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LITERATURE REVIEW: ANALYSIS OF PREGNANT WOMEN'S COMPLIANCE WITH MULTIPLE MICRONUTRIENT SUPPLEMENT (MMS) CONSUMPTION (INTERVIEWED FROM THE HEALTH BELIEF MODEL THEORY AND THEORY OF PLANNED BEHAVIOR)

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ABSTRACT

Nutritional deficiencies in pregnant women, such as anemia and KEK, are serious public health issues that can lead to complications such as low birth weight and premature birth. To address this problem, the WHO recommends MMS as an alternative or supplement to iron and folic acid supplements, as MMS contains a combination of 15 essential vitamins and minerals, making it a more comprehensive intervention. Although Indonesia has gradually launched the MMS program since 2024, the level of compliance with supplement consumption is still low, influenced by a lack of knowledge, cultural values, and discomfort such as taste and tablet size. This study aims to analyze the factors that influence MMS consumption compliance using the Health Belief Model and Theory of Planned Behavior frameworks. The research method used is a literature review by searching national and international journals published between 2020 and 2025 with the keyword "Adherence with Multiple Micronutrient Supplement (MMS) Consumption by Pregnant Women." Compliance is greatly influenced by a combination of psychological and contextual factors. The initial data consisted of 207 journals, then analyzed according to the characteristics and 10 suitable articles were found. The literature review was conducted narratively by searching for scientific articles from databases relevant to the research topic, then analyzed descriptively and comparatively. According to the Health Belief Model, the main driver of compliance is the mother's belief, particularly her perception of the benefits; mothers believe that MMS provides real benefits. Meanwhile, the Theory of Planned Behavior highlight the role of perceived behavioral control, which is the mother's view of the ease of acting consistently.

Keywords: consumption adherence; health belief model; MMS; pregnant women; theory of planned behavior

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INTRODUCTION

Malnutrition among pregnant women remains a public health issue that requires serious attention. Pregnant women are particularly vulnerable to nutritional problems (Nabila et al., 2024). According to WHO data, approximately 37%-40% of pregnant women worldwide suffer from anemia, the most common micronutrient problem. Furthermore, various other nutritional problems arise, such as Chronic Energy Deficiency (CED) and iodine deficiency disorders. Malnutrition can lead to various complications during pregnancy, including low birth weight (LBW), premature birth, and even maternal or infant death. Furthermore, overnutrition can also lead to risks such as preeclampsia and cesarean delivery. These nutritional problems not only impact pregnancy but also affect the child's

future quality of life, particularly in terms of physical growth and mental development (Lestari, 2021).

One approach taken by the WHO to address nutritional problems in pregnant women is to recommend the provision of multiple micronutrient supplements (MMS) as an alternative or supplement to iron and folic acid supplements. MMS is intended to provide a combination of 15 essential vitamins and minerals needed during pregnancy, providing more complete nutrition than iron supplements. Multiple Micronutrient Supplement (MMS) is a micronutrient formulation that has been shown to significantly correlate vitamin and mineral levels with increased blood hemoglobin, making it important to consider as a treatment for anemia in pregnant women (Kasim & Mohamad, 2025).

In several low- to middle-income countries, the level of compliance of pregnant women with nutritional supplements, particularly iron and folic acid tablets, remains very low. One of the main causes of this low compliance is a lack of knowledge among pregnant women about the importance of supplements to prevent anemia and other nutritional problems during pregnancy (Mulalida et al., 2024). Many pregnant women are currently unaware of the benefits of supplements for fetal development and the prevention of pregnancy complications. Furthermore, local cultural values and traditions often influence attitudes toward supplement use, as some communities rely more on traditional healing methods or are skeptical of health products. Another factor that worsens compliance is the lack of easily accessible health facilities, either due to the long distance to health services, high transportation costs, or the often unstable availability of supplements (Ersila, 2024).

