A Review on Worldwide Ubiquitousness of An Atrocious Disease: The Anemia in Pregnant Woman Causing Predicament

Shweta Geed[1], Dr. Shuchita Chandorkar[2], Sakshi Thakur[3], Sheeba Khan[4]

[1]*Research Scholar at the School of Studies in Zoology and Biotechnology, Vikram University Ujjian (M.P.)*

[2]*Assistant Professor, Department of Zoology, Govt. Girls P. G. College Ujjain M.P. India,*

3*Research Scholar at the School of Studies in Zoology and Biotechnology, Vikram University Ujjian (M.P.)*

4*Research Scholar at the School of Studies in Zoology and Biotechnology, Vikram University Ujjian (M.P.)*

Abstract

Anemia is a worldwide health issue, especially in developing countries like India. A decrease in hemoglobin percentage is one of the most common problem in pregnant women. There are many causes behind this issue and many agencies have been involved in finding solutions to the substantial situation. According to WHO, a hemoglobin percentage less than 11gm in pregnant women is anemia. Various agencies are trying to overcome the prevalence of anemia in pregnant women so that the next generation can be healthier because anemia affects developing foetuses and possibly may cause some ailments. Iron deficiency, malnutrition, deficiency of vitamins, folic acid, etc. are common reasons for anemia. It is also a major problem in some geographic area.

Key Words: *Anaemia, Pregnant, Vitamins, folic acid, hemoglobin.*

Introduction

Anaemia is the commonest problem in pregnancy in developing countries. WHO defines it as a hemoglobin level of less than 11 grams % in pregnancy. It is divided into three degrees mild degree (9.0-10.9gm%), moderate degree (7.0-8.9 gm%), and severe degree. It has long been recognized that anemia is a major public health problem, especially among poorer segments of the population in developing countries [1]. Anaemia is one of the most prevalent nutritional deficiency problems affecting pregnant women, defined by the WHO as hemoglobin levels of less than 11 gm %**: (Dreyfuss1992, Marchant 1998, World Health Organization, 2000; 2002) [1-4]**. A hemoglobin level of 9.0- 10.9 gm% is mild anemia, 7.0-8.9 gm% is moderate anemia and less than 7 gm% is called severe anemia **(Stratton JA,1985) [5].**

About a quarter of the world's population suffers from anemia. Children and women, especially pregnant women, are at higher risk **(Mattei 2015 , Pena-Rosas 2019) [6,7]**. Based on different causes, anemia can be classified into three types: nutritional anemia, disease-related anemia, and anemia caused by genetic factors **(Chaparro, 2015)[8].** A deficiency in iron, folate, vitamin B12, vitamin A, vitamin C, and other nutrients can cause nutritional anemia, which is common in low- and middle-income countries **(Breymann,2019)[9]**. Iron deficiency (ID) is one of the main causes of anemia, accounting for about 50% of all anemic cases (**Kassebaum,2016)**[10]. The occurrence of ID and iron deficiency anemia (IDA) can be affected by geographical, cultural, dietary, and economic factors, as well as genetic factors (e.g., single-nucleotide polymorphisms of gene TMPRSS6)(**An et al 2018,Gan et al 2012**) [11,12]. IDA during pregnancy is associated with adverse health outcomes for both mothers and babies, including premature delivery, infants who are small for gestational age, low birth weight, or even perinatal death **(Breymann 2019, Santos 2017 and Kang 2015) [9,13,14].** The common prevention and treatment of ID and IDA during pregnancy include iron-containing supplements, medicines, and nutrition counseling on dietary practices (**Mattei 2015, Pena-Rosas 2017, Derbyshire 2020)[6,15,16].** Maintaining proper nutrition during antenatal care is crucial for favorable birth outcomes and healthier offspring. In many low- and middle-income countries, inadequate intake of essential nutrients like vitamins, minerals, proteins, iron, and folic acid is common, affecting both mothers and babies(Marshall,a 2022)[17]. According to the National Family Health Survey-4 (NFHS-4), one out of every four women in India has an undernourished diet, with a body mass index (BMI) lower than 18.5 kg/m^2 causing deficiencies such as iron deficiency anemia. Providing nutrition supplements to mothers in the form of IFA tablets is the most efficient and scalable intervention, which reduces the burden of undernutrition and has been shown to impact various health outcomes positively (WHO, 2020) [18].

