ORIGINAL RESEARCH ARTICLE

Empowering Community Health Volunteers as a Strategy to Prevent Anemia in Pregnant Women: A Quasi-Experimental Study

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ABSTRACT

Background: Pregnancy anemia is a significant public health issue causing postpartum hemorrhage, premature birth, and low birth weight. Empowering community health volunteers could improve compliance and improve hemoglobin levels.

Methodology: The study investigates the impact of community health volunteer's empowerment on adherence to iron supplement tablets tablet consumption and hemoglobin levels. the sample size is 62 third-trimester pregnant women (31 per group) for precision standard care using only the Maternal and Child Health book without cadre assistance. The Morisky Medication Adherence Scale-8 questionnaire was used to assess compliance. Data analysis included Chi-square and Paired Sample T test.

Results: Adherence to blood tablet consumption increased significantly in the intervention group compared to the control group with a significant value of p <0.001. Hemoglobin levels also increased significantly (p-value = 0.001), and adherence to the consumption of iron supplement tablets influenced hemoglobin levels (p-value = 0.003).

Conclusion: Empowering cadres in primary health facilities is effective in increasing compliance with iron supplement tablets tablet consumption, which impacts hemoglobin levels in third-trimester pregnant women.

Keywords: Community health volunteers' empowerment, Iron supplement tablets, Adherence, Hemoglobin, Anemia, Pregnant women

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INTRODUCTION

Anemia in pregnancy is a medical condition characterized by hemoglobin levels <11 g/dL in the first and third trimesters and <10.5 g/dL in the second trimester, as defined by World Health Organization.[1] This condition has a profound impact on maternal and fetal health, including an increased risk of postpartum hemorrhage, premature birth, low birth weight babies (LBW), and maternal and neonatal death.[2] Iron supplement tablets are the main pharmacological intervention for the prevention and treatment of iron deficiency anemia in pregnancy. Iron supplement tablets generally contain ferrous sulfate (Fe^{2+}), a form of iron that is easily absorbed by the body, often combined with folic acid or vitamin C to improve absorption.[3]

Absorbed iron is bound by transferrin and taken to the bone marrow for erythropoiesis or red blood cell formation.[4] The mechanism of action of iron supplement tablets is systemic and integrated, from absorption to hemoglobin synthesis in the bone marrow.[5] thus, becoming an important scientific basis in community-based anemia control. One source of iron in pregnant women is iron supplement tablets.

In Indonesia, although iron supplement tablets have become part of antenatal care, the compliance rate among pregnant women is still low.[6] The prevalence of anemia among pregnant women remains a significant public health issue, with a 2018 national survey (Riskesdas) reporting a rate of 48.9%. This figure represents an increase from the 37.1% reported in 2013.[7] While the government's program aims for 90% coverage for iron supplementation, studies indicate that low adherence to the recommended dosage of at least 90 tablets per pregnancy is a significant issue.[8] A 2018 report found that only 38.1% of Indonesian pregnant women consumed iron tablets as recommended. The 2017 Indonesian Health Demographic Survey (IDHS) reported that 13% of pregnant women did not consume iron tablets at all, and 29.4% consumed fewer than 60 tablets.[9] A study published in 2022 found that 60.9% of noncompliance with iron intake could be attributed to poor quantity and quality of antenatal care, low socioeconomic status, and living in rural areas. A more recent study from 2023 on young pregnant women aged 15-24 in Indonesia found that the prevalence of anemia was 36.2%.[10]

Empowering health community health volunteers as an extension of formal health workers has the potential to bridge the education and assistance gap.[11] Health community health volunteers play a strategic role in primary care as a link between the community and health workers, especially in maternal and child health programs. They act as promotive-preventive agents through education, behavior monitoring, and referral facilitation. The effectiveness of this role is supported by community health volunteers, which showed an increase in adherence to iron supplement tablets consumption in pregnant women through community health volunteers assistance while confirming the important role of community health volunteers in anemia education and prevention.[12]

Through interpersonal approach and social closeness, community health volunteers can build personalized and contextually relevant communication, thus encouraging motivation and adherence of pregnant women to take iron supplement tablets regularly. Therefore, community health volunteers are a key element in community interventions to reduce the prevalence of pregnancy anemia. This study aims to evaluate the effect of community health volunteer's empowerment on adherence to taking iron supplement tablets and increasing hemoglobin levels in third-trimester pregnant women. The intervention was conducted through community health volunteers training and scheduled monitoring, which offers a comprehensive approach and is not yet a common practice in the study area. The results of the study are expected to support the formulation of evidence-based policies related to optimizing the role of community health volunteers in the prevention of pregnancy anemia. We hypothesized that community health volunteers have a significant positive influence on increasing compliance with iron supplement tablet consumption and hemoglobin levels in pregnant women in the third trimester.