According to the 2023 Basic Health Research (Riskesdas) and the Indonesian Nutritional Status Survey (SSGI), the prevalence of anemia in pregnant women ranged from 27.7% to 48.9%. The largest decline occurred in the 15-24 age group, from 84.6% to 14.5%. One of the main causes of this high prevalence of anemia is low compliance with iron supplement consumption by pregnant women. Although the distribution of iron supplements (TTD) in Indonesia has reached the national target, only a small number of pregnant women actually consume iron supplements. This low level of compliance contributes to the high incidence of anemia. This is because iron tablets are the primary measure for preventing and treating anemia during pregnancy.

One approach the Indonesian government is taking to reduce low compliance with iron supplements is by promoting the introduction of Multiple Micronutrient Supplement (MMS) tablets. These MMS tablets serve as a nutritional intervention for pregnant women, containing 10 vitamins and five essential minerals, including iron, folic acid, vitamins A, D, E, C, and zinc. The benefits of these vitamins and minerals not only prevent anemia in pregnant women but also reduce the risk of low birth weight (LBW) and infant mortality. This program has been rolled out in stages since 2024, focusing on 15 provinces with high rates of low birth weight and a high number of pregnant women. Every pregnant woman is recommended to consume 180 MMS tablets regularly daily for six months of pregnancy (Kasim & Mohamad, 2025).

However, one of the main obstacles to implementing MMS is improving adherence among pregnant women. Several factors contributing to this low adherence include inadequate knowledge, inconveniences such as unpleasant taste and large tablet size, lack of support from family and medical personnel, and a lack of structured education and reminders for consumption. Recommended strategies to increase adherence include in-depth education about the benefits of MMS through direct guidance, the use of communication media, and strengthening support from the pregnant woman's family and community (Karingga et al., 2024).

The health belief model (HBM) theory emphasizes that a person's health behavior, including adherence to MMS consumption by pregnant women, is influenced by several related individual perceptions. First, there is the perception of vulnerability, which is a pregnant woman's belief about

the possibility of experiencing health problems such as anemia or complications if she refuses to consume MMS. Second, the perception of severity relates to how seriously the mother assesses the potential impacts, such as the risk of anemia, which can lead to maternal death or low birth weight (LBW). Self-efficacy reflects the mother's belief in her capacity to consistently consume MMS during pregnancy (WIdhiastuti & Pratiwi, 2023).

The next theory is the theory of planned behavior, which explains that MMS use by pregnant women is influenced by three main elements: perspective on the action, which relates to the pregnant woman's perception of the benefits and significance of consuming MMS. Next, subjective norms arise from support and social pressure from family members, medical personnel, or the environment. Third, perception of behavioral control, which is the mother's perception of the ease of consistently carrying out the action during pregnancy (Kalangi et al., 2025). This study aims to analyze the factors that influence MMS consumption compliance using the Health Belief Model and Theory of Planned Behavior frameworks.

METHOD

The method used in writing this research is a literature review. Literature review is a method used by searching literature from national and international journals through databases. Data and information collection for this research is from the results of previously published research totaling 161 journals on Google Scholar and 46 journals on PubMed. In conducting the research, researchers conducted a search for research journals published in electronic media. This study used the keyword "Compliance with Multiple Micronutrient Supplement (MMS) Consumption by Pregnant Women". The articles used were within a 5-year period, namely 2020-2025. The inclusion criteria in this study were having a dependent variable of MMS consumption compliance, independent variables in accordance with the theory of health belief and planned behavior theory, and having an ISSN or being detected by Sinta to Google Scholar. Meanwhile, the exclusion character is in the form of a thesis and cannot be accessed so that from the inclusion and exclusion criteria above. Ten of the 207 articles met the criteria. A narrative literature review was then conducted by searching for scientific articles relevant to the research topic from databases, followed by descriptive-comparative analysis.

