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Literature Review

DETERMINANTS OF IRON AND FOLIC ACID SUPPLEMENTATION ADHERENCE AND ITS IMPACT ON ANEMIA AMONG PREGNANT WOMEN: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

Background: Anemia in pregnant women remains a major global public health problem, particularly in developing countries, including Indonesia. One of the primary interventions to prevent anemia is iron supplementation. However, the effectiveness of this intervention is highly dependent on adherence to iron tablet consumption among pregnant women. This study aims to analyze the determinants of adherence to iron supplementation and its impact on anemia through a synthesis of international and national studies.
Methods: The method used was a literature review of five reputable scientific articles with cross-sectional and case-control designs. The analysis was conducted using a descriptive narrative approach with thematic synthesis focusing on determinants and anemia outcomes**.**
Results: The results show that adherence to iron supplementation remains low, with an average below 50%. The main determinants include maternal education, socioeconomic status, antenatal care (ANC) visits, access to healthcare services, and exposure to health information. In addition, program-related factors such as social assistance and the quality of healthcare services also play a role. Adherence to iron supplementation has been shown to significantly reduce the risk of anemia, with an estimated reduction of more than 25%.
Conclusion: It can be concluded that anemia in pregnancy is a multifactorial problem influenced by individual, social, and healthcare system factors. Interventions to improve adherence should be carried out comprehensively through education, strengthening ANC services, and optimizing community-based health programs.

Keywords: ***Iron supplementation, Adherence, Anemia, Pregnancy, ANC***

INTRODUCTION

Anemia in pregnancy is a major public health concern associated with increased risks of maternal mortality, preterm birth, low birth weight, and impaired fetal development [1]. This condition not only affects maternal health but also has long-term consequences on infant growth, cognitive development, and overall population health. Globally, anemia continues to disproportionately affect women in low- and middle-income countries, reflecting persistent inequalities in nutrition, healthcare access, and social determinants of health [7].

Iron deficiency is the primary cause of anemia during pregnancy due to increased iron requirements for fetal growth, placental development, and expansion of maternal blood volume. As a result, iron and folic acid (IFA) supplementation has been established as a cornerstone intervention in global maternal health strategies [2]. Adequate supplementation has been shown to improve hemoglobin levels, reduce the risk of iron deficiency anemia, and contribute to better pregnancy outcomes. However, the effectiveness of this intervention is highly dependent on consistent and adequate adherence throughout pregnancy.

Despite strong global and national recommendations, adherence to IFA supplementation remains low in many developing countries [3]. In Indonesia, the prevalence of anemia among pregnant women remains high, indicating persistent gaps between policy implementation and actual practice at the community level [9]. Several challenges, including limited health literacy, misconceptions about supplementation, side effects, and irregular supply of supplements, contribute to poor compliance.

Adherence to IFA supplementation is influenced by multiple and interconnected determinants. Individual factors such as maternal knowledge, education level, beliefs, and attitudes toward supplementation play a significant role in shaping adherence behavior [4]. Socioeconomic conditions, including household income, food security, and family support, further affect access to healthcare services and the ability to maintain consistent supplementation. In addition, health system factors such as antenatal care (ANC) utilization, quality of healthcare services, accessibility of facilities, and effectiveness of health communication are critical in determining adherence [5].

Understanding these multidimensional determinants is essential for designing effective and sustainable interventions. Addressing anemia in pregnancy requires not only biomedical approaches but also behavioral, social, and systemic strategies. Therefore, a comprehensive analysis of adherence determinants and their impact on anemia outcomes is crucial to inform evidence-based policies and improve maternal and child health outcomes.

MATERIAL AND METHODS

Study Design

This study used a systematic literature review design.

Study Location and Time

A comprehensive search was conducted in PubMed, Scopus, and Google Scholar for articles published between 2021 and 2025 using keywords related to anemia, pregnancy, iron and folic acid supplementation, and adherence.

Population and Sample

The inclusion criteria included studies involving pregnant women, studies examining IFA supplementation and adherence, peer-reviewed articles, and full-text availability. Studies with irrelevant topics or incomplete data were excluded.

Instruments and Data Collection

Data extraction was performed to identify study characteristics, determinants of adherence, and anemia-related outcomes. The selected studies were analyzed using thematic synthesis.

RESULTS

The findings from the selected studies consistently indicate that adherence to iron and folic acid (IFA) supplementation among pregnant women remains suboptimal across diverse settings, particularly in low- and middle-income countries [3]. Reported adherence levels frequently fall below recommended thresholds, with several studies documenting compliance rates below 50% [10]. This pattern persists despite long-standing global recommendations and national supplementation programs, suggesting a substantial gap between policy implementation and actual behavioral uptake[11].

Across the reviewed literature, determinants of adherence were consistently identified within three major domains: individual, socioeconomic, and health system factors. At the individual level, maternal education and knowledge were strongly associated with adherence behavior [3]. Women with higher educational attainment and better awareness of anemia prevention were more likely to adhere to supplementation regimens [11]. However, several studies also highlighted persistent barriers, including negative perceptions of side effects, misconceptions regarding supplementation, forgetfulness, and low perceived susceptibility to anemia [12].