METHODOLOGY

Research design and location: This study was a quasi-experimental study with a pretest-posttest control group design to investigate the effect of empowering community health volunteers on preventing anemia in pregnant women. The study was conducted in two community health center working areas, namely Ayamaru Selatan community health center and Ayamaru Timur community health center, Maybrat Regency, Southwest Papua Province, Indonesia. The research was conducted for 4 months, from February to June 2025.

Population and sample: The population in this study were all third-trimester pregnant women in the working area of the two health centers. The sample size was 62 respondents, divided into two groups, namely 31 people in the intervention group from the Ayamaru Selatan Health Center area and 31 people in the control group from the Ayamaru East Health Center area. The formula used in this study is clinical judgment paired with numerical analytical research. Here is the form of the formula:

$$n1 = n2 = 2\left(\frac{(Z_\alpha + Z_\beta)S}{X_1 - X_2}\right)$$

Where,

n1: Minimum sample size for the intervention group
n2: Minimum sample size for the control group
Zα: Type I error (set at 1.96)

Zβ: Type II error (set at 0.842)
X1−X2: Clinical judgment, defined clinical difference (1.25)
S: Frozen deviation between the two groups (1.30)

The calculated sample size for both the groups was 30.77 rounded to 31 (n1=n2=31.77≅31). The sampling technique was carried out by purposive sampling with the following inclusion and exclusion criteria:

Inclusion criteria: Pregnant women with gestational age 28-36 weeks, Willing to follow the entire series of interventions and provide informed consent, diagnosed with mild to moderate anemia Hb between 8-10.9 g/dL, Pregnant women who are not compliant in taking iron tablets, defined as pregnant women with a Morisky Medication Adherence Scale-8 (MMAS-8) score that indicates a low level of compliance.

Exclusion criteria: Pregnant women with pregnancy complications such as preeclampsia, hemorrhage, or severe comorbidities, mothers with multiple pregnancies (twins or more), did not attend more than 3 community health volunteers visits during the intervention period.

Intervention procedure: The intervention group received assistance from trained community health volunteers and used the Maternal and Child Health book as an educational tool. Assistance was provided for 8 weeks with scheduled home visits every week. Intervention materials included education on anemia, proper consumption of iron supplement tablets, nutritional support, and monitoring adherence and hemoglobin levels. Each community health volunteers was responsible for assisting five pregnant women.
The control group only received basic education through the Maternal and Child Health book without community health volunteers' assistance. There was no direct interaction between researchers or community health volunteers with the control group, to maintain the validity of the comparison. The education components can be seen in Table 1.

Table 1: Follow-up mechanism comparison of health education between intervention and control groups

Education Component	Intervention Group	Control Group
Assistance Method	Direct face-to-face by community health volunteers through weekly home visits	No direct assistance
Intervention Duration	8 weeks (1 time/week)	Only during the initial visit
Education Media	MCH book + interpersonal communication + direct monitoring by community health volunteers	MCH book only
Education Materials	Anemia and its risks, Correct consumption of iron supplement tablets, Nutritional support, Management of Iron supplement tablet side effects	Only basic information in the Maternal and Child Health book
Compliance Monitoring	Yes (by community health volunteers, recorded weekly)	No
Hemoglobin Level Measurement	Yes (pre-post intervention, monitored by community health volunteers and researchers)	Yes (pre-post intervention, only by researcher)
Social Approach and Motivation	Yes (personal approach, motivation, two-way discussion)	No
Community health volunteers per Respondent Ratio	1 community health volunteers assisted 5 pregnant women	Not applicable

