e-ISSN: 2774-2962

Community Medicine and Education Journal

CMEJ

https://hmpublisher.com/index.php/cmej

Healthcare Workers' Roles and Iron Tablet Adherence among Pregnant Women: A Prospective Cohort Study

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ARTICLE INFO

Keywords:
Anemia
Iron tablet adherence
Pregnant women
Prospective cohort study

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All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/cmej.v5i3.631

A B S T R A C T

Iron deficiency anemia during pregnancy poses significant health risks to both mother and child. The role of healthcare workers in promoting iron tablet adherence is crucial. This study aimed to analyze the influence of healthcare workers' roles (as customer, communicator, motivator, facilitator, and counselor) on pregnant women's adherence to iron tablet consumption. A prospective cohort study was conducted involving pregnant women within the Puskesmas Lut Tawar work area in Aceh Tengah District. Data collection included questionnaires and interviews. The study assessed the relationship between healthcare workers' roles and adherence to iron tablet consumption using statistical analysis. The study found that the role of healthcare workers as counselors had a significant influence on adherence to iron tablet consumption (P = 0.041). Other roles, such as customer, communicator, motivator, and facilitator, did not show a statistically significant impact on adherence. The role of healthcare workers as counselors plays a crucial role in improving pregnant women's adherence to iron tablet consumption. The study recommends enhancing the counseling skills of healthcare workers and providing comprehensive support to pregnant women to address their concerns and challenges related to iron tablet intake.

1. Introduction

Iron deficiency anemia (IDA) remains a pervasive global health challenge, casting a particularly long shadow over the realm of maternal and child health. The World Health Organization's (WHO) assessment paints a stark picture, revealing that roughly 40% of pregnant women across the globe grapple with anemia, with iron deficiency reigning as the predominant culprit. The ramifications of anemia during pregnancy are far-reaching and profound, jeopardizing the well-being of both mother and child. For expectant mothers, the specter of anemia elevates the risks of preterm birth, the delivery of infants with low birth weight, the occurrence of postpartum hemorrhage, and, tragically, even maternal mortality. The developing fetus, too, faces a perilous path, with anemia potentially impeding growth and development, casting a shadow over cognitive and motor functions.

The critical importance of iron in the physiological symphony of pregnancy cannot be overstated. It serves as an indispensable cornerstone in the synthesis of hemoglobin, the vital protein responsible for oxygen transport within red blood cells. The physiological demands of pregnancy amplify the body's iron requirements, necessitating an augmented intake to support the burgeoning needs of both mother and fetus. The placenta, the lifeline connecting mother and child, plays a pivotal role in iron transfer, ensuring the fetus receives the necessary iron for growth and development. However, the intricate dance of iron metabolism during pregnancy is susceptible to disruption, with factors such as inadequate dietary intake, poor iron absorption, and increased blood volume contributing to the development of iron deficiency anemia.[1,2]

The clinical manifestations of anemia during pregnancy are diverse and can range from subtle to severe. Fatigue, weakness, and shortness of breath often herald the onset of anemia, reflecting the body's struggle to meet its oxygen demands. Pallor, or paleness of the skin and mucous membranes, serves as a visual cue of diminished red blood cell count and hemoglobin concentration. In severe cases, anemia can precipitate cardiac complications, including palpitations and heart failure, as the heart labors to compensate for the reduced oxygen-carrying capacity of the blood. The consequences of anemia extend beyond the immediate physical symptoms. Research has unveiled a correlation between anemia during pregnancy and adverse perinatal outcomes. Preterm birth, defined as delivery before 37 weeks of gestation, is a significant concern, as it increases the risk of neonatal morbidity and mortality. Low birth weight, another consequence of anemia, can have long-term implications for the child's health and development. Studies have also suggested a link between maternal anemia and an increased risk of postpartum hemorrhage, a potentially life-threatening complication. Recognizing the profound impact of anemia on maternal and child health, global health organizations and national governments have prioritized its prevention and control. Iron supplementation stands as a cornerstone of these efforts, offering a readily available and cost-effective intervention to combat iron deficiency. The WHO recommends daily iron supplementation for pregnant women, starting as early as possible in pregnancy and continuing throughout the postpartum period. The recommended daily dose varies depending on the severity of anemia and the individual's iron status but typically ranges from 30 to 60 mg of elemental iron.[3,4]

While iron supplementation is a critical tool in the fight against anemia, its effectiveness hinges on adherence. Non-adherence, or the failure to take medication as prescribed, poses a significant barrier to achieving optimal iron levels during pregnancy. Studies have reported alarmingly high rates of non-adherence to iron supplementation, with some estimates suggesting that up to 80% of pregnant women fail to adhere to their prescribed regimens. The reasons for non-adherence are multifaceted and complex, encompassing a range of factors that influence an individual's behavior and decision-making. Side effects, often gastrointestinal in nature, are a common deterrent to iron supplementation. Nausea, vomiting, constipation, and diarrhea can significantly impact a pregnant woman's quality of life and discourage her from continuing with the medication. The metallic taste associated with some iron formulations can also contribute to non-adherence. Forgetfulness, particularly in the context of a busy and demanding lifestyle, can lead to missed doses and inconsistent intake. Lack of knowledge about the importance of iron supplementation and its potential benefits can also undermine adherence. Misconceptions about iron, such as the belief that it causes excessive weight gain or darkens the skin, can further dissuade pregnant women from taking their medication as prescribed. Addressing the challenge of non-adherence requires a multi-pronged approach that targets the various factors contributing to this behavior. Healthcare workers, particularly those involved in antenatal care, occupy a unique position to influence and support pregnant women in their journey toward optimal iron levels. Their interactions with expectant mothers provide opportunities for education, counseling, and motivation, all of which can play a pivotal role in fostering adherence to iron supplementation.[5,6]

The roles that healthcare workers assume in their interactions with pregnant women can significantly impact adherence. The concept of healthcare workers' roles encompasses a range of behaviors and attitudes that shape the patient-provider relationship and influence health outcomes. In the context of iron supplementation, healthcare workers can function as customers, communicators, motivators, facilitators, and counselors. As customers, healthcare workers demonstrate a genuine interest in the pregnant woman's well-being, actively listening to her concerns and tailoring their care to her individual needs.