RESULT

Table 1.
Results of the article review

Author (Year)	Title	Objective and Research Design Research Results	Research Results	Implications
Nisrina Abidah dan Sri Sumarmi (2023)	*A Comparison o Adherence Levels of Pregnant Wimen to Consuming Multiple Micronutrient Supplements and Iron Folic Acid at Mulyorejo Public Health Center, Surabaya*	Objective: To compare the level of compliance of pregnant women in consuming IFA and MMS for 30 days and to analyze the relationship between compliance and acceptability of consumption, knowledge, and family support. Research Design: Observational study with a prospective cohort design.	The average levels of compliance, knowledge, acceptability, consumption, and family support in the MMS group were higher than in the IFA group. Based on correlation testing, knowledge and acceptability of consumption showed a significant relationship with adherence, while family support did not show a significant relationship.	Improving compliance with supplement consumption by pregnant women is not sufficient simply by replacing IFA with MMS but must be accompanied by good education and improvements in supplement packaging.
Annas Buanasita, Sri Sumarmi, Su Peng Loh, dan Kartika Sri	*Factor Affecting Adherence of Multiple Micronutrient*	Objective: To determine factors influencing adherence to MMS in	Factors influencing adherence to MMS consumption include employment status,	The MMS program in Surabaya has been well-received (acceptability > 80%),

Author (Year)	Title	Objective and Research Design Research Results	Research Results	Implications
Redjeki (2025)	*Supplement Consumption Among Pregnant Mothers in Surbaya, East Java Indonesia*	Surabaya. Research Design: Cross-sectional.	pregnancy-related complaints, and gestational age. This study highlights the need for educational interventions targeted at utilizing health workers.	but adherence according to gestational age remains low, necessitating strategies to ensure daily tablet consumption.
Nur Nadila Alamri, Vivien Novarina A. Kasim, dan Rini Wahyini Mohamad (2025)	Overview of Knowledge, Attitudes, and Behavior of Pregnant Women Regarding Multi-Micronutrient Supplement (MMS) Tablets in the Botumoito Community Health Center Work Area, Boalemo Regency.	Objective: To determine the overview of knowledge, attitudes, and behavior of pregnant women regarding MMS in the Botumoito Community Health Center work area, Boalemo Regency. Research Design: Quantitative descriptive study.	• Knowledge of pregnant women was categorized as good (60.9%) and sufficient (39.1%). • Attitudes of pregnant women were categorized as good (56.8%), sufficient (23.9%), and inadequate (19.6%). • • Behavior of pregnant women was categorized as good (45.7%), sufficient (34.8%), and inadequate (19.5%).	The implications of this study's results indicate that although the level of knowledge and attitudes of pregnant women regarding the consumption of Multi-Micronutrient Supplement (MMS) Tablets in the Botumoito Community Health Center work area, Boalemo Regency, is already in the good category, consistent consumption behavior is still not optimal, thus requiring strengthening interventions at the service practice, education, and policy levels.
Sabaria Manti Battung, Henk Groen, dan Eline M. van der Beek (2025)	*Prental multiple micronutrient supplementation in the Parepare district Indonesia; population characteristics and intake adherence*	Objective: To assess adherence to recommended intakes of multiple micronutrient supplements (UNIMMAP-MMS) in relation to demographic characteristics, along with a community-based MMS program. Research Design: Longitudinal study.	Implementation of the MMS program for pregnant women through health centers during routine ANC visits demonstrated significant adherence after initiation of supplementation. A total of 75.3% of mothers achieved an intake of ≥90 tablets throughout pregnancy, particularly for those who started in the first trimester. However, given that many women still start MMS late in pregnancy, increased attention is needed to plan antenatal visits earlier in pregnancy.	Planning and utilization of ANC visits from the first trimester should be a program priority, including strengthening counseling on the benefits of MMS, explaining that early pregnancy nausea and vomiting are common symptoms that should not delay supplementation, and monitoring adherence through a bottle return system and recording in the KIA (Maternal and Child Health) book.
Dwi Nur Octaviani atili, Levana SOndakh, Rizky Nikmathul Husna Ali, Efri Leny Rauf, dan Fitria Meiyanti	*Effect of Giving MMS (Multiple Micronutrient Supplement) Tablets on Changes in Anemia Status in Pregnant Women*	Objective: To determine the effect of MMS administration on changes in anemia status in pregnant women using a quasi-experimental	Administration of Multi-Micronutrient Supplement (MMS) tablets substantially increased hemoglobin levels among anemic pregnant women. Mean hemoglobin levels increased from 10.612 ± 1.2149 g/dL to 12.294 ±	Multiple Micronutrient Supplement (MMS) supplementation has been proven to be more effective than single Fe tablets in increasing hemoglobin levels and improving

