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The Effect of Information, Education, and Communication on Compliance with Multiple Micronutrient Supplements Consumption in Pregnant Women

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Abstract:
Multiple micronutrient supplements (MMS) are widely recommended during pregnancy to prevent anemia and improve maternal nutritional status. Despite their proven benefits, adherence to MMS intake among pregnant women remains suboptimal, contributing to the persistently high prevalence of maternal anemia in many low- and middle-income countries. Effective Information, Education, and Communication (IEC) delivered by health workers may play a crucial role in improving maternal knowledge and adherence to supplementation. This study aimed to examine the association between the quality of IEC provided by health workers and compliance with MMS consumption among pregnant women. A cross-sectional study was conducted involving 30 pregnant women selected through a total sampling method. Data were collected using validated and reliable questionnaires measuring the quality of IEC and adherence to MMS intake. Descriptive statistics were used to summarize participant characteristics, and the association between IEC quality and MMS compliance was analyzed using the Chi-square test. Odds ratios (OR) were calculated to estimate the strength of the relationship. The majority of respondents received high-quality IEC (63.3%), and 66.7% of pregnant women reported compliance with MMS consumption. Statistical analysis revealed a significant association between IEC quality and MMS compliance ($p = 0.012$). Pregnant women who received high-quality IEC were 10.5 times more likely to adhere to MMS intake compared with those who received poor-quality IEC (OR = 10.5). The quality of Information, Education, and Communication (IEC) significantly influences pregnant women's compliance with MMS consumption. Strengthening structured, interactive, and continuous IEC during antenatal care is recommended to improve adherence to supplementation and ultimately enhance maternal nutritional outcomes.

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INTRODUCTION

Anemia during pregnancy remains a major global public health concern and contributes substantially to maternal and neonatal morbidity and mortality (Obeagu & Obeagu, 2025). Maternal anemia is associated with adverse outcomes such as preterm birth, low birth weight, impaired fetal growth, and increased risk of maternal complications during delivery (Kabir et al., 2022). To address micronutrient deficiencies during pregnancy, the use of Multiple Micronutrient Supplements (MMS) has been increasingly recommended as a more comprehensive intervention compared with iron–folic acid supplementation alone (Kissell et al., 2024). MMS contains a broader range of essential

vitamins and minerals that support maternal nutritional status, fetal development, and overall pregnancy outcomes (Mwangi et al., 2025).

Despite the potential benefits of MMS, the effectiveness of supplementation programs depends largely on maternal compliance (Smith et al., 2025). Compliance refers to the consistent use of supplements at the recommended dosage and duration throughout pregnancy (Battung et al., 2025). However, adherence to micronutrient supplementation remains suboptimal in many settings, particularly in low- and middle-income countries (Kang et al., 2025). Poor compliance limits the potential impact of supplementation programs and contributes to the persistent burden of anemia among pregnant women (Silubonde et al., 2022).

One of the key factors influencing maternal compliance is the quality of Information, Education, and Communication (IEC) provided by health workers during antenatal care (Lungu et al., 2023). Effective IEC helps improve mothers' understanding of the importance of micronutrient supplementation, addresses misconceptions about side effects, and encourages positive health behaviors (Kraemer et al., 2022). In rural communities, pregnant women often face additional barriers to compliance, including limited knowledge about supplement benefits, perceived side effects, competing daily responsibilities, and insufficient family support (Labonté et al., 2024). These challenges highlight the importance of clear, structured, and culturally appropriate communication strategies delivered by trusted health professionals (Sauer et al., 2025).

From a theoretical perspective, health behavior models provide a useful framework for understanding adherence to supplementation. The Health Belief Model suggests that individuals are more likely to engage in preventive health behaviors when they perceive themselves as susceptible to health risks, recognize the benefits of the recommended action, and perceive minimal barriers to performing the behavior (Intarakamhang & Prasittichok, 2022). Similarly, the Theory of Planned Behavior emphasizes that attitudes, subjective norms, and perceived behavioral control influence an individual's intention to adopt health-related behaviors (Najafi et al., 2023). Through well-designed IEC interventions, health workers can strengthen perceived benefits, reduce perceived barriers, and positively influence attitudes toward MMS consumption (Alfaqeeh et al., 2025).

Previous studies have shown that counseling and health education can improve adherence to iron supplementation during pregnancy. However, much of the available evidence focuses primarily on iron tablets and relies heavily on self-reported adherence measures (Berhane & Belachew, 2022). Evidence specifically examining the role of IEC in improving compliance with Multiple Micronutrient Supplements remains limited, particularly in rural Indonesian settings where sociocultural factors may influence maternal health behaviors. Therefore, this study aims to examine the effect of Information, Education, and Communication on compliance with MMS consumption among pregnant women. The findings are expected to provide empirical evidence to support the development of more effective and context-appropriate IEC strategies to improve maternal nutritional outcomes (Prasetyo et al., 2023).