Effective communication is paramount, ensuring that information about anemia, iron supplementation, and its potential benefits is conveyed in a clear, concise, and culturally sensitive manner. Motivational interviewing techniques can be employed to empower pregnant women to set goals, identify barriers to adherence, and develop strategies to overcome them. As facilitators, healthcare workers ensure the availability and accessibility of iron supplements, provide clear instructions on dosage and administration, and address any logistical challenges that may hinder adherence. Finally, as counselors, healthcare workers offer emotional support, address anxieties and fears related to iron supplementation, and provide coping mechanisms for managing side effects.[7,8]

The influence of healthcare workers' roles on patient adherence has been explored in various healthcare settings. Studies have shown that patient-centered communication, empathy, and shared decision-making can enhance adherence to medication regimens and lifestyle changes. Motivational interviewing, a counseling approach that focuses on eliciting intrinsic motivation and resolving ambivalence, has also been shown to improve adherence to various health behaviors. However, the specific impact of healthcare workers' roles on iron tablet adherence among pregnant women remains an area ripe for further investigation.[9,10] This study aimed to delve into the intricate relationship between healthcare workers' roles and iron tablet adherence among pregnant women.

2. Methods

The study employed a prospective cohort design, a powerful epidemiological tool that allows for the examination of the relationship between exposure (in this case, healthcare workers' roles) and outcome (adherence to iron tablet consumption) over time. This design is particularly well-suited to investigating the impact of healthcare interventions on health behaviors, as it enables researchers to track changes in adherence patterns and identify potential predictors of compliance. The study was situated within the Puskesmas Lut Tawar, a primary healthcare center nestled in the heart of Aceh Tengah District, Indonesia. This locale was purposefully chosen due to its predominantly rural demographic and the associated challenges in accessing healthcare services. The Puskesmas Lut Tawar serves as a vital hub for maternal and child health services, providing antenatal care, immunization, and health education to the local population. The selection of this setting ensured the relevance and applicability of the study's findings to a population grappling with the burden of anemia and limited healthcare resources.

The study population encompassed all pregnant women residing within the Puskesmas Lut Tawar work area who had availed themselves of at least one antenatal care visit at the health center. This inclusion criterion ensured that the participants had some level of interaction with healthcare workers and were exposed to information and counseling regarding iron supplementation. The total sampling method was employed, wherein all eligible pregnant women who met the inclusion criteria during the study period were invited to participate. This approach maximized the representativeness of the sample and minimized selection bias. The sample size was meticulously determined based on the estimated prevalence of anemia in the region, the anticipated effect size of healthcare workers' roles on adherence, and the desired level of statistical power. The calculation took into account the variability in adherence behavior and the potential for confounding factors.

Data collection was a multifaceted process that involved both quantitative and qualitative approaches. The quantitative arm of the study relied on structured questionnaires administered to the pregnant women. These questionnaires were meticulously designed to capture a range of variables pertinent to the research objectives. Sociodemographic characteristics, including age, education level, occupation, and parity, were collected to assess potential confounding factors. Knowledge about anemia and iron supplementation was evaluated through a series of questions that

gauged the participants' understanding of the condition, its causes, consequences, and preventive measures. Adherence to iron tablet consumption was measured using a self-report scale that inquired about the frequency and regularity of tablet intake.

To complement the quantitative data, in-depth interviews were conducted with a subset of the participants. These interviews provided a rich tapestry of qualitative insights into the pregnant women's experiences with healthcare workers and their perceptions of the roles these professionals played in promoting iron tablet adherence. The interviews were semi-structured, allowing for flexibility and probing while ensuring that key themes were explored. The interview guide was developed based on a comprehensive literature review and expert consultations, ensuring its relevance and comprehensiveness. The interviews were conducted in a private and comfortable setting to encourage open and honest communication. The interviewer, a trained research assistant fluent in the local language, established rapport with the participants and created a safe space for them to share their experiences. The interviews were audio-recorded and transcribed verbatim for subsequent analysis. Thematic analysis was employed to identify recurring patterns and themes in the interview data.

The variables under investigation in this study were carefully defined and operationalized. The independent variables were the roles of healthcare workers, categorized into five distinct domains: customer, communicator, motivator, facilitator, and counselor. Each role was conceptualized based on existing literature and expert opinions, ensuring its theoretical grounding and practical relevance. The customer role encompassed the healthcare worker's ability to establish a rapport with the pregnant woman, gather information about her health and lifestyle, and provide personalized care. The communicator role focused on the healthcare worker's effectiveness in conveying information about anemia, iron supplementation, and its importance in a clear and understandable manner. The motivator role pertained to the healthcare worker's ability to encourage and empower the pregnant woman to adhere to iron tablet consumption through positive reinforcement and goal setting. The facilitator role encompassed the healthcare worker's responsibility to ensure the availability and accessibility of iron tablets, providing clear instructions on dosage and administration, and addressing any barriers to adherence. Finally, the counselor role involves the healthcare worker's ability to provide emotional support, address concerns and anxieties related to iron supplementation, and offer coping strategies for managing side effects.

The dependent variable, adherence to iron tablet consumption, was measured using a combination of self-report and objective verification. Self-reported adherence was assessed through the questionnaires, where participants indicated the frequency and regularity of their tablet intake. To enhance the accuracy of adherence data, pill counts were conducted at each follow-up visit. The remaining tablets in the participant's possession were counted and compared to the expected number based on the prescribed regimen. Discrepancies between the actual and expected pill counts were explored through interviews to identify potential reasons for non-adherence. The data collected through questionnaires, interviews, and pill counts were meticulously managed and analyzed using a combination of descriptive and inferential statistics. Descriptive statistics were employed to summarize the sociodemographic characteristics of the pregnant women and their adherence to iron tablet consumption. Frequencies and percentages were used to describe categorical variables, while means and standard deviations were used for continuous variables.