Table 2: Pearson correlation matrix between statement items on the compliance instrument (MMAS-8)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Q1	1.000	0.733**	0.802**	0.471**	0.668**	0.424*	0.680**	0.302
Q2	0.733**	1.000	0.802**	0.740**	0.935**	0.566**	0.816**	0.452*
Q3	0.802**	0.802**	1.000	0.683**	0.741**	0.520**	0.764**	0.413*
Q4	0.471**	0.740**	0.683**	1.000	0.800**	0.666**	0.659**	0.537**
Q5	0.668**	0.935**	0.741**	0.800**	1.000	0.614**	0.873**	0.494**
Q6	0.424*	0.566**	0.520**	0.666**	0.614**	1.000	0.577**	0.533**
Q7	0.680**	0.816**	0.764**	0.659**	0.873**	0.577**	1.000	0.431*
Q8	0.302	0.452*	0.413*	0.537**	0.494**	0.533**	0.431*	1.000

Notes: Q1-Q8 are items in the MMAS-8-based blood tablet adherence instrument, (*) is a significant value at $p < 0.005$, (**) is a value at $p < 0.01$ (2-tailed).

Instruments and measurements: The main instrument to measure adherence to iron supplement tablets consumption was the Morisky Medication Adherence Scale-8 (MMAS-8)[13] which has been translated and validated in Bahasa Indonesia. The MMAS-8 score categorizes respondents into high, moderate, or low adherence. Adherence is defined by the percentage of tablets consumed, with a person considered adherent if the percentage exceeds 80% of the minimum standard. The validity and reliability of the instrument were tested before the implementation of the intervention. Hemoglobin levels were measured twice pre- and post-intervention using a digital hemoglobinometer, Family Dr Easy Touch GCHb, through the finger prick method or capillary blood test.

Validity and reliability test: A validity test was conducted by correlation between items using Pearson Product Moment, while reliability was tested using Cronbach Alpha. The MMAS-8 instrument was declared valid and reliable with an α value > 0.70. Details of the data can be seen in Table 2 and 3.

Table 3: Reliability of the MMAS-8-based blood tablet adherence instrument

Indicator	Value
Cronbach's Alpha	0.934
Number of Statement Items	8

Instrument validity tests were conducted using Pearson correlations between items on the MMAS-8 instrument. Results showed that most items were significantly correlated with each other ($p < 0.01$), indicating strong construct validity. Furthermore, the reliability test resulted in a Cronbach's Alpha value of 0.934, indicating a very high internal consistency and reliability of the instrument in measuring adherence to the consumption of iron supplement tablets.

Research ethics: This study has received recommendations for ethical approval from the Research Ethics Commission of the Faculty of Public Health, Hasanuddin University, Makassar, according to letter number 248/UN4.14.1/TP.01.02/2025, dated February 10, 2025. The research protocol with the number 1225092031 was reviewed through the expedited review procedure and declared ethically feasible to be implemented. All participants provided written informed consent before being involved in the study. Data confidentiality and participant rights are guaranteed during and after the research process.

Data analysis: Data were analyzed using SPSS version 26.0. Univariate analysis was used to describe the characteristics of respondents. Bivariate analysis was performed using the Chi-Square Test to see group compliance differences. Paired sample T test and independent sample T test to compare hemoglobin levels between groups because the data were not normally distributed, and the significance level was set at $p < 0.05$.

RESULTS

The data analysis presented in this section is based on data collected post-intervention for all research participants. This section describes the results of the study based on data analysis from two study groups, namely the intervention group that received assistance from community health volunteers along with the utilization of Maternal and Child Health books, and the control group that only received Maternal and Child Health (MCH) books without assistance. The findings are organized coherently including the profile of respondents, the level of adherence to iron supplement tablets consumption in each group, changes in hemoglobin levels before and after the intervention, and the relationship between adherence to iron supplement tablets consumption and hemoglobin levels. All analyses were aimed at assessing the extent to which the effectiveness of community health volunteers mentoring contributed to increased adherence and improved hemoglobin status in third-trimester pregnant women.

Respondent characteristics: A total of 62 third-trimester pregnant women participated in this study, 31 each in the intervention and control groups. Most respondents were between 20-35 years old, married, and had primary to secondary-level education. There were no significant differences in demographic characteristics between the two groups ($p > 0.05$), so the two groups could be compared equally. Details of the data can be seen in Table 4.

The distribution of respondent characteristics in both groups was relatively balanced. Most respondents were not working, with similar proportions in the intervention (29.0%) and control (32.3%) groups ($p = 0.678$). The education level was dominated by the middle category (junior high school/high school), and there was no significant difference between groups ($p = 0.425$). The distribution of socioeconomic status was also balanced, with almost half of the respondents in each group in the income category at or above the minimum wage ($p = 0.442$). Based on parity, primiparas dominated both groups, and the difference in the parity category was also not significant ($p = 0.439$). Overall, there were no significant differences in baseline characteristics between the intervention and control groups, indicating that both groups had equivalent baseline conditions before the intervention.