Socioeconomic determinants were also prominently reported [4]. Women from lower socioeconomic backgrounds were consistently found to have lower adherence rates, largely due to financial constraints, limited access to nutritious food, and reduced engagement with healthcare services [12]. In addition, lack of family or partner support was identified as a contributing factor to inconsistent supplementation practices [13].

Health system-related factors were critical in shaping adherence outcomes [5]. Regular antenatal care (ANC) attendance was positively associated with higher adherence, as it facilitates access to supplements, health education, and monitoring [13]. However, studies also reported that poor quality of care, inadequate counseling, and inconsistent supply of supplements significantly hinder adherence, even among women who access health services [14].

Importantly, adherence to IFA supplementation was consistently associated with improved hemoglobin levels and reduced prevalence of anemia[7]. Women who adhered to supplementation demonstrated significantly better hematological outcomes compared to non-adherent groups, confirming the effectiveness of IFA interventions when properly utilized[8].

DISCUSSION

The findings of this review underscore a critical paradox in maternal nutrition programs: although iron and folic acid supplementation is a well-established and evidence-based intervention, its effectiveness

at the population level remains limited due to persistently low adherence. This indicates that the challenge is not primarily the lack of intervention, but rather the failure to ensure its consistent utilization.

At the individual level, maternal education and knowledge are frequently identified as key determinants of adherence. However, a critical analysis of the findings suggests that knowledge alone is insufficient to drive sustained behavioral change. Many women who are aware of the benefits of IFA supplementation still fail to adhere due to perceived side effects, low risk perception, or competing daily priorities. This highlights a well-documented gap between knowledge and practice, indicating that cognitive awareness must be complemented by behavioral and motivational strategies. Interventions that rely solely on information dissemination are therefore unlikely to produce meaningful improvements in adherence.

Socioeconomic factors further complicate adherence behavior, reflecting broader structural inequalities in health. Women from disadvantaged backgrounds face multiple, overlapping barriers, including financial constraints, food insecurity, and limited access to healthcare services. These constraints not only reduce the ability to adhere to supplementation but also influence health-seeking behavior more broadly. Importantly, adherence in this context cannot be viewed purely as an individual choice, but rather as a behavior shaped by structural conditions. This perspective challenges conventional approaches that place responsibility solely on individuals and underscores the need for equity-oriented interventions.

Health system factors represent another critical layer influencing adherence. While ANC utilization is consistently associated with improved adherence, the quality of these services is often variable. In many settings, ANC visits are characterized by limited consultation time, inadequate counseling, and poor patient-provider communication. Such conditions reduce the effectiveness of health education and weaken patient engagement. Furthermore, supply-side constraints, including inconsistent availability of supplements and weak supply chain systems, undermine adherence even among motivated individuals. These findings highlight that improving service coverage alone is insufficient without ensuring service quality and reliability.

A key insight from this review is the complex interaction between determinants of adherence. Rather than acting independently, individual, socioeconomic, and health system factors are deeply interconnected. For instance, higher education may increase awareness, but without access to quality healthcare services, adherence may still remain low. Similarly, improved healthcare access may not translate into better adherence if socioeconomic barriers persist. This interconnectedness suggests that single-component interventions are unlikely to be effective, and that integrated, multi-level strategies are required.

Another critical consideration is the methodological limitation of the existing evidence base. Most of the included studies employed cross-sectional designs, which limit the ability to establish causal relationships between determinants and adherence. Additionally, variations in the definition and measurement of adherence across studies introduce heterogeneity, making direct comparisons challenging. This highlights the need for more robust research designs, including longitudinal and

intervention studies, to better understand causal pathways and evaluate the effectiveness of adherence-enhancing strategies.

The strong association between adherence and improved hemoglobin levels reinforces the biological effectiveness of IFA supplementation. However, this also implies that low adherence significantly undermines the potential impact of existing programs. In this context, adherence functions as a critical mediating factor between intervention availability and health outcomes. Without addressing adherence, even well-funded and well-designed programs may fail to achieve meaningful reductions in anemia prevalence.

From a policy and practice perspective, these findings suggest that improving adherence requires a shift from a purely biomedical approach to a more comprehensive, systems-oriented strategy. Behavioral interventions, such as personalized counseling, reminder systems, and community engagement, should be integrated with efforts to strengthen health systems, including improving ANC quality and ensuring consistent supplement availability. At the same time, addressing socioeconomic barriers through social protection programs and community-based support mechanisms is essential to create an enabling environment for adherence.

Overall, this review highlights that adherence to IFA supplementation is a complex and multifaceted issue that cannot be addressed through isolated interventions. A comprehensive, multisectoral approach that simultaneously targets individual behavior, social determinants, and health system performance is necessary to achieve sustainable improvements in maternal nutrition and reduce the burden of anemia among pregnant women.

NOVELTY OF THE STUDY

This study provides a comprehensive synthesis of recent evidence (2021–2025) on adherence to iron and folic acid supplementation among pregnant women. It highlights the multidimensional interaction between individual, socioeconomic, and health system factors, offering a more integrated perspective compared to previous studies that focused on single determinants.

STUDY LIMITATIONS

This study synthesizes recent evidence and includes diverse study settings, enhancing its relevance and generalizability. However, heterogeneity in study design and reliance on cross-sectional data limit causal interpretation. Potential publication bias may also exist.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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