METHOD

Research Design

This study employed a quantitative cross-sectional design to examine the association between Information, Education, and Communication (IEC) and compliance with Multiple Micronutrient Supplement (MMS) consumption among pregnant women. The study was conducted in September 2025 at an independent midwifery practice in Bondowoso Regency, Indonesia. A cross-sectional approach was used to assess the relationship between IEC exposure and compliance with MMS consumption at a single point in time.

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Participants

The study population consisted of all pregnant women attending antenatal care at the selected midwifery practice who received Multiple Micronutrient Supplements. A total of 30 respondents were recruited using a total sampling technique. Participants were included if they met the following criteria: pregnant women in the first to third trimester, currently receiving MMS, able to communicate effectively, and willing to participate in the study. Pregnant women who declined participation or were unable to complete the questionnaire were excluded.

Data Collection

Data were collected using a structured questionnaire designed to assess two main variables: the quality of Information, Education, and Communication (IEC) and compliance with MMS consumption. The IEC component included indicators such as frequency of counseling, quality of counseling provided by health workers, and the use of educational media. MMS compliance was measured based on regularity of supplement intake, adherence to the prescribed dosage, and consistency with the recommended consumption schedule. Compliance was operationally defined as consuming at least 90% of the prescribed MMS doses during the previous month.

The research instrument underwent validity and reliability testing prior to data collection. Validity testing using the Pearson correlation method produced correlation coefficients ranging from 0.45 to 0.78, exceeding the critical value (r-table = 0.361), indicating that all questionnaire items were valid. Reliability testing using Cronbach's Alpha resulted in a coefficient of 0.812, indicating good internal consistency.

Data Analysis

Data analysis consisted of both univariate and bivariate analyses. Univariate analysis was used to describe the characteristics of respondents and the distribution of study variables. Bivariate analysis was performed using the Chi-square test to examine the association between IEC quality and compliance with MMS consumption. The strength of association was interpreted using the Odds Ratio (OR). A significance level of $p < 0.05$ was applied for all statistical tests. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS).

Ethical Clearance

Ethical approval for this study was obtained from the Health Research Ethics Committee of the Faculty of Health Sciences, Institute of Technology, Science and Health, Dr. Soepraoen Hospital. All participants were informed about the study objectives, procedures, and their rights as research participants. Written informed consent was obtained from each respondent prior to participation, and confidentiality of all collected data was strictly maintained.

RESULT

Respondents' Characteristics

The analysis showed that most respondents were aged 20–35 years (73.3%), a healthy reproductive age group, and therefore generally have better awareness of pregnancy health. The education level was dominated by high school (56.7%), which allows for a more optimal understanding of IEC information compared to primary education. Most respondents were housewives (66.7%), who theoretically have more flexible time to attend education and adhere to the MMS consumption schedule. Most respondents were in the second trimester (46.7%), a period when micronutrient needs increase and educational interventions are crucial.

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In addition, this characteristic tendency indicates that the productive age group, those with secondary education, and the unemployed are more likely to comply with MMS consumption because they find it easier to access health information.

Table 1. Distribution of Characteristics of Pregnant Women (n = 30)

Characteristics	Category	Frequency	Percent
Mother's Age	< 20 years	4	13.3
	20–35 years	22	73.3
	> 35 years	4	13.3
Education	Elementary–Middle School	8	26.7
	Senior High School	17	56.7
	College	5	16.7
Work	Housewife	20	66.7
	Work	10	33.3
Trimester of Pregnancy	First trimester	6	20.0
	Second Trimester	14	46.7
	Third Trimester	10	33.3

IEC Variables and MMS Consumption Compliance

Table 2. Distribution of IEC Variables and MMS Consumption Compliance (n = 30)

Variables	Category	Frequency	Percent
Quality of IEC	Good	18	60.0
	Not enough	12	40.0
MMS Consumption Compliance	Obedient	17	56.7
	Not obey	13	43.3

Most pregnant women reported receiving good-quality IEC (60%). Regarding compliance, 56.7% of mothers were compliant, while 43.3% were non-compliant. These findings indicate that although more than half of mothers are compliant, the non-compliance rate remains high and warrants attention, particularly because low compliance can reduce the effectiveness of the MMS program.

