REVIEW PAPER

Clinical And Humanistic Impact Of Pharmacist-Driven Educational Interventions On Maternal Iron Deficiency Anemia And Health-Related Quality Of Life

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ABSTRACT

Worldwide, iron deficiency anemia is still a public health problem for expectant mothers, particularly in low and middle-income nations where insufficient patient information and treatment adherence make maternal care problematic. Treatment results and quality of life are however risked by behavioural, emotional and systemic hurdles even in the cases of familiar requirements for iron supplementation. With well- organized, interactive, and educational treatments, pharmacists have become important healthcare providers in recent years providing patient-centered care. This mainly looks at how pregnant women who have anemia and who receive pharmacist-led counselling are different from women who receive standard treatment, such as haemoglobin levels and health-related quality of life (HRQoL). The most important motives of the intervention include nonstop follow-up, nutritional counselling, medication adherence support, individualized education, and side effect management. Pharmacist-led treatments significantly boost haemoglobin levels, treatment compliance, mental health, and quality of life.

Keywords: Iron deficiency anemia, patient education, medication adherence, pharmacist-led interventions, maternal health.

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1. INTRODUCTION

Approximately 40% of pregnant women suffer from iron deficiency anemia, which is still a serious public health concern that increases maternal and neonatal morbidity and mortality [1]. Anemia is an old issue, mainly in low- and middle-income countries and yet traditional professional standards dictate systematic iron supplementation. This shows attention to a significant discrepancy between evidence-based action and normative run-through, known as the “adherence gap”, which is one of the main blockades to an effective management of anemia during pregnancy. [2]. Pharmacological treatment and laboratory observation have been the main attentions of traditional maternal healthcare models, which habitually ignore the negotiating, emotional, and educational obstacles that mark treatment compliance. [3-5]. Poor adherence and prompt management cessation are often initiated by factors, for example, gastrointestinal discomfort, cultural dietary limitations, fear of side effects, misconceptions about iron therapy, and low health literacy [6]. In addition to compromising treatment results, these difficulties can lead to chronic fatigue, shrank productivity, mental discomfort, and a worse quality of life for expectant mothers [7,8]. The unadventurous product-oriented role of pharmacists has given way to a patient-centered clinical and informative role in recent years. [9,10]. Pharmacists compromise personalized counselling and explain treatment areas, clear up misapprehensions, control side effects, and make stronger adherence practices through systematized pharmacist-led educational interventions (PEIs [11]. By transfiguring clinical approvals into worthwhile, culturally relevant recommendation, pharmacists help close the gap between prescription medicine and patient behaviour. Pharmacists aid in get the most out of iron absorption and treatment acceptance by demythologizing iron therapy, proactively handling gastrointestinal side effects, and submission of evidence-based dietary counselling. Therapeutic efficacy is auxiliary increased by counselling on when to take supplements, how to sidestep absorption inhibitors like tea