Comparison of adherence to blood addition tablet consumption: Further analysis was conducted to evaluate the impact of the intervention on iron supplement tablets adherence. Adherence to iron supplementation is a key indicator of intervention success as it directly contributes to improvements in the hemoglobin status of pregnant women. This

evaluation was conducted to determine the extent to which community health volunteers mentoring influenced changes in respondents iron supplement tablets consumption behavior during the intervention period. The results of the following adherence analysis presenting the comparison between the two groups after the eight-week intervention was implemented can be seen in Table 5.

Table 4: Distribution of Respondent Characteristics by Intervention and Control Groups

Respondent Characteristics	Intervention Community health volunteers' assistance and MCH book N (%)	Control MCH Book N (%)	P Value
Occupation			
Not Employed	18 (29,0)	20 (32,3)	0.678
Employed	13 (21,0)	11 (17,7)	
Education			
Low Education (not yet graduated from elementary school)	12(19.4)	11(17.7)	0.425
Medium education (completed junior high school or high school)	15(24.2)	12(19.4)	
Higher education (undergraduate)	4(6.5)	8(12.9)	
Social Economy			
Per the minimum wage	15(24.2)	12(19.4)	0.442
Non-minimum wage	16(25.8)	19(30.6)	
Parity			
Primiparous	15(24.2)	15(24.2)	0.439
Multiparous	11 (17.7)	14(22.6)	
>4 births	5 (8.1)	2(3.2)	

Source: Chi-square test

Table 5: Adherence to iron supplement tablets consumption in intervention and control groups

Adherence to iron tablets consumption	Intervention Group (%)	Control Group (%)	p-value
Compliant	31 (100)	2 (6.5)	< 0,001
Non-compliant	0 (0)	29 (93.5)	

Source: Chi-square test

Table 6: Comparison of Hemoglobin Levels between Intervention and Control Groups

Group	Mean ± SD	Min-Max	Increase (g/dL)	p-Value
Intervention				
Pretest	10.3 ± 0.5	9.2 - 11.2	0.9	0.001
Posttest	11.2 ± 0.6	10.1 - 12.4		
Control				
Pretest	10.2 ± 0.5	9.1 - 11.1	0.1	0.084
Posttest	10.3 ± 0.5	9.2 - 11.0		

Source: Paired T-test

Adherence to taking iron supplement tablets was significantly higher in the intervention group compared to the control group. All participants who received community health volunteers' assistance showed 100% full compliance, while only 6.5% of respondents in the control group were compliant. The chi-square test confirmed this difference was statistically significant at p <0.001. These results indicate the effectiveness of the community health volunteers-based approach in modifying the consumption behavior of iron supplement tablets in third-trimester pregnant women, which has direct implications for efforts to reduce pregnancy anemia. there were no statistically significant differences in baseline characteristics, including adherence and hemoglobin levels, between the intervention and control groups.

Comparison of hemoglobin level before and after intervention: After analyzing that the community health volunteers intervention was effective in improving adherence to blood tablet consumption, the evaluation continued on the physiological aspect which is a direct indicator of program success, namely hemoglobin levels. Increased hemoglobin levels reflect improvements in the anemia status of pregnant women and are an important outcome of community-based interventions. Therefore, the following analysis focuses on the comparison of hemoglobin levels before and after the intervention, to assess the real impact of community health volunteers' assistance on the hemoglobin status of third-trimester pregnant women. The data can be seen in Table 6.

Changes in hemoglobin levels before and after intervention in both groups. In the intervention group, the mean hemoglobin level increased from 10.3 ± 0.5 g/dL (range 9.2-11.2) at pretest to 11.2 ± 0.6 g/dL (range 10.1-12.4) at posttest, with a mean increase of 0.9 g/dL. Statistical test results showed that the increase was statistically significant (p = 0.001). In contrast, in the control group, the mean hemoglobin level only increased from 10.2 ± 0.5 g/dL (range 9.1-11.1) to 10.3 ± 0.5 g/dL (range 9.2-11.0), with a very small increase of 0.1 g/dL and not statistically significant (p = 0.084).