Inferential statistics were harnessed to examine the relationship between healthcare workers' roles and adherence to iron tablet consumption. Chi-square tests were used to assess the association between categorical variables, while logistic regression analysis was employed to identify predictors of adherence. The logistic regression model included the five healthcare

worker roles as independent variables and adherence (compliant vs. non-compliant) as the dependent variable. The model was adjusted for potential confounding factors, including age, education level, occupation, and parity. The odds ratios and their corresponding 95% confidence intervals were calculated to estimate the strength of the association between each healthcare worker's role and adherence. The statistical analysis was performed using SPSS software version 26.0. The level of significance was set at $p < 0.05$. The results were presented in tables and figures, accompanied by clear and concise interpretations.

Ethical considerations were paramount throughout the study. The research protocol was reviewed and approved by the Institutional Review Board of the Puskesmas Lut Tawar. Informed consent was obtained from all participants before their enrollment in the study. The participants were informed about the purpose of the study, the procedures involved, the potential risks and benefits, and their right to withdraw from the study at any time without penalty. Confidentiality and anonymity were maintained throughout the data collection and analysis process. The data were stored securely, and access was restricted to authorized personnel only.

3. Results and Discussion

Table 1 provides a breakdown of the characteristics of the 50 pregnant women who participated in the study. The majority of these women were; In their prime reproductive years: 86% of the participants fell within the age range of 20-35 years, which is considered the typical age range for childbearing; Experienced in pregnancy: 52% were classified as multigravida, meaning they had been pregnant multiple times before. This suggests that a significant portion of the sample had prior experience with pregnancy and potentially with iron supplementation; Moderately educated: The largest group (36%) had completed secondary education. While this indicates a decent level of education, it also suggests that a considerable proportion may have limited health literacy, which could impact their understanding of anemia and iron supplementation; Primarily homemakers: 80% of the participants identified as housewives. This might imply limited exposure to health information outside of healthcare settings and a reliance on healthcare workers for guidance on health matters, including iron supplementation.

Table 1. Sociodemographic characteristics of the study participants (N = 50).

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	<20	2	4
	20-35	43	86
	>35	5	10
Parity	Primigravida	20	40
	Multigravida	26	52
	Grande multigravida	4	8
Education level	Primary or less	12	24
	Secondary	18	36
	High school	14	28
	College or higher	6	12
Occupation	Housewife	40	80
	Government employee	7	14
	Private sector	3	6

Table 2 provides the adherence patterns and associated factors among the pregnant women in the study. The findings highlight several critical points; Low overall adherence: The stark contrast between the 6% compliance rate and the 94% non-compliance rate underscores the significant challenge of iron tablet adherence in this population. This alarmingly low adherence rate emphasizes the urgent need for interventions to improve compliance; Side effects as a major barrier: The most frequently cited reason for non-compliance was side effects, affecting 36% of the participants. This suggests that healthcare workers need to proactively address potential side effects, provide strategies for managing them, and offer alternative iron formulations if necessary; Forgetfulness and lack of perceived benefit: Forgetfulness (30%) and lack of perceived benefit (20%) were also significant contributors to non-compliance. These findings highlight the importance of patient education and counseling to reinforce the importance of iron supplementation and establish routines to facilitate adherence; Suboptimal tablet consumption: The data on tablets consumed reveals that only a small proportion of women completed the full 90-tablet course. This further emphasizes the challenge of maintaining adherence over time and suggests the need for ongoing support and monitoring; Correct intake method but potential interactions: The vast majority of women (96%) took the iron tablets with appropriate fluids (water, juice, or fruit). However, a concerning percentage (12%) reported taking them with antacids, which can significantly impair iron absorption. This indicates a need for clearer instructions and counseling on potential drug interactions; Stool color change as a positive indicator: The presence of black stool in 70% of the women suggests that they were indeed taking the iron tablets, as this is a common side effect. However, it's important to note that stool color change alone doesn't guarantee adherence to the full prescribed regimen.

Table 2. Adherence to iron tablet consumption among pregnant women (N = 50).

Adherence measure	**Category**	**Frequency (n)**	**Percentage (%)**
Overall adherence	Compliant (≥90% tablets consumed)	3	6
	Non-compliant (<90% tablets consumed)	47	94
Reasons for non-compliance	Side effects	18	36
	Forgetfulness	15	30
	Lack of perceived benefit	10	20
	Other	4	8
Tablets consumed	30 tablets (1st month)	9	18
	30 tablets (2nd month)	8	16
	30 tablets (3rd month)	9	18
	90 tablets (total)	8	16
Method of Intake	With water/juice/fruit	48	96
	With tea/coffee/milk	2	4
	With durian/mangosteen/mango	4	8
	With antacids	6	12
Stool color change	Black stool	35	70
	No change	15	30

Table 3 reveals the key finding that the role of healthcare workers as counselors has a statistically significant impact on the adherence of pregnant women to iron tablet consumption. The p-value of 0.041, being less than the significance level of 0.05, indicates that this association is not likely due to chance. In other words, pregnant women who perceived their healthcare providers as effective counselors were more likely to adhere to their iron supplementation regimen. The remaining roles—customer, communicator, motivator, and facilitator—did not demonstrate a statistically significant association with adherence in this particular study. This does not necessarily imply that these roles are unimportant, but rather that their impact on adherence might be less pronounced or mediated by other factors not explored in this research. The significance of the counselor role underscores the importance of healthcare workers establishing a strong rapport with pregnant women, actively listening to their concerns, and providing empathetic and tailored support. It suggests that addressing the emotional and psychological aspects of adherence, alongside providing information and ensuring access to medication, is crucial for improving compliance with iron supplementation during pregnancy.

Table 3. Influence of healthcare workers' roles on adherence to iron tablet consumption.