and coffee, and how to eat foods extraordinary in vitamin C. Additionally, by regular monitoring and follow-up, pharmacists help identify poor response early and modify therapy on time [11-12]. Pharmacist-led therapies have displayed generous benefits in accumulative Health-Related Quality of Life (HRQoL) surrounded by anaemic pregnant women in addition to enlightening biochemical indicators. HRQoL is a decisive indicator of the efficacy of healthcare and consist of the social, emotional, psychological, and physical aspects of health [13]. Fatigue, weakness, light-headedness are indicators of anemia. Additionally, psychological repercussions, including depression, anxiety, and irritability, make treatment compliance and salvage even more difficult [14]. The liaison known as the "fatigue–anemia–depression triad," in which physical grogginess exaggerates mental suffering and disseminates unhealthy habits. By addressing this harmony through behavioural therapy, psychosocial maintenance, and empathic communication, pharmacist-led education helps to renovate both emotional and physical well-being. Research has demonstrated that regulated educational programs improves patient participation in care, lower treatment-related anxiety, and lift self-efficacy [15]. The incorporation of pharmacist treatments into customary prenatal care is stagnant uneven, exclusively in areas with restricted resources, even though mounting confirmation of their twin advantages on haemoglobin levels and HRQoL. Various maternal health ingenuities still place a higher primacy on laboratory results at the overhead of patient-centered indicators of satisfaction and well-being. As a result, pharmacist's capacity to help with comprehensive anemia therapy is still mistreated. Pharmacist interaction is not only harmonizing but needed to efficacious anemia therapy by looking at changes in haemoglobin levels with HRQoL results. Pharmacist-led care is just as chief as pharmaceutical therapy itself in reestablishing maternal health and nurturing long-term treatment attainment by addressing behavioural, emotional, and educational determinants of health. [16]. One of the most common and obstinate nutritional conditions distressing expectant mothers worldwide is iron deficiency anemia (IDA), which pretenses a serious public health concern [17]. The risk of iron insufficiency is ominously upraised during pregnancy due to physiological changes like increased plasma volume, increased iron requirements for fetal growth, also expanded maternal red blood cell mass. Pregnant women are exceptionally prone to anemia when these prominent dietary needs are not sufficiently satisfied, chiefly in environments with low resources. The As per World Health Organization approximately between 40 and 45 percent of pregnant women globally suffer from anemia [18]. In low- and middle-income nations, where poverty, food uncertainty, restricted access to medical treatment, and insufficient dietary intake prominently rise the occurrence of disease, the drain is equivalently greater. The highest rates of maternal anemia are still seen in provinces like South Asia, Sub-Saharan Africa, and servings of Southeast Asia. Maternal anemia is still a foremost public health issue in India and other South Asian nations Approximately 50% of pregnant women in India are anaemic, according to data from the National Family Health Survey [19-20]. This is largely a result of concerns like unbalanced supplement delivery, poor program monitoring, postponed prenatal registration, and Inadequate patient follow-up. Women's nutritional scantiness is further heightened by sociocultural norms, such as gender-based inequalities in food distribution and dietary restrictions all through pregnancy. Pregnancy-related iron deficiency anemia has severe effects on the well-being of the mother and the foetus. Apart from this lethargy, decreased physical capacity, weak immunity, and greater liability to infections are all linked to anemia in mothers [21]. The threat of maternal morbidity and death is prominently increased by severe anemia, exclusively when hitches such as postpartum haemorrhage, sepsis, and heart failure are existing. Maternal anemia is an inevitable origin of mortality that significantly adds to maternal deaths in low-income environments. Maternal anemia damages the fetus's ability to get oxygen and nutrients, which can aid to negative birth outcomes. Maternal IDA has been continually associated in studies with stillbirth, low birth weight, intrauterine growth restriction, and preterm birth. Furthermore, children born to anaemic moms are more likely to suffer from decreased immunity, a greater risk of childhood anemia, and impaired cognitive and psychomotor expansion. These early-life disadvantages may prolong cycles of deficiency by having long-term possessions on economic productivity and educational presentation [22]. Maternal anemia has a substantial socioeconomic impact on families and healthcare classifications in addition to its medical effects. Economic drain is intensified in low-resource environments by abridged job capacity, higher healthcare utilization, and extended hospital stays. The general well-being of the family is obstructed when women who suffer from chronic fatigue and weakness are unable to do childcare and home duties. The frequency of maternal anemia is still similarly high worldwide,

The delivery of supplements is advised in many national programs, but behavioural, educational, and emotional support for treatment adherence are not sufficiently addressed. Additionally, efforts to reduce anemia are hindered by challenges in healthcare delivery systems. Many other complications that rural and backward communities must overcome include fractional contact with trained healthcare providers and transportation matters. The efficacy of current maternal nutrition interventions is hampered by these systemic shortcomings [23]. The long-lasting clinical outcomes in anemia management requires coalescing dietary therapies with

patient-centered education, community involvement, and enduring monitoring. Program success may be prominently increased by augmenting the role of healthcare professionals, such as community healthcare workers, nurses, and pharmacists.