Relationship between blood additive tablet consumption compliance and hemoglobin levels in third trimester pregnant women: After being analyzed separately, both iron supplement tablets consumption compliance and hemoglobin levels showed a significant increase in the intervention group. To corroborate the relationship between behavioral

changes and physiological outcomes, further analysis focused on the relationship between the level of adherence and hemoglobin levels. This relationship is important to ensure that improvements in hemoglobin status do not occur by chance, but are a direct result of changes in iron supplementation consumption behavior. This analysis provides empirical evidence for the role of adherence as a key determinant of the success of community health volunteers-based interventions in addressing pregnancy anemia. The data can be seen in Table 7.

Table 7: Relationship between Iron supplement tablets consumption compliance and hemoglobin levels

Adherence to blood addition tablet consumption	Hb (g/dL) Mean ± SD
Compliant	11,2 ± 0,6
Non-compliant	10,3 ± 0,5

Source: Independent sample T test, P value 0.003

Analysis of the relationship between adherence to taking iron supplement tablets and hemoglobin levels showed statistically significant results. The average hemoglobin level of respondents who were compliant with taking iron supplement tablet was higher at 11.2 ± 0.6 g/dL, compared to those who were not compliant, which only reached 10.3 ± 0.5 g/dL. The Independent sample T test showed a p-value = 0.003, indicating that the difference was statistically significant. This finding confirms that adherence to iron supplement tablet consumption has a significant contribution to the increase in hemoglobin levels of third-trimester pregnant women. Thus, adherence is not only a behavioral indicator but also plays a direct role as a physiological determinant in efforts to prevent pregnancy anemia.

DISCUSSION

This study was conducted to assess the extent to which community health volunteer's empowerment can contribute to increasing adherence to taking iron supplement tablets and improving hemoglobin levels in third-trimester pregnant women. The intervention was designed through an educative approach facilitated by trained health community health volunteers and conducted systematically. Findings showed that this approach had a significant impact on changes in health behaviors and physiological conditions of mothers. To clarify the pathways of influence of the intervention, this section presents a discussion of each main finding in a structured manner, starting from the characteristics of the respondents, the level of adherence to the consumption of iron supplement tablets, to changes and linkages in hemoglobin levels. Each aspect is critically analyzed concerning theory and the results of previous studies, to strengthen the relevance of the findings and encourage the implementation of similar approaches in public health practice.

A study reveals that community health volunteers can significantly increase pregnant women's adherence to iron supplementation and improve their hemoglobin levels, contributing to the UN's Sustainable Development Goals and the World Health Organization's targets. The study aims to halve the prevalence of anemia among women of reproductive age and reduce anemia among women of reproductive age by 50% by 2030. The study also reveals that a community-based approach can achieve 100% compliance in the intervention group, highlighting the importance of leveraging community health workers as a link between formal healthcare systems and the community to improve health outcomes.[14]

The balance of baseline characteristics between intervention and control groups is crucial to ensure internal validity. A balanced baseline distribution allows the causal relationship between intervention and control to be analyzed more objectively. In this study, there were no significant differences in the variables of gestational age, education level, economic status, and parity at p >0.05, indicating that the results obtained can be attributed directly to the influence of the community health volunteers intervention. Treatment adherence is strongly influenced by social support, knowledge, and belief in the intervention.[15,16]

The Health Belief Model (HBM) states that perceptions of benefits, barriers, and cues to action influence adherence to health behaviors. In this study, the involvement of community health volunteers as educational agents and monitors acted as a strong cue to action, leading to 100% adherence in the intervention group.[11,17,18] Health community health volunteers effectively bridge the communication gap between health workers and communities, where community-based interventions tend to be more accepted as they involve close interpersonal relationships.[19,20]

The significant increase in hemoglobin levels in the intervention group supports the physiological pathway of iron in the body. Based on the biochemical hematology theory, iron supplementation will increase heme formation in bone marrow erythroblasts, ultimately increasing hemoglobin levels.[1,21] This process is only effective if iron is consumed consistently and in sufficient amounts.[22] Therefore, the success of increasing hemoglobin levels in this study reflects the success of the community health volunteers mentoring strategy in ensuring adherence to the consumption of iron supplement tablets. In addition, this approach also reflects the promotive-preventive principle in public health care, which prioritizes educative efforts and simple but effective interventions to prevent long-term complications.[23,24] The significant relationship between the level of adherence to taking iron supplement tablets and hemoglobin levels (p = 0.003) proves the close relationship between behavior and clinical outcomes. Health behavior is influenced by intentions

formed by attitudes, subjective norms, and behavioral control. The assistance of community health volunteers plays a role in shaping social norms and behavioral control, thus encouraging pregnant women to comply with iron supplement tablets consumption recommendations.[25] community-based interventions involving local actors, such as community health volunteers, can significantly increase the success of iron supplementation programs.[26] These results reinforce the effectiveness of community health volunteer's empowerment strategies and emphasize the importance of behavior-based approaches in anaemia management.

