of knowledge among pregnant women about anemia, especially regarding early detection. Many pregnant women do not understand the importance of regular Hb checks, the early signs and symptoms of anemia, and the short- and long-term consequences if anemia is not treated immediately. In fact, knowledge is a predisposing factor that plays an important role in shaping health behavior. According to health promotion theory and health behavior models, increased knowledge can enhance risk perception and encourage individuals to take more proactive preventive actions, including utilizing health services and adhering to healthcare professionals' recommendations (Glanz et al., 2019).

Health education is one of the key strategies in improving pregnant women's knowledge and awareness of anemia. Effective education not only conveys information, but also helps mothers understand the clinical significance of anemia, the importance of early detection, and practical steps that can be taken to prevent and recognize anemia early on. A number of studies show that educational interventions during pregnancy can improve knowledge, attitudes, and behaviors related to anemia prevention. Research by Engidaw et al. (2024) reports that nutritional education during pregnancy significantly increases compliance with iron-folic acid supplementation and contributes to improved hemoglobin status in pregnant women. Similar findings were also reported in a study that assessed the use of educational media, such as leaflets and videos, which proved effective in increasing pregnant women's knowledge about anemia prevention (Arindra et al., 2023).

However, most previous studies have focused more on education on the prevention of anemia in general, such as nutritional fulfillment and compliance with iron supplementation, while the aspect of early detection of anemia has received relatively little attention. Early detection involves not only laboratory tests, but also the ability of pregnant women to recognize early symptoms, understand risk factors, and know when to consult a health professional immediately. This gap is the research gap in this study, especially in the context of primary health care in Indonesia, which has limited resources and varying levels of public health literacy.

Indonesia's diverse social, cultural, and geographical context also influences the effectiveness of health education. In some areas, especially remote and island regions, access to health information and laboratory tests is still limited, making the role of education even more important. Health workers, especially midwives, are in a strategic position to provide continuous and contextual education to pregnant women during antenatal visits. With adequate knowledge, pregnant women are expected to be able to play an active role in maintaining their own health and conducting early detection of anemia independently or together with health workers.

The urgency of this research is even greater when linked to the agenda of improving maternal health and reducing the risk of pregnancy complications. Early detection of anemia, supported by good knowledge, enables faster and more appropriate treatment, thereby preventing a more severe drop in Hb levels prior to delivery. In addition, increasing pregnant women's knowledge about anemia also has the potential to strengthen the success of the national anemia prevention program launched by the government.

Based on the above description, this study aims to analyze the effectiveness of education in improving knowledge of early detection of anemia in pregnant women. The results of this study are expected to contribute scientifically and practically to the development of more effective educational interventions, as well as to strengthen midwifery practices and antenatal services in the prevention of anemia in pregnant women in Indonesia.

2. Research Method

This study is a quantitative study with a pre-experimental approach that aims to analyze the effectiveness of education in increasing knowledge of early detection of anemia in pregnant women in the working area of the Galala Community Health Center. A quantitative approach was chosen because the study focused on measuring changes in knowledge scores objectively before and after the provision of educational interventions, thereby enabling statistical analysis to assess the magnitude of the effect of the education provided.

The research design used was a one-group pretest–posttest design, in which respondents were given a knowledge level assessment before the intervention (pretest), then given health education on early detection of anemia in pregnant women, and then given a re-assessment of their knowledge level after the intervention (posttest). This design is considered the most appropriate and applicable for research in primary health care because it is easy to implement, does not interfere with routine services, and is still able to describe the changes in knowledge that occur as a result of educational interventions.

The study was conducted in the working area of the Galala Community Health Center, which is a primary health care facility with a high coverage of pregnant women who actively attend antenatal services. The selection of the research location was based on considerations of respondent availability, health worker support, and the relevance of anemia in pregnant women in the area. The research period included the preparation of instruments, initial data collection (pretest), implementation of education, final data collection (posttest), and data processing and analysis.

The population in this study consisted of all pregnant women who were registered and attended antenatal visits at the Galala Community Health Center during the study period. The study sample consisted of pregnant women who met the inclusion and exclusion criteria. The inclusion criteria included pregnant women who were willing to be respondents, could communicate well, and participated in the entire series of research activities. The exclusion criteria included pregnant women who did not complete the education session or did not complete the pretest and posttest questionnaires.

The sample size in this study was determined using total sampling, whereby all pregnant women who met the inclusion criteria during the study period were included as respondents. This technique was chosen because the number of pregnant women available was relatively limited and the researchers wanted to obtain a comprehensive picture of the effectiveness of education in the target population in the Galala Community Health Center working area.