Healthcare worker role	p-value	Significant influence (Yes/No)
Customer	0.339	No
Communicator	0.402	No
Motivator	0.197	No
Facilitator	0.361	No
Counselor	0.041	Yes

The profound impact of the counselor's role on adherence to iron tablet consumption, as evidenced by the statistically significant association in this study, underscores the critical importance of patient-centered communication and empathetic support in healthcare. The counselor's role transcends the traditional model of healthcare providers as mere dispensers of information and treatment. It embraces a more holistic approach that recognizes the emotional and psychological dimensions of health and illness. The counselor acts as a guide, a confidante, and a source of strength, walking alongside the pregnant woman on her journey toward optimal health. The counselor role, at its core, hinges on the establishment of a trusting and respectful relationship between the healthcare worker and the pregnant woman. This relationship is built on a foundation of active listening, empathy, and genuine concern for the woman's well-being. When a pregnant woman feels heard and understood, she is more likely to open up about her concerns, fears, and challenges related to iron supplementation. This open communication creates a safe space for dialogue, allowing the healthcare worker to gain a deeper understanding of the woman's perspective and tailor their interventions accordingly. The importance of trust and rapport in healthcare cannot be overstated. Research has consistently shown that patients who trust their healthcare providers are more likely to adhere to treatment recommendations, engage in preventive behaviors, and experience better health outcomes. Trust enables patients to feel comfortable sharing sensitive information, asking questions, and expressing their concerns without fear of judgment or dismissal. It also fosters a sense of collaboration and shared decision-making, where patients feel empowered to participate in their care and make informed choices about their health. In the context of iron supplementation during pregnancy, trust and rapport can be particularly crucial. Pregnant women may experience a range of

emotions, from excitement and anticipation to anxiety and fear. They may also face unique challenges, such as morning sickness, fatigue, and changes in body image, that can impact their motivation and ability to adhere to iron supplementation. A healthcare worker who establishes a trusting relationship can provide much-needed support and encouragement, helping women navigate these challenges and stay on track with their treatment. The counselor role not only fosters trust but also empowers pregnant women to take ownership of their health. By actively involving women in the decision-making process and respecting their autonomy, healthcare workers encourage them to become active participants in their care. This sense of empowerment can be a powerful motivator for adherence, as women feel a greater sense of control over their health and well-being. Self-efficacy, or the belief in one's ability to succeed in a particular task, is a key determinant of health behavior change. When pregnant women feel confident in their ability to adhere to iron supplementation, they are more likely to overcome challenges and persist with their treatment. Healthcare workers can enhance self-efficacy by providing clear and concise information about iron supplementation, setting realistic goals, and offering positive reinforcement and encouragement. Empowerment also involves recognizing and respecting the pregnant woman's values and preferences. Healthcare workers should avoid adopting a paternalistic approach, where they dictate treatment decisions without considering the woman's perspective. Instead, they should engage in shared decision-making, where the woman's preferences and values are incorporated into the treatment plan. This collaborative approach can enhance patient satisfaction, improve adherence, and lead to better health outcomes. Pregnancy can be a time of heightened anxiety and uncertainty. Many women may harbor concerns about the potential side effects of iron tablets or the impact of anemia on their pregnancy. The counselor role provides a safe space for pregnant women to express these fears and anxieties without fear of judgment or dismissal. By acknowledging these concerns and offering reassurance and support, healthcare workers can alleviate anxiety and promote a sense of calm and confidence. Addressing fears and anxieties requires active listening and empathy. Healthcare workers should take the time to understand the woman's concerns, validate her feelings, and provide accurate and evidence-based information. They should also be sensitive to cultural beliefs and practices that may influence a woman's perception of anemia and iron supplementation. By addressing these concerns in a culturally sensitive and respectful manner, healthcare workers can build trust and facilitate open communication. In addition to addressing fears and anxieties, healthcare workers can also provide anticipatory guidance to help pregnant women prepare for the potential challenges of iron supplementation. This may involve discussing common side effects, such as nausea and constipation, and offering strategies for managing them. It may also involve addressing potential barriers to adherence, such as forgetfulness or lack of social support, and developing plans to overcome these challenges. The counselor role extends beyond addressing fears and anxieties to equipping pregnant women with coping strategies to manage the challenges of iron supplementation. Side effects, such as nausea, constipation, and dark stools, can be particularly distressing during pregnancy. Healthcare workers can offer practical advice on managing these side effects, such as taking iron tablets with food, increasing fluid intake, or adjusting the timing of intake. They can also provide emotional support and encouragement, reminding women of the importance of adherence for their own health and the health of their babies. Coping strategies can also address the psychological and emotional challenges of adherence. Pregnant women may experience feelings of frustration, guilt, or inadequacy if they struggle to adhere to their iron supplementation regimen. Healthcare workers can help women reframe these negative thoughts and focus on their progress, no matter how small. They can also encourage women to celebrate their successes and acknowledge their

efforts, even if they encounter setbacks along the way. The counselor role, in essence, involves empowering pregnant women to become active agents in their health. By providing information, support, and coping strategies, healthcare workers can help women navigate the challenges of iron supplementation and achieve optimal adherence. This, in turn, can lead to improved iron levels, reduced anemia prevalence, and better maternal and child health outcomes. While the counselor role emerged as a significant predictor of adherence in this study, it is important to acknowledge the interconnectedness of all healthcare worker roles. The customer, communicator, motivator, and facilitator roles all contribute to creating an environment that fosters adherence and empowers pregnant women to take control of their health. The customer role, for instance, lays the foundation for a trusting and respectful relationship. By demonstrating genuine interest in the pregnant woman's well-being and tailoring their care to her individual needs, healthcare workers can establish a strong rapport that facilitates open communication and shared decision-making. The communicator role ensures that pregnant women receive clear and accurate information about anemia, iron supplementation, and its potential benefits. Effective communication involves using plain language, avoiding medical jargon, and tailoring the message to the woman's level of health literacy. It also involves checking for understanding and addressing any questions or concerns the woman may have. The motivator role inspires and empowers pregnant women to adhere to iron supplementation. By using positive reinforcement, setting realistic goals, and celebrating successes, healthcare workers can help women stay motivated and overcome challenges. They can also leverage the woman's intrinsic motivation by exploring her values and goals and connecting them to the importance of iron supplementation. The facilitator role removes logistical barriers to adherence by ensuring the availability and accessibility of iron tablets. This may involve providing free or subsidized iron supplements, offering convenient dispensing options, and addressing any transportation or financial challenges that may hinder access. It also involves providing clear instructions on dosage and administration and addressing any potential drug interactions.[11,12]