Relationship between IEC and MMS Consumption Compliance

Table 3. Relationship between IEC and MMS Consumption Compliance (Chi-Square Test)

IEC	Obedient	Not obey	Total	p-value
Good	14 (77.8%)	4 (22.2%)	18 (100%)	0.012
Not enough	3 (25%)	9 (75%)	12 (100%)	

A p-value of 0.012 (<0.05) from the Chi-Square test indicates a significant relationship between the quality of IEC and adherence to MMS consumption. Pregnant women who received good-quality IEC had 77.8% adherence, significantly higher than those who received poor-quality IEC (25%).

Odds Ratio (OR) Calculation

Based on the table:

OR = (14/4) / (3/9)

OR = (3.5) / (0.33)

OR ≈ 10.5

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This means that pregnant women who receive high-quality IEC are 10.5 times more likely to comply with MMS consumption than mothers who receive low-quality IEC. These results confirm that IEC quality is a critical determinant of adherence among pregnant women. Clear, consistent, and easy-to-understand information helps mothers overcome barriers such as forgetting to take their baby, concerns about side effects, and a lack of motivation. Therefore, improving communication quality among healthcare workers in antenatal care can significantly contribute to the success of the MMS program.

DISCUSSION

The findings of this study demonstrate a significant association between the quality of Information, Education, and Communication (IEC) and compliance with Multiple Micronutrient Supplement (MMS) consumption among pregnant women. This result highlights the crucial role of effective health communication in influencing adherence behavior during pregnancy. In primary maternity care settings, where interactions between midwives and pregnant women occur frequently through antenatal care visits, the quality of communication can directly shape mothers' understanding and attitudes toward recommended health practices. Pregnant women who received higher-quality IEC were more likely to comply with MMS consumption, suggesting that adherence is not solely determined by the availability of supplements but also by the clarity, consistency, and effectiveness of health messages delivered by healthcare providers (Breuste et al., 2026; Lestari et al., 2025).

From a theoretical perspective, these findings can be interpreted through established health behavior models. The Health Belief Model proposes that individuals are more likely to engage in preventive health behaviors when they perceive clear benefits and minimal barriers. High-quality IEC may strengthen mothers' awareness of MMS's health benefits, such as preventing anemia and supporting fetal development, while also addressing concerns about potential side effects. Similarly, the Theory of Planned Behavior emphasizes that attitudes, subjective norms, and perceived behavioral control influence individuals' intentions and actions. IEC delivered by trusted health workers can positively shape maternal attitudes toward supplementation, reinforce supportive social norms, and increase confidence in the ability to maintain consistent supplement intake (Rachmah et al., 2022).

Despite the positive influence of high-quality IEC, the results indicate that compliance with MMS consumption remained suboptimal among some pregnant women. This finding suggests that communication alone may not fully address all determinants of adherence. Several practical barriers may continue to affect compliance, including forgetfulness, perceived or experienced side effects, busy daily routines, and limited support from family members or partners. In rural or community-based settings, sociocultural factors may also influence maternal health behaviors. Therefore, strengthening IEC should be complemented with additional supportive strategies, such as engaging family members in counseling sessions, implementing reminder systems, and reinforcing follow-up monitoring during routine antenatal care visits (Smitha et al., 2024; Efendi et al., 2025).

Several limitations should be considered when interpreting the findings of this study. First, the relatively small sample size and the use of a single research site may limit the generalizability of the results to broader populations. Second, the cross-sectional design restricts the ability to establish causal relationships between IEC and compliance with MMS consumption. Third, compliance data were collected via self-reported questionnaires, which may introduce recall or social desirability bias. Nevertheless, the study provides valuable preliminary evidence on the importance of strengthening IEC strategies within antenatal care services. Future research using larger samples, multi-site

settings, and longitudinal or interventional study designs would be beneficial for better understanding causal pathways and identifying the most effective IEC approaches to improve MMS adherence among pregnant women.

CONCLUSION

This study demonstrates that the quality of Information, Education, and Communication (IEC) is significantly associated with compliance with Multiple Micronutrient Supplement (MMS) consumption among pregnant women. Pregnant women who received higher-quality IEC were substantially more likely to adhere to recommended MMS intake, highlighting the critical role of effective health communication in supporting maternal nutritional interventions. These findings suggest that strengthening structured, clear, and context-appropriate IEC within antenatal care services is essential to improve supplementation adherence. Healthcare providers, particularly midwives, should emphasize personalized counseling on the benefits of MMS, the correct dosage, and the management of potential side effects, while also using supportive strategies such as visual educational materials, digital reminder systems, and family involvement to enhance maternal compliance and ultimately improve pregnancy-related health outcomes.

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