In conclusion, iron deficiency anemia during pregnancy remains a serious global health concern, Its great incidence, solemn health effects, and significant socioeconomic impact highlights how urgently resourceful and all-inclusive therapies are needed. It is acknowledged that the support of prevention and management for iron deficiency anemia throughout pregnancy is iron supplementation. Furthermore, prenatal care programs commonly give oral iron preparations, commonly in conjunction with folic acid. Poor patient adherence reduces the clinical benefits of these supplements, despite their low cost and demonstrated efficacy. According to the study, even when supplements are given for free, a significant percentage of women stop taking them within the first few weeks of management. This early cessation raises the risk of chronic or repeated anemia [24]. The occurrence of gastrointestinal side effects linked to oral iron therapy is one of the most important factors of non-adherence. Generally, pregnant women experience symptoms like nausea, vomiting, constipation, diarrhea, stomach discomfort and metallic taste. These deficiencies are usually found along with pregnancy-related symptoms, which creates a lot of complications as well as limits the scope of treatment., Many women consider these particular effects to be risky for themselves or also to their unborn baby, and intentionally reduces dosages or stopping them altogether is also risky. Another major factor that causes poor adherence is inadequate patient education. Many expectant mothers know little about the side effects of anemia. Many people are convinced that iron supplements are optional rather than necessary for prenatal care. Irregular consumption was significantly associated with illiteracy, duration, treatment, and its reimbursement. When medical professionals do not emphasize the value of sustainable treatment, patients are less likely to adhere with long-term supplementation [25]. Old customs, social attitudes, and culture have a deep impact on compliance. Misconceptions about the use of "hot" medications during pregnancy, such as iron tablets, which are thought to induce miscarriage or excessive fetal growth, still exist in some societies. Consumption of iron-rich foods like meat, eggs, and green leafy vegetables may be restricted by dietary restrictions based on cultural norms. Medication Adherence is greatly influenced by their level of health literacy, Dosage instructions, administration schedules, and possible side effects are frequently difficult for women with low educational attainment or little exposure to health information to understand. Poor communication and language problems between patients and healthcare professionals makes understanding difficulty [26]. Consultations in packed prenatal clinics are frequently hasty, with little opportunity for individualized advice or answering questions. A large portion of poor adherence is also caused by systemic and healthcare-related variables. Program efficacy is weakened by irregular supplement supply, stock-outs, a lack of uniform follow-up procedures, and uneven monitoring. Iron pills are frequently given out in public health settings without the necessary paperwork or follow-up reminders. Further interfering with continuity of care are missed appointments and postponed prenatal registration. Anxiety, mood swings, and stress from financial limitations, familial obligations, and health issues are the most common throughout pregnancy. Anemia-related tiredness and miserable indicators may make it harder to adhere to the treatment plans. Non-treated emotional suffering may have a harmful impact on self-care practices, such as taking medications [27]. Adherence may also be affected by financial limitations, primarily in states where free supplements are often not offered. Financial complications of permanent care include transportation costs, loss of daily income from clinic visits, and increased distribution of nutritious food. These issues, like iron deficiency anemia, their related diet are more salient for underprivileged and rural communities. Additionally, premature termination of treatment sometimes occurs due to misconceptions about its efficacy. When subjective indicators such as weakness or dizziness increases, some women stop taking the supplement because they believe the treatment is no longer mandatory. Most of the people think that anemia is a short-term illness that goes away on its own after giving birth.