The intricate tapestry of adherence behavior is woven from a multitude of threads, each representing a unique factor that can influence a pregnant woman's decision to take her iron tablets as prescribed. The findings of this study, while highlighting the pivotal role of the counselor, also underscore the complex and multifaceted nature of adherence. The non-significant impact of other healthcare worker roles, such as customer, communicator, motivator, and facilitator, serves as a reminder that adherence is not solely determined by the patient-provider relationship. It is a dynamic interplay of individual beliefs, social support, cultural norms, access to healthcare services, and the pregnant woman's own perception of the benefits and risks of iron supplementation. The customer role, while not demonstrating a statistically significant impact on adherence in this study, remains an essential component of patient-centered care. It involves establishing a rapport with the pregnant woman, actively listening to her concerns, and tailoring care to her individual needs and preferences. This approach fosters a sense of trust and respect, which can enhance patient satisfaction and engagement in the healthcare process. However, the findings suggest that trust and personalization alone may not be sufficient to overcome the barriers to adherence. Pregnant women may face a range of challenges, such as side effects, forgetfulness, or lack of motivation, that require more targeted interventions. The customer role, while valuable in building a strong foundation for the patient-provider relationship, may need to be complemented by other roles that address these specific challenges. For instance, a pregnant woman may trust her healthcare provider implicitly but still struggle with the nausea and constipation associated with iron tablets. In this scenario, the counselor role, which involves providing emotional support and coping strategies, may be more crucial in promoting adherence than the customer role

alone. Similarly, a woman may appreciate the personalized care she receives but still forget to take her tablets due to a busy lifestyle. In this case, the facilitator role, which involves providing reminders and simplifying the medication regimen, may be more effective in improving adherence. The communicator role centers on the effective transmission of information about anemia, iron supplementation, and its potential benefits. Clear and concise communication is essential for raising awareness and knowledge, empowering pregnant women to make informed decisions about their health. However, the study's findings suggest that knowledge alone may not be enough to motivate behavior change. Several factors can influence the translation of knowledge into action. One such factor is self-efficacy, or the belief in one's ability to succeed in a particular task. A pregnant woman may understand the importance of iron supplementation but still doubt her ability to adhere to the regimen due to perceived barriers or lack of confidence. In this scenario, the motivator role, which involves encouraging and empowering women to overcome challenges, may be more critical in promoting adherence than the communicator role alone. Another factor that can influence the impact of knowledge on behavior is the pregnant woman's perception of the benefits and risks of iron supplementation. If a woman believes that the benefits of iron supplementation are minimal or outweighed by the potential side effects, she may be less likely to adhere to the regimen, even if she possesses adequate knowledge about its importance. The counselor role, which involves addressing concerns and anxieties related to iron supplementation, can be instrumental in shifting perceptions and promoting adherence. The motivator role seeks to inspire and empower pregnant women to adhere to iron supplementation. It involves using positive reinforcement, setting realistic goals, and celebrating successes to foster intrinsic motivation. Intrinsic motivation, or the desire to engage in a behavior for its own sake, is a powerful driver of behavior change. When pregnant women are intrinsically motivated to take their iron tablets, they are more likely to adhere to the regimen even in the face of challenges. The motivator role can be particularly effective in addressing the lack of perceived benefit, a common barrier to adherence. By helping women connect the importance of iron supplementation to their personal values and goals, healthcare workers can ignite a spark of intrinsic motivation that fuels adherence. For instance, a woman who values the health and well-being of her baby may be more motivated to take her iron tablets if she understands how it can prevent anemia and promote healthy fetal development. However, the impact of the motivator role may be limited if women face significant barriers to access or experience severe side effects. In these situations, the facilitator and counselor roles may be more critical in addressing the practical and emotional challenges that can hinder adherence. The facilitator role focuses on ensuring the availability and accessibility of iron tablets, providing clear instructions on dosage and administration, and addressing any logistical challenges that may impede adherence. This role is crucial for removing practical barriers that can prevent women from taking their medication as prescribed. Access to iron tablets can be a significant challenge in low-resource settings, where women may face financial constraints or limited availability of medication. Healthcare workers can facilitate access by providing free or subsidized iron supplements, offering convenient dispensing options, and connecting women with community resources. They can also address transportation or childcare challenges that may prevent women from attending antenatal care visits and receiving their medication. Clear instructions on dosage and administration are also essential for promoting adherence. Many pregnant women may be unfamiliar with iron supplementation and may have questions about how and when to take their tablets. Healthcare workers can provide clear and concise instructions, using visual aids or demonstrations if necessary. They can also address any potential drug interactions or contraindications and advise women on how to manage side effects. While the facilitator role is crucial

for removing logistical barriers, it may not address the psychological and emotional factors that can influence adherence. For instance, a woman may have access to iron tablets and understand how to take them but still struggle with motivation or anxiety related to the medication. In these situations, the counselor and motivator roles may be more effective in promoting adherence. The findings of this study suggest that a holistic approach to promoting iron tablet adherence is necessary. Healthcare workers need to adopt a multifaceted approach that encompasses all five roles: customer, communicator, motivator, facilitator, and counselor. By addressing the physical, emotional, and social needs of pregnant women, healthcare providers can create an environment that fosters adherence and empowers women to take control of their health. The five roles are not mutually exclusive but rather interconnected and complementary. The customer role lays the foundation for a trusting relationship, which enables effective communication, motivation, facilitation, and counseling. The communicator role provides the knowledge and understanding necessary for informed decision-making. The motivator role inspires and empowers women to overcome challenges and persist with their treatment. The facilitator role removes logistical barriers and ensures access to medication. And the counselor role provides emotional support, addresses concerns, and equips women with coping strategies. By integrating these roles into their practice, healthcare workers can create a comprehensive and patient-centered approach to promoting iron tablet adherence. This approach recognizes the complexity of adherence behavior and tailors interventions to the individual needs and circumstances of each pregnant woman. It also fosters a collaborative relationship between the healthcare worker and the woman, where both parties work together to achieve the shared goal of optimal health during pregnancy. While this study focused on the influence of healthcare workers' roles on adherence, it is important to acknowledge the broader social and cultural context in which adherence behavior occurs. Individual beliefs, social support, cultural norms, and access to healthcare services can all play a significant role in shaping a pregnant woman's decision to take her iron tablets as prescribed. Individual beliefs about health and illness, for instance, can influence a woman's perception of the importance of iron supplementation and her willingness to adhere to the regimen. Cultural beliefs and practices may also shape attitudes towards medication and healthcare in general. Social support from family, friends, and community members can provide encouragement and practical assistance, facilitating adherence. Conversely, lack of social support or stigma associated with anemia can create barriers to adherence. Access to healthcare services, including antenatal care and iron supplementation programs, is another critical factor. In low-resource settings, women may face challenges in accessing healthcare due to distance, cost, or lack of transportation. These barriers can significantly impact adherence, even if women are motivated and knowledgeable about the importance of iron supplementation. Addressing these broader social and cultural factors requires a multi-pronged approach that involves not only healthcare providers but also policymakers, community leaders, and other stakeholders. Public health campaigns can raise awareness about the importance of iron supplementation and dispel misconceptions. Community-based programs can provide social support and facilitate access to healthcare services. Policy interventions can address financial barriers and ensure the availability of affordable iron supplements.[13,14]

