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Review Article

IRON DEFICIENCY ANEMIA (IDA) IN PREGNANCY: PREVALENCE AND MANAGEMENT

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ABSTRACT

Anaemia is a significant public health problem worldwide, particularly among pregnant women. The World Health Organization (WHO) estimates that 18% of pregnant women in developed countries and 56% in developing countries are anaemic. In India, anemia during pregnancy affects 45.7% of women in urban areas and 54.3% in rural areas. This review aims to provide an overview of the prevalence, causes, and management strategies of Iron Deficiency Anemia (IDA) during pregnancy, with a focus on the Indian context. The review highlights that anemia during pregnancy leads to significant health risks, including low birth weight and impaired cognitive and physical development in children. Key factors contributing to anemia include inadequate dietary intake, increased iron demands during pregnancy, and traditional cooking practices that do not promote adequate iron absorption. Management strategies for IDA include dietary modifications to increase iron intake and bioavailability, oral iron supplements, and intravenous iron therapy in severe cases. The review underscores the importance of early and regular antenatal care to monitor and address anemia. Notably, oral iron supplements are recommended to start early in pregnancy and continue with adjusted doses throughout gestation.

INTRODUCTION

Anemia is a serious public health problem all around the globe[1]. WHO has assessed that the prevalence of anemia among pregnant women is 18% in developed nations, while it significantly rises to 56% in developing countries[2]. India faces a critical public health issue with anemia, as highlighted by the National Family Health Survey NFHS-5 report (2019-2021), which shows that the prevalence of anemia during pregnancy in India is 45.7% in urban areas and 54.3% in rural areas. In Uttar Pradesh (UP), the prevalence is even higher, estimated at 45.9% [3].

Anemia during pregnancy is linked to an elevated risk of low birth weight and babies being small for gestational age. Anemia decreased cognitive and physical development potential in children born to mothers affected by the condition [1].

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Anemia is directly responsible for 20% of maternal deaths in India, with an additional 20% of maternal deaths being indirectly attributed to the condition[4]. According to the WHO guidelines outlined in the "Tools for effective prevention and control of nutritional anemia, 2017," anemia in pregnant women is diagnosed based on hemoglobin (Hb) levels, categorized as mild (10.0–10.9 g%), moderate (7.0–9.9 g%), and severe (<7.0 g%)[5].

Fareed et al (2024) conducted a study in Era's Lucknow Medical College and Hospital. In this study included a total of 290 cases, of which 161 (55.5%) were diagnosed with anemia. The distribution of anemia severity was as follows: mild anemia in 64 cases (22.1%), moderate anemia in 84 cases (29.0%), severe anemia in 11 cases (3.8%), and very severe anemia in 2 cases (0.7%). The majority of women, both anemic (73.3%) and non-anemic (77.5%), were from urban areas. Most anemic women had completed education up to the secondary level or higher (60.2%), while the majority of non-anemic women had finished schooling only up to high school (55.1%). Most non-anemic women were primigravida (53.5%), whereas the majority of anemic women were multigravida

(54.7%). A significantly higher proportion of anemic women (8.1%) were employed compared to non-anemic women (2.3%). Most women in the anemic group (42.2%) visited the hospital during the second trimester (gestational age of 14–27 weeks), while the majority of non-anemic women (42.6%) visited during the first trimester (gestational age of 0–13 weeks) [6].

Moderate anemia in women leads to reduced working efficiency and heightened maternal morbidity rates, increasing susceptibility to infections. Moreover, pregnant women with moderate anemia frequently experience ante-partum and post-partum hemorrhage, as well as eclampsia. This condition is correlated with poor intrauterine growth and a heightened risk of low birth weight, contributing to elevated chances of sepsis, perinatal complications, and infant mortality rates. Consequently, anemia, particularly during pregnancy, warrants significant attention and specialized care [4]. The persistence of anemia as a prevalent cause of mortality and morbidity in India underscores its significant impact on public health. Contributing factors include reduced iron intake, heightened iron requirements, metabolic disturbances, pre-pregnancy health status, increased iron demands in cases of multiple or rapidly recurring pregnancies, blood loss during childbirth, heavy menstrual bleeding, as well as inflammatory and infectious diseases such as hookworm infection, all of which collectively contribute to the development of anemia during pregnancy [7].

Methodology: This research article is based on a comprehensive literature review of scientific studies. Relevant articles were identified through electronic databases. Key search terms included “Anemia,” “Iron deficiency,” “Management of IDA,” “Dietary practices,” and “Cooking practices”.