Adherence to iron supplementation administration may also be hampered by its ambiguity. Guiding principles are rarely emphasized regarding when they should avoid tea or coffee, and when they should favor foods rich in vitamin C. Without providing proper guidance to the patient, we cannot reduce absorption, which may result in poor clinical response and dissatisfaction. These institutional, behavioral, social, and psychological barriers work together to create an ongoing “adherence gap” in maternal anemia treatment. It goes beyond standard prescription procedures to address these concerns that cause various health issues. Improving long-term compliance is a comprehensive methodology that unites patient education, emotional support, ongoing monitoring, and individual counseling. In this regard, the use of pharmacist-led educational campaigns is a viable strategy to overcome barriers to adherence. Pharmacists can improve treatment outcomes by providing skilled counseling, monitoring the side effects, addressing all the anemia and diet-related misconceptions, and enhancing their motivation about the condition. All of these, patient-centered treatments require adherence or compliance issues [28].

2. EXPANDING ROLE OF PHARMACISTS IN MATERNAL HEALTHCARE:

2.1 Pharmaceutical Care and Patient-Centered Practice

The product-oriented function of pharmacists has expressively changed for the duration of the last ten years, giving way to a patient-centered clinical practice methodology. Optimizing therapeutic results through straight patient participation, medication therapy management, and team-based healthcare delivery is a major constituent of modern pharmaceutical care. The organization of chronic and preventive health disorders, exclusively maternal health, has made pharmacists important members of multidisciplinary healthcare teams [29]. The vigilant administration of medication therapy with the goal of achieving specific results that boost a patient's quality of life is acknowledged Pharmacists dynamically participate in patient education, drug-related problem diagnosis, treatment checking, and adherence support within this framework. The roles and responsibilities are mostly important in maternal healthcare for the reason that physiological changes that occur during pregnancy, the greater predisposition to dietary deficiencies, and the possible threats of using medications improperly [30].

2.2 Pharmacist-Led Educational Interventions

Pharmacists can discuss the significance of iron supplements, suitable delivery methods, and projected therapeutic results during individualized counselling sessions. Research has shown that commissioned counselling greatly increases patient's comprehension of treatment plans and stimulates sustained compliance [10]. The table 1. summarizes the detailed educational approaches employed by pharmacists and the resulting clinical and behavioural improvements recognized in maternal health.

Intervention Strategy	Description of Activity	Impact on Maternal Health	References
Personalized Counseling	Face-to-face sessions explaining the "why" and "how" of iron therapy	Increased treatment comprehension and trust in medical advice.	Al-Qudah et al. (2022); Nkansah et al. (2010)
Adherence Reinforcement	Use of pill counts, diaries, and digital reminders (SMS/Apps).	Sustained compliance and reduced "early cessation" rates.	Smith et al. (2020); Pereira et al. (2020)
Dietary & Absorption Guidance	Advising on Vitamin C intake and avoiding tea/coffee/calcium during dosing.	Optimized iron absorption and improved Hb recovery.	Sharma et al. (2021); WHO (2024)
Behavioral Support	Motivational interviewing to overcome cultural or psychological resistance.	Enhanced self-efficacy and patient engagement in self-care.	Miller & Rollnick (2013); Lee & Gomez (2025)
Side Effect Pre-empting	Educating patients on GI symptoms and adjusting timing (e.g., taking with food).	Higher tolerance levels and lower discontinuation of therapy	Ahmad et al. (2024)

Table 1: Pharmacist-Led Intervention and Maternal Health Outcomes

2.3 Adverse Drug Reaction Management and Monitoring

Pharmacist's identification and super vision of adverse drug reactions (ADRs) is another crucial responsibility in maternal care. Gastrointestinal side effects are often linked to oral iron supplementation and are a significant cause of non-compliance. Pharmacists can determine the severity of these reactions and offer suitable management techniques, like dietary changes, formulation amendments, or dose adjustments. Numerous monitoring makes it possible to detect therapy failure or inadequate response permitting for prompt intervention. It was found that clinical outcomes for patients on long-term therapy were substantially boosted by pharmacist-led monitoring plans [11]. to evade absorption inhibitors like tea and coffee, vitamin C supplements, and foods great in iron. Such dietary advice increases overall efficacy and supports pharmaceutical treatment. Research shows that dietary and