The independent variable in this study was education about early detection of anemia, while the dependent variable was the level of knowledge of pregnant women about early detection of anemia. Education was provided in the form of health counseling covering the definition of anemia, causes and risk factors of anemia in pregnancy, signs and symptoms of anemia, the importance of hemoglobin testing, and efforts for early detection and prevention of anemia. The educational media used could be leaflets, visual media, or direct delivery by researchers/health workers according to field conditions.

Knowledge levels were measured using a structured questionnaire that had been developed based on indicators of knowledge of early detection of anemia. The questionnaire was administered twice, before education (pretest) and after education (posttest). Knowledge

scores were calculated based on the number of correct answers and then categorized according to criteria established by the researchers.

The data obtained were analyzed in stages. Univariate analysis was used to describe the characteristics of respondents and the distribution of knowledge scores before and after education, including mean values, minimum values, maximum values, and standard deviations. Next, bivariate analysis was performed to assess the effectiveness of education on changes in the level of knowledge of early detection of anemia.

Prior to bivariate analysis, data normality was tested using the Shapiro–Wilk test because the sample size was less than 50 respondents. If the knowledge score data was normally distributed, the difference analysis was performed using the paired t-test. However, if the data was not normally distributed, the Wilcoxon signed-rank test was used as a non-parametric alternative test. A p-value < 0.05 was set as the statistical significance threshold.

The entire research process was conducted in accordance with the principles of health research ethics. Respondents were given an explanation of the objectives, procedures, benefits, and confidentiality of the research data, and were asked to provide written consent (informed consent) before participating. The identities of respondents were kept confidential and the data obtained was used solely for research purposes.

With this research method, it is hoped that a clear picture of the effectiveness of education in increasing knowledge of early detection of anemia in pregnant women in the Galala Community Health Center working area can be obtained, so that the research results can be used as a basis for strengthening promotive and preventive interventions in antenatal services.

3. Results And Discussion

Table 1. Demographic data.

	Var	n	F (%)
Age	< 20 years old	1	3.3
	20-35 years old	24	80.0
	>35 years old	5	16.7
Education	Elementary school	0	0
	Junior high school	1	3.3
	High School	14	46.7
	College/university	15	50.0
Employment	Housewife	15	50
	Farmer	4	13.3
	Private employee	10	33.3
	Government employee	1	3.3
Parity	0	12	40.0
	1	12	40.0
	2	6	20.0
Knowledge before	Poor	6	20.0
	Moderate	23	76.6
	Good	1	3.3
Knowledge after	Poor	0	0
	Moderate	10	33.3
	Good	20	66.7
Total		30	100

(source: primary data, 2025).

This study involved 30 pregnant women in the Galala Community Health Center working area. Respondent characteristics were presented based on age, education level,

occupation, parity, and level of knowledge about early detection of anemia before and after education.

Based on age group, most respondents were in the 20–35 age range, namely 24 people (80.0%), which is the ideal reproductive age. Respondents aged >35 years numbered 5 (16.7%), while respondents aged <20 years numbered only 1 (3.3%). This distribution shows that the majority of pregnant women are in the age group that is biologically relatively more prepared for pregnancy, although there are still respondents in the risk age group.

In terms of education level, almost half of the respondents had a college education, namely 15 people (50.0%), followed by 14 people (46.7%) with a high school education. Only 1 respondent (3.3%) had a junior high school education, and there were no respondents with an elementary school education. The high proportion of respondents with upper secondary education indicates good health literacy potential, which can influence the acceptance and understanding of the educational material provided.

Based on employment status, half of the respondents were housewives, totaling 15 people (50.0%). Respondents who worked as private employees numbered 10 (33.3%), farmers numbered 4 (13.3%), and civil servants numbered 1 (3.3%). This variation in employment status reflects diverse socioeconomic backgrounds, which can influence access to information and health experiences of pregnant women.

The parity characteristics show that there were 12 respondents (40.0%) with parity 0 (never given birth) and parity 1, while there were 6 respondents (20.0%) with parity 2. There were no respondents with parity ≥3. This indicates that most pregnant women are in the early stages of pregnancy and childbirth, which may affect their need for information and education related to pregnancy health, including early detection of anemia.

The level of knowledge of pregnant women about early detection of anemia before education showed that most respondents were in the moderate knowledge category, namely 23 people (76.6%). Respondents with poor knowledge numbered 6 people (20.0%), while only 1 person (3.3%) had good knowledge. This condition indicates that before the educational intervention, the majority of pregnant women did not have an optimal understanding of early detection of anemia.