Author (Year)	Title	Objective and Research Design Research Results	Research Results	Implications
(2025)	*: A Quasi Experimental Study*	design. Research design: Quasi-experimental	0.9148 g/dL after the intervention, with $p \leq 0.05$ indicating a significant difference.	anemia status in pregnant women in the third trimester, so it has the potential to be a strategic nutritional intervention that is worth considering in routine ANC program policies in areas with a high prevalence of anemia and micronutrient deficiencies.
Aissata Ba, Monica J. Fox, Adam Mamby Keita, Kristen M. Hurley, dkk (2024)	*Qualitative evaluation of a package of implementation strategies codesigned to support the introduction of multiple micronutrient supplementation (MMS) for pregnant women in Bamako Mali*	Objective: Adapt the packaging and materials for antenatal care counseling using MMS to optimize delivery, acceptance, and adherence to MMS. Research Design: In-Depth Interviews and Focus Group Discussions (FGDs).	Any transition from a national policy on IFA to MMS must involve planning and budgeting for training on MMS counseling and relevant supporting materials, along with ongoing supervision of ANC providers. The materials tested in this study can be a significant first step and provide a foundation for the development of other community-based behavior change strategies that can support MMS adherence among pregnant women.	This study concluded that the codedesigned implementation strategy package was highly acceptable and helped improve pregnant women's understanding, perceived benefits, and adherence to MMS compared to IFA. However, there are barriers that need to be addressed through strengthening the ANC system, ongoing training and supervision for midwives, greater involvement of pharmacists, and community-based behavior change strategies that involve husbands and family members as reminders and advocates for MMS consumption.
Mohammed Alfaqeeh, Auliya A. Suwantika, Maarten J. Pstma, Annisa Dewi Nugrahani, Rizka Ayu Setyani, Neily Zakiyah (2025)	*Maternal Perspectives on Multiple Micronutrient Supplementation (MMS) in Indonesia : A cross-sectional study of knowledge, attitudes, and acceptance*	Objective: To evaluate the level and determinants of knowledge, attitudes, and acceptance of MMS among pregnant women in Indonesia. Study design: A cross-sectional study.	Although the general perception of MMS is very favorable, gaps in understanding and suboptimal acceptance highlight the importance of improving health education and counseling. Key factors influencing these outcomes include gestational stage, income level, employment status, and knowledge, demonstrating the importance of socioeconomic and behavioral aspects in influencing maternal health practices. Knowledge acted as a stable and significant determinant across multiple	An important implication of this study is the need to strengthen MMS education and counseling from the first ANC visit, with clear materials on benefits, usage, and safety, as knowledge has been shown to be a key determinant of pregnant women's attitudes and acceptance.