According to the World Health Organization, pregnant women with hemoglobin (Hb) levels ≥11 g/dL are considered non-anemic, 10.0–10.9 g/dL as mildly anemic, 7.0–9.9 g/dL as moderately anemic, and <7.0 g/dL as severely anemic. Despite various health programs in India, over 50% of pregnant women still suffer from anemia. This study explores the barriers to preventing anemia and examines the attitudes and behaviors of anemic women (Kalaivani 2018)[19].

The Indian government, in collaboration with the World Health Organization (WHO), has been addressing anemia as a major health concern. According to the National Family Health Survey from the year 2019-2021 (NFHS-5), 52.2% of pregnant women in India (ages 15-49) are anemic, with the highest prevalence in Ladakh, Bihar, Gujarat, West Bengal, and Odisha. The state/union territory governments are responsible for implementing health programs, with support from the Ministry of Health through the National Health Mission (NHM). The Anemia Mukt Bharat (AMB) initiative, launched in 2018, aims to eliminate anemia through a life-cycle approach, focusing on adolescent girls and pregnant women. Strategies include providing IFA supplements, behavior change campaigns, delayed cord clamping, and digital hemoglobinometers for testing. The initiative also addresses non-nutritional factors like malaria, hemoglobin disorders, and fluorosis. Severe anemia in pregnant women is treated with iron sucrose or blood transfusions, and a national deworming program is carried out biannually. Key districts receive targeted interventions, and healthcare workers are trained to manage anemia effectively. (**Dutta at al 2023**)[20]

A Terrible Journey of Anemia During Pregnancy

Many scientists have been studying the occurrence of anemia in pregnant women and children for many years.

Studies from early twentieth century

A decrease in red cell count or hemoglobin levels during pregnancy may result from physiological hydremia, true anemia (commonly due to iron deficiency or megaloblastic erythropoiesis), or a combination of both. Hydraemia-induced low hemoglobin does not harm the mother or fetus **(F. P. Retie,1967) [21],** but true anemia should be identified and treated. While blood volume changes during pregnancy have been well studied **(Hytten, et. al 1964,**

Ziintz, 0. 1911)[22,23], correlating these findings with standard measures of hematopoietic efficiency remains challenging. Pregnancy-related blood volume changes are difficult to assess due to altered body mass, surface area, and extracellular fluid distribution. Additionally, diagnostic criteria for iron or folate deficiency in non-pregnant individuals may not apply during pregnancy **(Miller, et al. 1915, Zaron. et al. 1964) [24,25].**

In 1967 some investigators investigated anemia in pregnant women in Trinidad, where 34% of women had hemoglobin levels below 10 g/dL, a commonly used threshold for anemia. The study highlighted the prevalence of anemia in the region and suggested that routine administration of iron in therapeutic quantities is justified where microcytic anemia is prevalent [26].

Studies from Late twentieth Century

In 1991 a few workers investigated the diagnostic utility of the serum transferrin receptor (sTfR) as a marker for detecting iron deficiency during pregnancy. Their study found that serum transferrin receptor concentrations were not significantly influenced by pregnancy itself, making it a sensitive indicator of iron deficiency. Interestingly, they observed a progressive rise in serum receptor concentrations during gestation, which they attributed to placental origin rather than iron deficiency. This study confirmed the potential utility of serum receptor measurements for diagnosing iron deficiency in pregnancy [27].

Similarly, a study done in 1998 in Singapore found the prevalence of anemia at delivery to be 15.3%. Multivariate logistic regression analysis revealed several key predictors for anemia at delivery, including iron prophylaxis and baseline hemoglobin levels. Women not receiving iron therapy were 11 times more likely to have anemia compared to those who did (95% CI 8.76–14.13). Furthermore, a 1 gm% increase in hemoglobin reduced the odds of anemia by 55%. Ethnic background also played a role, with Malays and Indians having 95% and 58% higher odds of anemia compared to the Chinese. Women with a history of anemia were 2.6 times more likely to be anemic during pregnancy. Iron deficiency was identified as the most common cause of anemia, confirming that anemia remains a significant health issue in both developed and developing countries [28].