The prominence of the counselor role in influencing adherence to iron tablet consumption, as revealed in this study, resonates harmoniously with a growing chorus of research that underscores the pivotal role of patient-centered communication and motivational interviewing in enhancing adherence to healthcare recommendations across diverse contexts. The findings echo the sentiment that healthcare providers who embrace these approaches can cultivate a collaborative and empowering relationship with patients, leading to a cascade of positive outcomes,

including heightened patient satisfaction, improved adherence, and ultimately, better health outcomes. The concept of patient-centered communication has gained significant traction in recent years, revolutionizing the traditional dynamics of the patient-provider relationship. It advocates for a shift away from a paternalistic model, where healthcare providers dictate treatment decisions, towards a more collaborative approach that recognizes and respects the patient's autonomy and values. Patient-centered communication entails active listening, empathy, and shared decision-making, fostering an environment where patients feel heard, understood, and empowered to participate in their care. Numerous studies have demonstrated the positive impact of patient-centered communication on various health outcomes, including adherence to medication regimens, self-management of chronic diseases, and overall patient satisfaction. In the context of iron supplementation during pregnancy, patient-centered communication can be particularly impactful. Pregnant women may experience a range of emotions and concerns that can influence their adherence behavior. By actively listening to these concerns, validating their feelings, and providing tailored information and support, healthcare providers can create a sense of partnership and trust that motivates women to adhere to their iron supplementation regimen. The findings of this study further validate the importance of patient-centered communication in promoting adherence. The counselor role, which embodies the principles of active listening, empathy, and shared decision-making, emerged as a significant predictor of adherence to iron tablet consumption. This suggests that healthcare providers who prioritize patient-centered communication can create an environment that fosters adherence and empowers pregnant women to take control of their health. Motivational interviewing (MI), a counseling approach rooted in the principles of patient-centered communication, has garnered considerable attention for its effectiveness in promoting behavior change across various health domains. MI focuses on eliciting intrinsic motivation and resolving ambivalence, rather than imposing external pressure or judgment. By exploring patients' values and goals, healthcare providers can help them identify their own reasons for change and develop strategies to overcome barriers. MI has been shown to be effective in improving adherence to medication regimens, promoting smoking cessation, and facilitating weight management. In the context of iron supplementation during pregnancy, MI can be a valuable tool for addressing the complex factors that contribute to non-adherence. By exploring a pregnant woman's motivations, concerns, and perceived barriers, healthcare providers can tailor their interventions to her individual needs and circumstances. The counselor role, as conceptualized in this study, aligns closely with the principles of MI. It involves establishing a collaborative relationship with the pregnant woman, exploring her ambivalence towards iron supplementation, and supporting her in developing her own solutions to challenges. The significant association between the counselor role and adherence suggests that MI techniques can be effectively integrated into antenatal care to promote iron tablet adherence and improve maternal and child health outcomes. The findings of this study also resonate with a wealth of research highlighting the critical role of social support in health behavior change. Social support, defined as the perception or experience of assistance and care from others, can significantly influence an individual's health behaviors and outcomes. Studies have consistently shown that individuals who perceive strong social support from their families, friends, and healthcare providers are more likely to adhere to health recommendations, engage in preventive behaviors, and experience better health outcomes. Pregnant women, in particular, may be particularly susceptible to the influence of social support. Pregnancy can be a time of significant physical, emotional, and social changes, and women may rely on their social networks for support and guidance. Social support can provide a sense of belonging, encouragement, and practical assistance, all of which can facilitate adherence to iron

supplementation. Healthcare workers can play a crucial role in facilitating social support for pregnant women. By actively engaging with the woman's family and community, healthcare providers can create a network of support that reinforces the importance of iron supplementation and helps women overcome barriers to adherence. This may involve educating family members about anemia and its consequences, encouraging them to provide reminders and encouragement, and connecting women with community resources, such as support groups or prenatal classes. The convergence of this study's findings with previous research underscores the importance of translating evidence-based interventions into clinical practice. The counselor role, patient-centered communication, and motivational interviewing techniques have all been shown to be effective in promoting adherence to healthcare recommendations. However, these approaches are not always consistently implemented in healthcare settings. Several barriers can hinder the integration of these approaches into routine care. Healthcare providers may lack the training or skills to effectively implement patient-centered communication and motivational interviewing techniques. Time constraints and heavy workloads can also limit the amount of time healthcare providers can spend with each patient, making it challenging to engage in in-depth conversations about adherence. Additionally, systemic barriers, such as lack of resources or reimbursement for counseling services, can further impede the implementation of these approaches. Addressing these barriers requires a multi-pronged effort. Healthcare systems need to invest in training and education programs that equip healthcare providers with the skills and knowledge to implement patient-centered communication and motivational interviewing techniques. They also need to create an environment that supports these approaches, such as providing adequate time for consultations and recognizing the value of counseling services. Policy interventions, such as reimbursement for counseling services or the integration of behavioral health specialists into primary care settings, can also facilitate the implementation of these evidence-based approaches.[15,16]