pharmaceutical interventions are combined and the results are better than when medication is used alone [22]. Another new aspect of pharmacists' role in maternal healthcare is their support of behaviour change. Pharmacists help patients establish long-term health habits by using motivational interviewing, This method works especially well for clearing up misunderstandings, overcoming cultural obstacles, and overcoming psychological resistance to ongoing treatment. Healthcare provider-led behavioural counselling dramatically increases patient involvement and self-management [12]. By assessing possible drug interactions, contraindications, and teratogenic hazards, pharmacists also help ensure that medications are safe to use during pregnancy. Pregnant women frequently take several medications, which raises the risk of negative effects. Medication reviews conducted by pharmacists reduce unnecessary prescriptions and improve treatment safety [30].

2.4 Interprofessional and Digital Health Approaches

Pregnant women seeking health advice, pharmacists are often the initial point of contact in primary and community healthcare settings. Their availability facilitates early detection of anemia symptoms. [13]. Pharmacy professionals will be responsible for overall care and timely service delivery in collaboration with obstetricians, nurses, nutritionists, and community health workers. It has been seen that these adaptive models increases patient satisfaction, reduce treatment intervals, and advance clinical efficiency [25]. Remote consultation, follow-up monitoring, and compliance reinforcement have been made conceivable by digital health technologies, tele-pharmacy services, and mobile-based instant systems. These progresses are expressly helpful in underserved and rural areas with circumscribed right of entry to medical services. The advantageous effects of pharmacist engrossment in parenthood healthcare are continuously supported by empirical research. Pharmacist engrossment in prenatal clinics greatly inflamed patient satisfaction, medication adherence, and patient knowledge. Pharmacists' inclusion into maternal healthcare systems is still irregular, particularly in underdeveloped nations, regardless of these demonstrated advantages. Pharmacists are indispensable in enlightening maternal health outcomes through personalized therapy, supervision of adverse effects, therapeutic monitoring, dietary advice, behavioural support, and pharmaceutical safety administration.

3. IMPACT OF PHARMACIST-LED INTERVENTIONS IN ANEMIC PREGNANT WOMEN

3.1 Effect on Haemoglobin Levels

Pharmacist-led interventions represent a highly effective and evidence-based approach in improving clinical outcomes by optimizing medication therapy, enhancing patient safety, promoting better adherence and patient-reported results. Through improved medication adherence, proper administration techniques and continuous patient education, pharmacist role has been demonstrated in numerous clinical studies to positively impact biochemical parameters particularly haemoglobin (Hb) levels. Pharmacists can decline treatment withdrawal and improper intake by offering tailored counselling and give emphasis to the value of constant supplementation. Patients on long-term therapy had higher adherence rates and better therapeutic outcomes when they take part in structured pharmaceutical care programs. Continuous compliance is crucial for supervision of maternal anemia to achieve proper iron storage and normalization of haemoglobin levels [19].

Pregnant women who received effective pharmacist counselling had better haemoglobin levels. By educating patients on proper supervision methods, pharmacists can also helps to improve treatment outcomes. It has been verified that iron bioavailability is greatly declined when iron supplements are taken with tea, coffee, and calcium-containing items.

Pharmacists can recommend therapy modifications by estimating test outcomes, assessing symptom improvement and spotting poor response. Pharmacist-led monitoring programs were allied to biochemical conclusions for a variation of chronic illnesses, as well as problems related to anemia [11]. Pharmacist managements have a momentous impact on patients' Health-Related Quality of Life (HRQoL) HRQoL is a multifaceted concept that consist of health status, social engagement, psychological well-being, and physical functioning. Patient-reported outcomes are decisive markers of healthcare effectiveness, specifically in chronic and devastating illnesses [17]. Anemia through pregnancy adversely impacts emotional, physical, psychological, and social well-being. Pharmacist-led educational and behavioural interventions play a pivotal role in improving haemoglobin levels, emotional health, and patient engagement.