Dietary practices: During pregnancy, women often develop anemia as their bodies require higher levels of iron and other essential vitamins to support the physiological demands of pregnancy. Adequate dietary habits during pregnancy are crucial, as they profoundly impact the long-term nutritional well-being of both the mother and the developing fetus, with research indicating that dietary deficiencies are more prevalent during pregnancy compared to other life stages. Inadequate dietary practices encompass habits such as excessive consumption of tea, coffee, or cocoa during meals, a decrease in meal frequency (<3 meals per day), and a lack of variety in food choices. A study of nutritional habits in pregnant women revealed that the average nutrient intake was less in some important nutrients, resulting in anemia [8].

Iron deficiency in women: Iron deficiency anemia (IDA) during pregnancy is a significant issue around the world, according to data from the World Health Organization (WHO), with prevalence rates ranging from an average of 14% of pregnant women in industrialized countries to an average of 56% (range 35-75%) in developing countries. Over and above, IDA is thought to be the only nutrient deficit that is highly frequent in both the developed and developing countries, affecting a lot of mothers and children in both Despite concerted efforts at numerous international nutrition conferences, the persistent challenge of reducing iron deficiency in women of childbearing age remains largely unabated, highlighting the profound impact and complexities associated with IDA, particularly among women in their reproductive years, worldwide.[9]

Iron deficiency is the leading cause of anemia in 58% of pregnant women in India. During pregnancy, approximately 1000mg of iron is needed for the developing fetal-placental unit and the expansion of maternal erythrocyte mass. Out of this amount, one-third of the iron is utilized to establish sufficient iron stores in neonates at birth [10].

Iron metabolism: The equilibrium of iron metabolism in healthy individuals is influenced by three factors: nutritional intake, iron loss, and current physiological demand. To meet the escalating demand for iron, particularly during phases of development, pregnancy, and lactation, supplemental exogenous iron becomes imperative. This heightened requirement is essential not only to sustain maternal blood volume but also to facilitate the growth of the fetus and placenta. Furthermore, pregnant women experience iron depletion both prenatally and postnatally. During pregnancy and lactation, approximately 1000mg of iron are lost in total, necessitating a daily intake of 27mg of iron for pregnant women compared to the standard 8mg recommended for non-pregnant adults [9].

Contribution of Cooking Practices to Iron Deficiency Anemia: Over the past few decades, cooking and food preparation practices in India have undergone a transformation, with traditional iron pots being replaced by lighter, aesthetically pleasing, and easier-to-clean aluminum and stainless steel cooking vessels. The shift away from using cast iron pots in cooking may have contributed to the increase in iron deficiency anemia (IDA), as iron leaches into food when cooked in these pots, and their beneficial effects on iron status have been well established. Research has shown that Indian snacks fried in cast iron pots had their iron content increased by 16.2%. Cooking green leafy vegetables in iron utensils has been shown to result in a threefold increase in iron content compared to cooking with steel or aluminium utensils [11]. Research revealed that cooking traditional Indian chicken curry in an iron karahi (Indian wok) increased

the iron content by fivefold compared to stainless steel cookware, demonstrating the substantial influence of cooking vessel material on nutrient retention. Moreover, when preparing acidic tomato chutney with a pH of 4.14, the iron content saw a remarkable 27-fold increase when cooked in iron utensils, emphasizing the significant role of cooking methods in enhancing nutrient absorption. However, employing cast iron pots remains a practical and economical approach to enhance the intake of bio accessible iron, offering an accessible solution to address nutrient deficiencies in cooking practices [11].

Management of IDA

Dietary management: Dietary iron exists in two forms: heme iron and non-heme iron, which differ in their chemical composition and bioavailability. Heme iron is found exclusively in hemoglobin and myoglobin from meat, poultry, and fish, whereas non-heme iron is present in both animal and plant products. The bioavailability of these iron forms varies significantly; heme iron can be absorbed by the human body at rates of up to 30%, while the absorption of non-heme iron, influenced by other nutrients, ranges from 1% to 10% [12].

There are two primary dietary strategies to address iron-deficiency anemia: increasing the intake of foods naturally high in iron and ensuring high iron bioavailability by including enhancers of iron absorption in meals and reducing the intake of iron inhibitors. According to the National Institutes of Health, the richest sources of heme iron are lean meat and seafood, while non-heme iron is found in nuts, beans, vegetables, and fortified grain products. The WHO recommends enhancing non-heme iron absorption by adding ascorbic, citric, or malic acid to meals or using food processing methods like fermentation, soaking, and germination to improve bioavailability, as iron from plant sources is less well absorbed [12].

Oral supplements: Pregnant women are commonly recommended oral iron supplements, with the optimal dosage determined by individual blood profiles and existing iron deficiency. Iron absorption is maximized when taken on an empty stomach approximately one hour before a meal, alongside a vitamin C supplement or consumption of vitamin C-rich fruit juice[13]. Poor compliance with iron supplements is often attributed to gastrointestinal side effects, including gastric irritation, diarrhea, constipation, and nausea, which restrict their intake among certain individuals [13].