After receiving health education, there was a clear change in the respondents' level of knowledge. There were no longer any respondents in the low knowledge category (0%). Some respondents were in the moderate knowledge category, namely 10 people (33.3%), while the majority of respondents improved to the good knowledge category, namely 20 people (66.7%). The increase in the proportion of good knowledge after education shows that the educational intervention provided was effective in improving pregnant women's understanding of early detection of anemia.

Overall, these results indicate a shift in the knowledge level of pregnant women from the low and moderate categories to the good category after receiving education. These findings provide a strong basis for further statistical analysis to assess the effectiveness of education in inferentially improving knowledge of early detection of anemia in pregnant women in the Galala Community Health Center working area.

Table 2. Logistic regression analysis for implant contraception interest.

Independent variable	N	P Value	Dependent variable
Knowledge before	30	0.000	Knowledge after
		Wilcoxon	

*significant (source: primary data, 2025)

To determine the effectiveness of education in improving knowledge of early detection of anemia in pregnant women, an analysis of the difference in knowledge levels before and after the intervention was conducted. Based on the results of the normality test, the knowledge score data did not meet the assumption of normal distribution, so the

difference analysis was performed using the Wilcoxon signed-rank test, which is a non-parametric test for paired data.

The Wilcoxon test results showed a p-value of 0.000 ($p < 0.05$), which means that there was a statistically significant difference between the knowledge levels of pregnant women before and after receiving education. These findings indicate that the education provided had a significant effect on increasing pregnant women's knowledge about early detection of anemia.

Practically speaking, these results reinforce descriptive findings that show a shift in knowledge levels from low and moderate categories before education to good categories after education. Thus, it can be concluded that health education is an effective intervention for improving pregnant women's understanding of early detection of anemia in the Galala Community Health Center working area.

Discussion

This study shows that health education provided to pregnant women in the Galala Community Health Center working area is effective in increasing knowledge about early detection of anemia. This is evidenced by a significant difference between the level of knowledge before and after education based on the Wilcoxon test ($p = 0.000$). Descriptively, there was a clear shift from a predominance of moderate and poor knowledge categories before education to a predominance of good categories after education. These findings confirm that structured education can address the information gap that has been one of the main obstacles in efforts to prevent anemia in pregnancy.

Increased knowledge after education can be explained through the mechanism of cognitive change that occurs when individuals receive relevant, contextual, and systematically delivered information. In the context of pregnancy, knowledge about anemia—including its definition, signs and symptoms, risk factors, and the importance of hemoglobin testing—is an important basis for pregnant women to recognize their health condition early on. A study by McLean et al. (2017) states that an increase in maternal health knowledge is significantly correlated with increased awareness of pregnancy risks, including anemia, thereby encouraging more optimal use of health services.

The results of this study are in line with various previous studies that emphasize the role of education in increasing pregnant women's knowledge about anemia. Research by Abu-Baker et al. (2020) shows that health education provided during antenatal care significantly increases pregnant women's knowledge and awareness of anemia and its prevention. Another study by Yilmaz et al. (2019) also reported that educational interventions based on individual and group counseling were able to increase pregnant women's knowledge and attitudes regarding the detection and prevention of anemia. The similarity of these results reinforces the evidence that education is a consistently effective intervention in various health service contexts.

From a health behavior theory perspective, these findings can be explained through the Health Belief Model (HBM), which states that increased knowledge will influence individuals' perceptions of their vulnerability and the severity of a disease, as well as the benefits of preventive measures (Rosenstock et al., 2018). In this study, education played a role in increasing pregnant women's understanding of the risks of anemia and the importance of early detection, thereby strengthening their perception of the benefits of Hb testing and regular consultations. In addition, Social Cognitive Theory emphasizes that knowledge is a prerequisite for the formation of self-efficacy, which ultimately influences health behavior (Bandura, 2016). With increased knowledge, pregnant women are expected to be more confident in recognizing the symptoms of anemia and taking appropriate action.

However, the results of this study also show that not all respondents achieved an optimal level of knowledge after education, as evidenced by the fact that there were still respondents in the moderate knowledge category. This finding indicates that knowledge

improvement does not always occur uniformly in every individual. Several factors that may influence this include differences in education levels, previous pregnancy experiences, individual comprehension, and the intensity and methods of delivering education. Research by Kaur et al. (2021) states that sociodemographic factors and personal experiences can affect the effectiveness of health education for pregnant women.