In addition, the community health volunteers-based approach in this study successfully improved behavioral and physiological indicators and reflected the effectiveness of contextual, social, and participatory interventions.[27] The role of community health volunteers as agents of behavior change cannot be separated from the concept of community empowerment in Pender's Health Promotion Model theory, which emphasizes the importance of social support, increasing the ability of individuals to make health decisions and active community involvement in health promotion.[28] As community members with social and cultural closeness to pregnant women, Community health volunteers can carry out the function of educators and motivators more effectively due to mutual trust and common background.[29] Intense interpersonal interactions between community health volunteers and pregnant women act as interpersonal influence, one of the critical determinants in this theory that encourages sustainable behavior change.[30]

This finding also aligns with Bandura's Social Cognitive Theory principles, which states that learning and adopting new behaviors can occur through observation and social experience.[31] Community health volunteers not only deliver information but also provide examples, build self-efficacy, and create a social environment that supports healthy behaviors, such as regular consumption of iron supplement tablets.[32] Thus, the effect of this intervention is not merely instructional but transformational, as it facilitates change through increased perceived control and positive reinforcement from the surrounding environment.

However, in the context of the evolving dynamics of primary health care, these conventional mentoring strategies still have room for further development. For example, integrating simple communication technologies such as text message reminders, adherence monitoring applications, or community health volunteers-based digital reporting can strengthen monitoring systems and expand the reach of interventions.[26,33] A hybrid approach that combines the strengths of community health volunteers' interpersonal relationships with information technology support can improve program efficiency, effectiveness, and sustainability by integrating Short Message reminders through apps like mHealth.[34-36] In other words, although the results of this intervention show a positive impact, further studies with innovative models and long-term designs are needed to evaluate the stability of the intervention impact and the readiness of the community to adopt more adaptive approaches in the future.

Strengths and Limitations

The results of this study strengthen the effectiveness of community-based interventions in tackling pregnancy anemia by optimizing the role of health community health volunteers. The strength of this study also lies in the high reliability of MMAS-8 (α=0.934), which enhances measurement validity. This systematic, eight-week community health volunteers mentoring model, which was shown to increase adherence to iron supplement tablets consumption and markedly improve hemoglobin levels. Unlike the passive education approach in previous studies, this model combines education, monitoring, and intensive social interaction to promote more sustainable behavior change. The use of community health volunteers as intervention agents also makes this strategy clinically effective, efficient, and easy to adopt in areas with limited health workers. These findings support the integration of community health volunteers' programs in primary care and provide a basis for strengthening policies on training and mentoring community health volunteers for successful maternal health programs.

The study on iron supplementation has limitations, including a quasi-experimental design, a short 8-week intervention duration, and a small sample size from only two centers. These factors could have influenced outcomes, such as the intervention group's higher baseline motivation for health improvement. The lack of randomization and blinding of assessors could also introduce bias. The study's findings are not generalizable due to the lack of randomization and the risk of confounding factors. Additionally, the study did not explicitly integrate theoretical frameworks like the Health Belief Model into its design, which limits a deeper understanding of psychological and social factors influencing pregnant women's decisions. There is also no specific data on side effects or adverse events from consuming iron supplements. Future research could focus on integrating health behavior theories to design more comprehensive and effective interventions.

Conclusion

Empowerment of health community health volunteers effectively improved adherence to iron supplement tablets consumption and hemoglobin levels in third-trimester pregnant women. Interventions conducted through direct education, scheduled monitoring, and community health volunteers' interpersonal approaches succeeded in encouraging signifi-

cant changes in the health behavior of pregnant women. This community-based approach can be an efficient and sustainable intervention strategy to reduce the prevalence of anemia in pregnancy, especially in rural Indonesian settings with limited health workers. The study recommends mandatory community health volunteers training in national antenatal programs, including educational materials on anemia, behavior monitoring, and referral facilitation. community health volunteer's empowerment is effective in increasing adherence to iron tablet consumption and hemoglobin levels in pregnant women.

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