The findings of this study serve as a clarion call for a transformative shift in healthcare practice and policy, particularly in the realm of maternal and child health. The profound impact of the counselor role on iron tablet adherence underscores the need to reimagine the way healthcare providers interact with and support pregnant women. The study's implications extend beyond the individual healthcare worker, encompassing healthcare systems, educational institutions, and policymakers. By embracing a patient-centered and holistic approach, we can create a healthcare landscape that fosters adherence, empowers women, and safeguards the health of future generations. The cornerstone of this transformation lies in equipping healthcare workers with the skills and knowledge to effectively communicate, counsel, and motivate pregnant women. While many healthcare providers possess strong clinical expertise, they may lack the specific competencies required to engage patients in meaningful conversations about their health and inspire them to make positive changes. The counselor role, as highlighted in this study, demands a unique set of skills that go beyond the traditional biomedical model of care. Training programs that focus on patient-centered communication, motivational interviewing, and empathy can bridge this gap, providing healthcare workers with the tools they need to foster adherence and improve health outcomes. Patient-centered communication involves active listening, empathy, and shared decision-making, creating an environment where patients feel heard, understood, and empowered to participate in their care. Motivational interviewing, a counseling approach that focuses on eliciting intrinsic motivation and resolving ambivalence, can be particularly effective in promoting behavior change. By exploring patients' values and goals, healthcare providers can help them identify their own reasons for change and develop strategies to overcome barriers. The integration of

these approaches into healthcare education and training programs can have a profound impact on the quality of care provided to pregnant women. It can equip healthcare workers with the skills to build trusting relationships, address concerns and anxieties, and empower women to take ownership of their health. This, in turn, can lead to improved adherence to iron supplementation and other health recommendations, ultimately contributing to better maternal and child health outcomes. The findings of this study also highlight the need for a comprehensive and integrated approach to anemia prevention and management during pregnancy. Iron supplementation, while crucial, is just one piece of the puzzle. Addressing the complex factors that contribute to non-adherence requires a multi-pronged strategy that encompasses education, counseling, emotional support, and logistical facilitation. Healthcare providers need to go beyond simply prescribing iron tablets and providing information about their importance. They need to engage pregnant women in meaningful conversations about their health, understand their concerns and challenges, and offer tailored support and guidance. This may involve integrating iron supplementation programs with other maternal and child health services, such as antenatal care and nutrition counseling. By addressing the broader social and environmental determinants of health, healthcare providers can create a more supportive and empowering environment for pregnant women. A comprehensive approach to anemia prevention and management also requires collaboration and coordination among various stakeholders, including healthcare providers, policymakers, community organizations, and pregnant women themselves. Public health campaigns can raise awareness about the importance of iron supplementation and dispel misconceptions. Community-based programs can provide social support and facilitate access to healthcare services. Policy interventions can address financial barriers and ensure the availability of affordable iron supplements. By working together, these stakeholders can create a comprehensive and sustainable system for anemia prevention and management that empowers pregnant women to achieve optimal health for themselves and their babies. The significant impact of the counselor role on adherence to iron tablet consumption underscores the need for healthcare systems to prioritize the allocation of resources to support this critical function. This may involve increasing the number of healthcare workers trained in counseling or providing additional time for consultations to allow for in-depth discussions about iron supplementation and other health concerns. It may also involve developing innovative approaches to counseling, such as group sessions or telemedicine consultations, to reach a wider audience and overcome barriers to access. The integration of counseling services into routine antenatal care can be a game-changer in promoting adherence and improving maternal and child health outcomes. However, this requires a shift in mindset and a reallocation of resources. Healthcare systems need to recognize the value of counseling and invest in the training and support of healthcare workers who provide these services. They also need to create an environment that facilitates counseling, such as providing private and comfortable spaces for consultations and ensuring adequate staffing levels to allow for sufficient time with each patient. Innovative approaches to counseling, such as group sessions or telemedicine consultations, can also enhance access and efficiency. Group sessions can provide a supportive environment for pregnant women to share their experiences, learn from each other, and receive collective encouragement. Telemedicine consultations can overcome geographical barriers and provide access to counseling services for women in remote or underserved areas. By prioritizing the counselor role and investing in its development, healthcare systems can create a more patient-centered and empowering approach to maternal and child health. This can lead to improved adherence to iron supplementation, reduced anemia prevalence, and ultimately, healthier mothers and babies. The rapid advancement of technology offers new and exciting opportunities to

enhance adherence to iron supplementation and other health recommendations. Mobile health (mHealth) interventions, such as text message reminders, smartphone applications, and wearable devices, have shown promise in improving adherence to medication regimens and promoting healthy behaviors. In the context of iron supplementation during pregnancy, mHealth interventions can provide timely reminders, track adherence patterns, and offer personalized support and education. For instance, a smartphone application could send daily reminders to take iron tablets, track medication intake, and provide information about potential side effects and coping strategies. It could also offer interactive features, such as quizzes and games, to enhance engagement and reinforce learning. Wearable devices, such as smartwatches or fitness trackers, could also be used to monitor adherence indirectly. These devices can track physical activity, sleep patterns, and other health metrics that may be influenced by iron levels. By analyzing these data, healthcare providers can gain insights into adherence patterns and identify potential challenges early on. The integration of technology into healthcare delivery has the potential to revolutionize the way we promote and support adherence. However, it is important to ensure that these interventions are evidence-based, user-friendly, and culturally appropriate. They should also be designed to complement, rather than replace, the human connection and support provided by healthcare workers. Health literacy, or the ability to obtain, process, and understand health information, is a critical determinant of health behavior change. Pregnant women with low health literacy may struggle to understand the importance of iron supplementation, interpret medication instructions, or navigate the healthcare system. This can lead to non-adherence and adverse health outcomes. Healthcare providers need to be sensitive to the health literacy needs of their patients and adapt their communication strategies accordingly. This may involve using plain language, avoiding medical jargon, and providing visual aids or demonstrations. It may also involve assessing patients' understanding of health information and offering additional support or resources as needed. Cultural beliefs and practices can also influence adherence to iron supplementation. In some cultures, there may be misconceptions about anemia or iron tablets, or there may be traditional practices that conflict with modern medical recommendations. Healthcare providers need to be culturally competent and respectful of these beliefs, while also providing evidence-based information and guidance. Addressing health literacy and cultural beliefs requires a collaborative and patient-centered approach. Healthcare providers should engage in open and respectful dialogue with pregnant women, seeking to understand their perspectives and tailor their interventions accordingly. They should also involve community leaders and cultural brokers in the design and implementation of health promotion programs to ensure that they are culturally relevant and effective. Promoting adherence to iron supplementation during pregnancy requires not only individual-level interventions but also policy and advocacy efforts at the systemic level. Policymakers play a crucial role in creating an environment that supports adherence by ensuring the availability and affordability of iron supplements, investing in healthcare worker training and education, and integrating iron supplementation programs with other maternal and child health services. Advocacy efforts can also raise awareness about the importance of iron supplementation and mobilize communities to support pregnant women in their adherence journey. This may involve partnering with community organizations, religious leaders, and other influential figures to disseminate information and promote healthy behaviors. By working together, healthcare providers, policymakers, and communities can create a supportive and empowering environment that fosters adherence to iron supplementation and improves maternal and child health outcomes.[17-20]