3.2 Effect on Health-Related Quality of Life (HRQoL

Pregnant women with iron deficiency anemia benefit significantly from educational interventions provided by healthcare professionals in terms of their Health-Related Quality of Life (HRQoL). These interventions go beyond simply prescribing medications. They improve patients' understanding of their condition, enhance their ability for self-management, and encourage healthy habits. It has been confirmed that pharmacist-led counselling improves treatment adherence, empowers patients, and reduces anxiety [5,15]. Physical, psychological, emotional, and social well-being are all contained within HRQoL. Fatigue, weakness, and poor focus are some of the warning signs. of anemia These interventions greatly improve daily functioning and emotional well-being. Education helps

clear misconceptions, increases self-confidence, and helps women handle warning signs more easily. Pharmacists support patients by explaining treatment goals, expected outcomes, and possible side effects [8]. Studies shows that structured, pharmacy-led educational interventions improve social interaction, emotional health, and physical functioning [10,26]. In addition to addressing psychological stress, these interventions help reduce symptoms of anxiety and depression and encourage healthier lifestyle choices, all of which contribute to long-term improvements in quality of life [22]. Particularly in underserved populations, pharmacist-led educational interventions promote long-term adherence and continuity of care. In addition, this approach improves trust and satisfaction by strengthening the relationship between patients and healthcare providers [25]. In many low- and middle-income countries, formal educational interventions remain limited despite their proven benefits due to inadequate funding and lack of policy support. As a result, many pregnant women continue to receive inconsistent care that gives little attention to patient education and HRQoL. Therefore, expanding pharmacist-led educational initiatives is essential for improving overall maternal health outcomes.

4. RESEARCH GAPS

Even though evidence supports the usefulness of pharmacist-led interventions in enlightening medication adherence and clinical outcomes. [13,17]. Many of the studies focus primarily on biochemical indicators or treatment compliance, with relatively little prominence on patient-reported outcomes and the overall well-being of the mother and baby. In addition, the role of pharmacists in repetitive antenatal care remains incorrectly defined across healthcare systems [5,16]. Furthermore, in most of the settings, pharmacists are underutilized in maternal health programs. In addition, existing research often fails to adequately address contextual factors in low- and middle-income countries, such as socioeconomic status, healthcare accessibility, cultural attitudes, and resource limitations. These factors may have a significant impact on quality-of-life outcomes, treatment response, and adherence. [8,13,16].

5. CONCLUSION

Iron deficiency anemia causes significant health, social, and economic difficulties during pregnancy. Iron supplementation remains the cornerstone of treatment, but poor adherence, inadequate counselling, and limited psychosocial support often diminish its effectiveness. This study highlights the vital role of pharmacists in addressing these challenges through structured educational and behavioural interventions.

Pharmacist-led programs contribute significantly in improving haemoglobin levels, enhancing medication adherence, improving dietary practices, and monitoring treatment-related side effects. Beyond their clinical benefits, these interventions also promote psychological well-being, social functioning, and patient empowerment, leading to meaningful improvements in Health-Related Quality of Life. By addressing the fatigue–anemia–depression cycle and strengthening self-management skills, pharmacists help restore both physical and emotional health among pregnant women.

This review paper highlights the importance of including pharmacists as active members of multidisciplinary healthcare teams in routine prenatal care settings. Long-term therapeutic success, patient engagement, and continuity of care can all be improved through pharmacist involvement. To improve maternal and neonatal outcomes, policymakers and healthcare administrators should prioritize the development of well-designed pharmacist-led educational initiatives, especially in low- and middle-income countries.

In conclusion, pharmacist-led educational interventions are a valuable, cost-effective, and patient-centered approach to managing maternal anemia. Their systematic implementation could bridge existing gaps in care, enhance overall health, and support sustained improvements in pregnancy outcomes and maternal well-being.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Informed Consent

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