Author (Year)	Title	Objective and Research Design Research Results	Research Results	Implications
			domains, confirming its importance in driving adoption.	
Junhui Zhong, Nan Li, Junxi Chen, Jufen Liu, Zhiwen Li, Jiamei Wang and Xiaohong L (2025)	*The effect of multiple micronutrients supplementation on preventing anemia during pregnancy : a retrospective cohort study*	Objective: To evaluate the effectiveness of multivitamin micronutrient (MMN) supplementation during pregnancy in reducing the risk of anemia in pregnant women. Study design: Retrospective cohort study.	Studies suggest that concurrent micronutrient supplementation is more effective than no micronutrient supplementation in preventing anemia in the second and third trimesters, and throughout pregnancy. However, the preventive effect of these supplements on anemia in the first trimester of pregnancy appears to be less significant. Consistent and early iron supplementation using multivitamin micronutrient tablets was associated with a more pronounced reduction in the risk of anemia than folic acid alone, but further research is needed to determine the ideal amount and timing of supplementation.	National guidelines and maternal health services should consider routine integration with intensive education to encourage adherence, while also preparing for further research to determine the optimal dose, most effective starting time, and impact on infant outcomes so that the intervention can be more widely adopted and based on strong evidence.
Klaus Kraemer, Klapana Beesbathuni, Sufia Askari, Rudaba Khondker, dkk (2023)	*Knowledge, Attitudes, and Practices of Pregnant Women and Healthcare Providers in Bangladesh regarding Multivitamin Supplements during Preganancy*	Objective: To understand pregnant women's perceptions and behaviors regarding prenatal multivitamins, identify barriers and motivations for their use, and explore the extent to which health care providers understand and promote this supplementation. Research design: Descriptive quantitative.	This study describes the results of a Knowledge, Attitudes, and Practices survey conducted with pregnant women and health care providers regarding the use of prenatal multivitamin supplements and supplementation practices during pregnancy in rural and urban areas of Bangladesh. The pregnant women participating in the survey highlighted several significant barriers to prenatal multivitamin supplement use, as well as factors that may have driven change. The results of this study can help improve the nutritional status of pregnant women by providing insights into current attitudes and practices related to nutrition during pregnancy.	More targeted educational interventions for pregnant women, their families, and health care providers, strengthening the role of service providers (obstetricians, midwives, pharmacists) in providing counseling about prenatal multivitamins, and developing social marketing strategies and policies that support the wider availability and utilization of prenatal multivitamin products (e.g., UNIMMAP MMS) are needed, particularly in low- and middle-income countries like Bangladesh.
Jocelyn M. Labonte, Mai Anh Hoang, Aishwarya Panicker, Hou	*Exploring Factors Affecting Adherence to Multiple Micronutrient*	Objective: To identify barriers and enablers to adherence to MMS among pregnant women in	The findings of this qualitative study emphasize the importance of understanding the perspectives and experiences	Future interventions should not simply shift from IFA to MMS but should integrate strengthening

Author (Year)	Title	Objective and Research Design Research Results	Research Results	Implications
Kroeun, dkk (2024)	*Supplementation During Pregnancy in Cambodia : A Qualitative Analysis*	Cambodia and identify strengths and challenges of ANC services. Research design: Qualitative study.	of pregnant women, their families, and midwives to improve adherence to MMS in Cambodia. The proposals outlined in this document provide guidance for addressing challenges to adherence to MMS and ensuring a successful transition from IFA to MMS.	midwives' counseling and knowledge, engaging families and community leaders in MMS promotion, improving the availability of ANC logistics and educational materials, and addressing workload and limited resources at community health centers (Puskesmas) to ensure an effective and sustainable transition to MMS that impacts maternal and infant health.
Finina Abebe, Yordanos Tadesse Kidanemariam, Menen Tsegaw, dkk (2025)	*Acceptance of multiple micronutrient supplementations (MMS) and iron and folic acid supplement utilisation among pregnant and lactating women in the rural part of Ethiopia, 2022: a cross-sectional study*	Objective: To identify the acceptance of Multiple Micronutrient Supplements (MMS) and the utilization of iron and folic acid (IFA) supplements among pregnant and lactating women in rural Ethiopia. To identify factors influencing the acceptance and utilization of MMS and IFA supplements. Research Design: A cross-sectional study with a mixed-methods approach.	IFA utilization: 59.3% of pregnant/lactating women, with a significant difference between pregnant (36.1%) and lactating (22.2%) women. MMS Acceptance: Only 44.8% of pregnant women had a good acceptance of MMS, while 55.2% showed a poor response. Factors Influencing IFA Utilization include geographic region, role of health workers, and pregnancy status. Birth weight gain with MMS supplementation during pregnancy increased birth weight by an average of 35 grams compared to IFA. Health impact: MMS reduces the risk of preterm birth and small for gestational age (SGA) babies. Barriers to MMS acceptance include lack of awareness, reliance on community health services, and preference for supplement form (tablets vs. powder).	Increasing the use of IFA and MMS cannot rely solely on the provision of tablets but must be accompanied by strengthening ongoing counseling (especially during lactation), managing side effects, and communication strategies that correct misconceptions.