In the developed countries, iron supplements are typically prescribed according to individual blood workup results, whereas in developing countries where screening may not be feasible, prophylactic daily oral supplements containing 60mg/day of elemental iron are commonly prescribed to prevent and manage iron deficiency anemia (IDA) in pregnant women[13]. In India, the Centers for Disease Control and Prevention (CDC) recommend starting oral low-dose iron supplements (30mg per day) at the first prenatal visit, followed by an increased dosage of 60 mg per day during the second and third trimesters[14].

Intravenous iron supplements: Oral iron supplements represent the standard treatment for IDA, including cases during pregnancy; however, in instances of low tolerance attributable to gastrointestinal side effects, healthcare providers may recommend parenteral iron therapy as an alternative approach [13]. Intravenous (IV) iron offers the benefits of enhanced bioavailability, reduced gastrointestinal side effects, and quicker recovery of hemoglobin levels compared to oral iron supplementation. Parenteral iron therapy should be administered following confirmation of iron deficiency through serum ferritin or other specific investigations, with informed consent obtained at a facility equipped with resuscitation capabilities[15]. Vital signs should be monitored periodically during and after infusion by a physician, nurse, or trained midwife. Test dosing is necessary only for Low Molecular Weight (LMW) iron dextran, as other parenteral iron preparations do not require it. Patients should be informed about the transient side effects of IV iron supplementation, including nausea, vomiting, pruritus, headache, flushing, myalgia, arthralgia, and back and chest pain, which typically resolve within 48 hours post-infusion [15].

Blood transfusion: Blood transfusion has traditionally been the standard approach for treating severe IDA, especially when patients have shown poor response to dietary iron rich food or when rapid correction of anemia is medically warranted [9]. Transfusion during pregnancy poses additional risks such as red blood cell allo-immunization, volume overload, and the potential development of fetal hemolytic disease. In obstetrics, the decision regarding transfusion should be tailored to each individual, considering factors such as the availability of alternative treatments like oral and parenteral iron, the current and potential risk of hemorrhage, comorbidities such as disseminated intravascular coagulation (DIC) and thrombocytopenia, the rate of hemoglobin decline, and the patient's cardiovascular status. Hence, the decision to perform a blood transfusion should only be made following a thorough evaluation of the potential risks weighed against the anticipated benefits [15].

Prevalence of Anemia during pregnancy at different periods of gestation

No.	Study	State	Total No.	Prevalence of anemia (%)	Period of gestation
1.	Lamba, J. & Saroch, N. (2023) [16]	North India	200	19.3% 50.3% 30.4%	First Trimester Second Trimester Third Trimester
2.	Himabindu, P. at al. (2023)[17]	Andhra Pradesh	8120	6.7% 41% 52.3%	First Trimester Second Trimester Third Trimester
3.	Biradar at al. (2023) [18]	Tamilnadu	302	57.6%	First Trimester
4.	Anand, S. at al. (2023) [19]	Uttar Pradesh	4300	92%	NA
5.	Qurat-ul-Ain at al. (2022) [20]	Kashmir	200	35.5%	NA
6.	Kumar, P. at al. (2022) [21]	India	1974	88.7%	First Trimester
7.	Yadav U. (2020) [5]	Uttar Pradesh	631	7.8% 68.6% 23.5%	First Trimester Second Trimester Third Trimester
8.	Suryanarayana, R. at al. (2017) [7]	Karnataka	427	14.3% 39.8% 45.9%	First Trimester Second Trimester Third Trimester
9.	Mangla, M. & Singla, D. (2016) [22]	Haryana	850	98%	NA
10.	Singh P., Chaudhary V. (2014) [2]	Uttar Pradesh	300	58.3%	Second Trimester
11.	Lokare, P. at al. (2012) [23]	Maharashtra	352	87.21%	NA

DISCUSSION

This review underscores the widespread nature of anemia during pregnancy in India, with variations seen across different states and gestational periods. This high prevalence, particularly in the second and third trimesters, highlights the need for targeted interventions. Improving antenatal care, enhancing nutritional support, and ensuring adequate iron supplementation throughout pregnancy are crucial steps to mitigate this significant public health issue. The regional differences in prevalence also suggest that localized strategies may be necessary to address specific community needs effectively.

Pregnancy is a period of rapid physiological changes that increase nutritional needs to maintain maternal metabolism and support fetal growth and development. Proper dietary habits are essential for the nutritional status of both the mother and fetus. Since anemia is a major health issue among pregnant women, special attention should be given to a well-balanced diet. Pregnant women are advised to increase their overall food intake, as the additional energy can help meet the increased iron requirement, estimated at 27mg/day during pregnancy.

CONCLUSION

Globally, IDA persists as the primary cause of anemia during pregnancy, posing significant risks to both maternal and fetal health, with potential consequences ranging from maternal mortality to preterm birth if left untreated.

The approach to managing IDA varies depending on the stage of gestation and the severity of the anemia[15].

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