Åkesson et al. (1998) explored the use of soluble serum transferrin receptor (sTfR) as a marker for iron deficiency during pregnancy. They found that sTfR is a specific and sensitive marker for iron deficiency, with its early low levels linked to reduced erythropoiesis. Further research was recommended to determine if decreased erythropoiesis impacts the early detection of iron deficiency using sTfR [29].

In addition, Milman et al. (1999) discussed the controversial issue of iron supplementation during pregnancy. They noted that among fertile women, 20% have sufficient iron reserves (±500 mg), 40% have moderate reserves (100–500 mg), and another 40% have minimal iron stores. Iron requirements increase substantially during pregnancy, from 0.8 mg/day in early pregnancy to 7.5 mg/day in late pregnancy, while the median dietary intake is 9 mg/day, often below the recommended 12–18 mg/day. This insufficient intake leads to iron deficiency anemia in 20% of women who do not take supplements. Milman suggested that prophylactic iron supplementation should be considered, with a selective approach based on early screening for serum ferritin levels to identify women who may not need supplements [30].

In a high-altitude study, Cohen and Haas (1999) estimated the prevalence of iron deficiency anemia among pregnant women residing in La Paz (3,600 meters) and El Alto (4,000 meters) in Bolivia. Their research provided a better fit for the hemoglobin-altitude curve than previous models and revealed that the prevalence of iron deficiency anemia in pregnancy was higher at these altitudes than previously estimated. The study underlined the importance of adjusting for altitude when assessing anemia prevalence in pregnant populations [31].

Studies from Early Twenty one Century

Scanlon et al. (2000) examined the association between maternal hemoglobin levels during pregnancy and the risk of preterm birth and small for gestational age (SGA) infants. The study found that women with low hemoglobin levels in the first and second trimesters had an increased risk of preterm birth, with an odds ratio (OR) of 1.68 for moderate-to-severe anemia in the first trimester (hemoglobin less than 95 g/L at 12 weeks, 95% CI 1.29–2.21). However, no significant link was found between anemia and SGA. Conversely, high hemoglobin levels were associated with an increased risk of SGA, with ORs of 1.27 (95% CI 1.02–1.58) for very high hemoglobin levels (over 149 g/L at 12 weeks) and 1.79 (95% CI 1.49–2.15) at 18 weeks [32].

A study by Bondevik et al. (2000) investigated the prevalence of anemia and severe anemia among pregnant Nepali women in Kathmandu. They found that anemia was highly prevalent, with a rate of 62.2%, and severe anemia affected 3.6% of the population. Socio-demographic factors such as age, ethnicity, maternal education, occupation, and biological factors such as body mass index, height, and parity were significantly associated with anemia prevalence [33].

In a comprehensive study by van den Broek (2000), the full spectrum of nutritional and non-nutritional factors associated with anemia in pregnancy was assessed in South Malawi. Among 150 anemic women, 23% were found to be iron deficient, with no evidence of folate, vitamin B-12, or vitamin A deficiencies. Interestingly, 32% were deficient in iron and one or more other micronutrients. High C-reactive protein (CRP) concentrations were found in 54% of the anemic women with no nutritional deficiencies and in 73.5% of those who were iron replete according to bone marrow assessments. This study emphasized the multifactorial nature of pregnancy anemia and the significant role of inflammation [34].

Anemia is the most common nutritional deficiency during pregnancy in Malaysia. A national-level study conducted by Haniff et al. (2007) found the overall prevalence of anemia to be 35% (SE 0.02) at a hemoglobin cut-off of 11 g/dL, and 11% (SE 0.03) at 10 g/dL, with most cases being mild. The study identified a higher prevalence of anemia among teenagers, and regression analysis showed that only gestational age remained a significant predictor of anemia.[35].

Thrombocytopenia is a common complication during pregnancy, and its etiology can vary widely. Correctly identifying the underlying cause of thrombocytopenia is essential for effective treatment and management. Some causes of thrombocytopenia are pregnancy-specific and may be unfamiliar to hematologists, requiring careful differential diagnosis. McCrae (2010) outlines the various causes of thrombocytopenia in pregnancy, focusing on the pathogenesis of selected disorders and offering guidance on the best approaches to manage these patients [36].