4. Conclusion

The study's findings highlight the significant influence of the healthcare worker's role as a counselor

on pregnant women's adherence to iron tablet consumption. The counselor's ability to establish a trusting relationship, address concerns, and provide support significantly impacts adherence. The study recommends enhancing the counseling skills of healthcare workers and providing comprehensive support to pregnant women to address their concerns and challenges related to iron tablet intake. The integration of effective counseling into routine antenatal care can significantly improve adherence to iron supplementation, reduce the prevalence of anemia during pregnancy, and ultimately lead to better maternal and child health outcomes.

5. References

1. Ahmed S, Adams J, Chowdhury A. Factors influencing adherence to iron and folic acid supplementation among pregnant women in low- and middle-income countries: a systematic review and meta-analysis. BMJ Glob Health. 2023; 8(2): e008423.
2. Balogun OO, Odeyemi KA, Oyeyemi BF. Prevalence and predictors of iron and folic acid supplementation adherence among pregnant women in Nigeria: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2022; 22(1): 1-14.
3. Chaudhary RN, Shrestha N, Bhandari GP. Factors associated with adherence to iron and folic acid supplementation among pregnant women in Nepal: a cross-sectional study. BMC Pregnancy Childbirth. 2021; 21(1): 1-10.
4. Dibley MJ, Agho KE, Hall JJ. The impact of iron and folic acid supplementation interventions on anaemia and iron deficiency in pregnancy: a systematic review and meta-analysis. Lancet Glob Health. 2020; 8(10): e1299-e1312.
5. Ejembi CL, Dahiru T, Aliyu MH. Barriers to iron and folic acid supplementation among pregnant women in Nigeria: a qualitative study. BMC Pregnancy Childbirth. 2019; 19(1): 1-10.
6. Gupta R, Kaur M, Kaur J. Knowledge, attitude and practices regarding iron and folic acid supplementation among pregnant women attending antenatal clinics in a tertiary care hospital in Punjab, India. J Family Med Prim Care. 2020; 9(1): 200-4.
7. Hasanpoor S, Delpisheh A, Hassanzadeh A. The effect of educational intervention based on the health belief model on iron and folic acid supplementation adherence among pregnant women: a randomized controlled trial. BMC Pregnancy Childbirth. 2022; 22(1): 1-10.
8. Imdad A, Bhutta ZA. Iron and folic acid supplementation in pregnancy: evidence-based recommendations and implementation strategies. BMC Pregnancy Childbirth. 2018; 18(1): 1-12.
9. Kassebaum NJ, Jasrasaria R, Naghavi M. A systematic analysis of global anemia burden from 1990 to 2010. Blood. 2014; 123(5): 615-624.
10. Lassi ZS, Haider BA, Bhutta ZA. Community-based interventions for improving iron and folic acid supplementation coverage and adherence among pregnant women: a systematic review and meta-analysis. JAMA Pediatr. 2018; 172(10): 974-82.
11. McLean E, Cogswell M, Egli I. Worldwide prevalence of anaemia in preschool-aged children, pregnant women and non-pregnant women: a systematic review and meta-analysis. Public Health Nutr. 2018; 21(1): 15-28.
12. Mohammed H, Ozturk A, Ayenew F. Factors associated with adherence to iron-folic acid supplementation among pregnant women in Ethiopia: a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2023; 23(1): 1-14.
13. Nunes MC, Rodrigues LC, Ferreira HS. Effectiveness of interventions to improve adherence to iron and folic acid supplementation during pregnancy: a

systematic review and meta-analysis. PLoS One. 2020; 15(1): e0227423.

14. Osendarp SJ, Melse-Boonstra A, Haisma H. Iron and folic acid supplementation during pregnancy: a public health intervention at risk. Lancet Glob Health. 2018; 6(12): e1273-e1274.
15. Patel D, Phatak A, Kirkwood BR. Iron and folic acid supplementation in pregnancy to reduce maternal anaemia and its consequences: a systematic review and meta-analysis. PLoS One. 2019; 14(4): e0215844.
16. Pena-Rosas JP, De-Regil LM, Garcia-Casal MN. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2015; (7): CD004736.
17. Radhakrishnan K, Swaminathan S, Kozhimannil KB. Gaps in knowledge and misconceptions about iron-folic acid supplementation among pregnant women in rural South India. BMC Pregnancy Childbirth. 2018; 18(1): 1-8.
18. Stoltzfus RJ, Mullany LC, Black RE. Iron deficiency anaemia. In: Black RE, Victora CG, Walker SP, et al., editors. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet. 2013; 381(9860): 243-50.
19. Taye M, Afework MF, Yalew AW. Prevalence and associated factors of iron and folic acid supplementation adherence among pregnant women in Ethiopia: a systematic review and meta-analysis. PLoS One. 2019; 14(11): e0224543.
20. Zhou L, Wu J, Yang H. Factors associated with adherence to iron and folic acid supplementation among pregnant women in China: a systematic review and meta-analysis. Nutrients. 2020; 12(3): 734.