DISCUSSION

Several studies have compared adherence to MMS consumption with iron supplement tablets (TTD) and regular folate supplements. Abidah and Sumarmi (2023) found that pregnant women's knowledge and acceptance of MMS consumption were significantly associated with adherence, while family support had no significant relationship. This is consistent with the health belief model theory, which emphasizes perceived benefits and self-efficacy in influencing health behaviors. Research by Buanasita et al. (2025) revealed the influence of employment status, pregnancy-related complaints, and gestational age on adherence to MMS consumption. This aligns with the Theory of

Planned Behavior, which highlights the influence of external factors and social context on pregnant women's perceived behavioral control over supplement consumption. Furthermore, this study emphasizes the importance of educational interventions and support from healthcare providers to overcome these barriers and strengthen mothers' intentions and behavioral control.

In a study by Alamri et al. (2025), pregnant women's knowledge regarding MMS was categorized as good and adequate, along with their varying attitudes and behaviors. This reinforces the approach of both theories, which emphasize attitudes and beliefs as determinants of behavior. In the context of the Theory of Planned Behavior, a positive attitude toward MMS consumption behavior drives a stronger intention to comply, whereas in the Theory of Health Belief Model, it tends to be influenced by perceptions of risks and benefits. Research by Battung et al. (2025) showed that adherence to MMS consumption was higher if it was started in the first trimester of pregnancy, and mothers consumed a dose of ≥ 90 tablets throughout pregnancy if they started early. This demonstrates the important behavioral control aspect of the Theory of Planned Behavior and the need to strengthen the threat perception in the Theory of Health Belief Model so that mothers start consuming MMS as early as possible.

Research by Octaviani et al. (2025) found that administering MMS significantly increased hemoglobin levels in pregnant women with anemia, demonstrating the effectiveness of the intervention for maternal and fetal health. This research strengthens the Theory of Health Belief Model's perceived benefits component, which is the belief that MMS consumption brings real benefits that encourage compliance. Research by Ba et al. (2024) highlights the importance of training healthcare workers, providing effective MMS counseling materials, and ongoing supervision as key factors in supporting adherence. This is closely related to the self-efficacy component of the Theory of Health Belief Model and perceived behavioral control in the Theory of Planned Behavior.

Alfaqeeh et al. (2025) showed that although pregnant women have favorable views of MMS, there are still gaps in understanding and acceptance. Factors such as gestational stage, income, and employment status influence these outcomes, indicating that socioeconomic and behavioral aspects are significant determinants. In the Theory of Health Belief Model, adherence is driven by the mother's internal beliefs. The mother's understanding and acceptance of MMS, along with concrete evidence of increased hemoglobin levels, reinforce the belief that MMS consumption brings significant benefits to maternal and fetal health, thus encouraging adherence. Maternal adherence is based on a strong understanding and acceptance of the benefits of MMS, as well as concrete evidence of increased hemoglobin levels directly felt by the mother. The belief that consuming MMS will provide significant benefits to the mother and fetus, such as improved health and prevention of anemia, is a key driver for mothers to consistently consume MMS.

Meanwhile, the theory of planned behavior explains that external factors and self-control influence a mother's intention to comply. The perceived behavioral control component is the main determinant. Inhibiting factors such as pregnancy complaints, employment status, and pregnancy stage are recognized as obstacles that directly reduce a mother's sense of control over her behavior. The Theory of Planned Behavior explains that a mother's intention to comply with the behavior of consuming MMS during pregnancy is influenced by external factors and perceived self-control. One of the main components in this theory is perceived behavioral control, namely the mother's feeling able to control her behavior despite various obstacles. Inhibiting factors such as pregnancy complaints, maternal employment status, and pregnancy stage are recognized as real obstacles that reduce a mother's sense of control over her behavior.

CONCLUSION

Compliance is strongly influenced by a combination of psychological and contextual factors. According to the Health Belief Model, the primary driver of compliance is maternal beliefs,

particularly perceived benefits, namely the belief that MMS provides real benefits. The theory of planned behavior highlights the role of perceived behavioral control, which is the mother's perception of the ease of acting consistently, and is influenced by external factors such as social support and practical barriers.

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