In addition, the duration and frequency of education also play an important role. One-time education, although effective in increasing general knowledge, may not be sufficient to ensure in-depth understanding among all pregnant women. This is in line with the findings of a systematic review by Lassi et al. (2020), which states that health education that is conducted repeatedly and integrated into antenatal services tends to have a greater and more sustainable impact on the knowledge and behavior of pregnant women.

The clinical implications of this study are quite important for midwifery practice and primary health care. Education on early detection of anemia has been proven to increase the knowledge of pregnant women, thereby potentially accelerating the identification of anemia and encouraging earlier treatment. With improved knowledge, pregnant women are expected to be more compliant in undergoing Hb tests, taking iron supplements as recommended, and seeking immediate consultation if they experience signs or symptoms of anemia. This aligns with midwifery practice recommendations that emphasize a promotive and preventive approach as an integral part of antenatal care (Renfrew et al., 2018).

For health workers, especially midwives at community health centers, the results of this study provide a scientific basis for systematically integrating early anemia detection education into every antenatal visit. Education tailored to the characteristics of pregnant women and supported by appropriate media has the potential to increase the effectiveness of anemia prevention programs. In addition, this educational approach is relatively easy to implement, low cost, and appropriate for the context of primary health care in Indonesia.

Overall, this study shows that health education is an effective intervention in increasing knowledge of early detection of anemia in pregnant women. However, it is necessary to strengthen educational strategies through repeated approaches, varied methods, and adjustments to target characteristics so that knowledge improvement can be more equitable and sustainable. Further research is recommended to evaluate the impact of this knowledge improvement on behavioral changes and clinical anemia status.

4. Conclusion

This study concluded that health education provided to pregnant women had a significant effect on increasing knowledge of early detection of anemia in the Galala Community Health Center working area. The results of the analysis showed a significant difference between the level of knowledge before and after education, confirming that education is an effective promotive-preventive intervention in increasing pregnant women's understanding of anemia. Although some respondents have not yet reached an optimal level of knowledge, in general, education has been able to shift knowledge from the poor and moderate categories to the good category. These findings emphasize the importance of systematically integrating early detection of anemia education into antenatal services in order to increase the awareness of pregnant women, accelerate the identification of anemia risk, and support efforts to prevent pregnancy complications.

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References

Arindra, B. P., et al. (2023). Counseling as an effort to prevent anemia in pregnant women. Indonesian Nutrition Media.

Engidaw, M. T., et al. (2024). Effect of nutrition education during pregnancy on iron–folic acid supplementation and anemia outcomes. BMC Pregnancy and Childbirth.

Glanz, K., Rimer, B. K., & Viswanath, K. (2019). Health behavior: Theory, research, and practice. Jossey-Bass.

Ministry of Health of the Republic of Indonesia. (2018). Riskesdas 2018. Jakarta.

Ministry of Health of the Republic of Indonesia. (2023). Indonesian Health Survey 2023. Jakarta.

World Health Organization. (2016). WHO recommendations on antenatal care for a positive pregnancy experience. Geneva.

World Health Organization. (2023). Anaemia in women and children: prevalence estimates. Geneva.

World Health Organization. (2025). Anaemia: Fact sheet. Geneva.

Abu-Baker, N. N., et al. (2020). Effect of antenatal health education on knowledge of anemia among pregnant women. Journal of Maternal-Fetal & Neonatal Medicine, 33(18), 3104–3110.

Bandura, A. (2016). Social foundations of thought and action: A social cognitive theory. Prentice Hall.

Kaur, S., et al. (2021). Determinants of effectiveness of health education among pregnant women. BMC Pregnancy and Childbirth, 21, 312.

Lassi, Z. S., et al. (2020). Impact of health education on maternal outcomes: A systematic review. Reproductive Health, 17, 67.

McLean, E., et al. (2017). Worldwide prevalence of anemia in women. Public Health Nutrition, 20(12), 2170–2181.

Renfrew, M. J., et al. (2018). Midwifery and quality care. The Lancet, 392(10148), 1129–1145.

Rosenstock, I. M., et al. (2018). The Health Belief Model revisited. Health Education & Behavior, 45(1), 3–14.

Yilmaz, D., et al. (2019). The effect of education on anemia knowledge in pregnancy. International Journal of Nursing Practice, 25(6), e12787.

WHO. (2019). WHO guideline on use of iron supplementation in pregnancy. Geneva.

WHO. (2021). Improving antenatal care quality. Geneva.

Ministry of Health of the Republic of Indonesia. (2020). Integrated antenatal care guidelines. Jakarta.

Sarkar, M., et al. (2019). Knowledge and awareness of anemia among pregnant women. Journal of Family Medicine and Primary Care, 8(11), 3635–3640.