Bánhidy (2011) explored the efficacy of iron supplementation in anemic pregnant women, examining pregnancy complications and birth outcomes. The study found that anemic pregnant women who did not receive iron treatment had significantly shorter gestational ages at delivery, with a higher rate of preterm births. These adverse outcomes were prevented with iron supplementation. Additionally, the study found that the rate of total and some congenital abnormalities was lower than expected, likely due to healthier lifestyles and folic acid supplements. However, anemic women on iron supplementation had a higher risk of constipation-related hemorrhoids and hypotension [37].

In her study, Sun (2017) discussed the diagnosis, maternal and fetal implications, and treatment of common etiologies of anemia in pregnancy. She emphasized that a decrease in hemoglobin levels during pregnancy is largely due to physiological changes, establishing lower anemia thresholds than those in nonpregnant individuals. However, microangiopathic hemolytic anemia complicates the diagnosis of anemia, posing serious risks for both the mother and fetus[38].

Öztürk et al. (2017) reported that the prevalence of anemia is 18% in developed countries, while it ranges from 35% to 75% in developing countries. In Turkey, the rates of mild, moderate, and severe anemia were found to be 16.64%, 3.07%, and 0.28%, respectively. The overall prevalence of anemia at the time of pregnancy detection was reported to be 20.0% [39].

Thrombocytopenia occurs in approximately 5% to 10% of pregnant women and may either be incidental or indicative of underlying disorders. Recent advancements have provided deeper insights into the causes and management of thrombocytopenia during pregnancy. Notably, the increasing use of treatments such as thrombopoietin receptor agonists and rituximab raises concerns regarding potential risks to the fetus. Additionally, updated diagnostic criteria for preeclampsia, the reliance on ADAMTS13 measurement for diagnosing thrombotic thrombocytopenic purpura (TTP), and the introduction of anti-complement therapies for managing atypical hemolytic uremic syndrome (HUS) are also crucial developments in the field. This chapter aims to assist hematology consultants by providing updated diagnostic and management strategies for thrombocytopenia, considering factors such as the trimester, severity, and clinical context (Cines et al., 2017)[40].

Faghir-Ganji et al. (2023) conducted a systematic review and meta-analysis to assess the prevalence and risk factors of anemia during the first, second, and third trimesters of pregnancy in Iran between 2000 and 2021. Their findings highlighted the significant burden of anemia among pregnant women in Iran, emphasizing the need for comprehensive preventive measures and effective treatments, particularly for vulnerable populations such as pregnant mothers. The study suggested that improving access to maternal health services is essential to minimize anemia and enhance maternal health outcomes [41].

In a study by Locks et al. (2024) in Eastern Maharashtra, India, the relationship between multiple micronutrient deficiencies and anemia during pregnancy was examined. The study found that while iron deficiency (ID) and anemia often coexist, they affect different individuals in many cases. The findings underscore the importance of addressing both iron deficiency and other causes of anemia through strengthened clinical and community-based strategies. Effective prevention and management of anemia during pregnancy in India will require targeted interventions that address both iron deficiency and the broader nutritional context [42].

Zhou et al. (2024) conducted a systematic review and meta-analysis to determine the prevalence of anemia, iron deficiency (ID), and iron deficiency anemia (IDA) among pregnant women in China. They found significant regional differences and urban-rural disparities in the prevalence of these conditions, suggesting the need for more context-specific interventions. The study also identified dietary factors as one of the major causes of anemia and recommended interventions such as iron-containing supplements and nutrition counseling to reduce the prevalence of anemia, ID, and IDA among Chinese pregnant women [43].

Conclusion :

Anemia during pregnancy is a global health concern, affecting millions of women worldwide. It is primarily caused by iron deficiency but can also result from deficiencies in folic acid, vitamin B12, or other underlying health conditions. Pregnant women are particularly vulnerable due to increased iron demand to support fetal growth and blood volume expansion. Anemia can lead to serious complications, including preterm birth, low birth weight, and maternal mortality. Preventive measures such as iron supplementation, proper nutrition, and early detection through screening are crucial to reducing the burden of anemia and ensuring better maternal and fetal health. Addressing anemia requires global collaboration, especially in low-resource settings where healthcare access is limited.

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