A Pragmatic Approach to Anemia in Pregnancy: An Overview

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ABSTRACT

Anemia is a common condition in pregnancy and has been associated with various adverse maternal and fetal outcomes. Hematological parameters are altered as a result of normal physiological changes during pregnancy, most notably a decrease in hemoglobin (Hb) concentration. As iron demands during pregnancy increase tremendously, it is not surprising that iron deficiency anemia is still the most common cause of anemia. Indeed, a mother's overall health and her ability to work can be negatively impacted by chronic iron deficiency, which also causes weariness. In order to assess the iron status, laboratory investigations are advised to start in the first trimester. Early identification and treatment of this clinical disease are essential because of the condition's severe negative effects on maternal-fetal outcomes. This calls for effective and immediate preventative measures to avoid complications that may lead to maternal and fetal morbidity and mortality. This review serves as a brief to approach anemia in pregnancy. It provides an overview of understanding the problem and suggests recommendations to decrease the prevalence.

Keywords: Anemia in pregnancy, iron deficiency, global burden, maternal and fetal complications.

I. INTRODUCTION

Anemia in pregnancy has emerged as a serious public health issue. World Health Organization (WHO) has defined anemia in pregnancy as hemoglobin (Hb) concentration of less than 11 g/dl [1]. Anemia during pregnancy contributes to an increase in the incidence of premature births, low birth weight babies, and prenatal mortalities [2]. Apart from the increasing prevalence, the financial burden inflicted on the healthcare system is also almost exponential. Therefore, effective strategies should be amended soon to overcome this problem.

A. Global Burden of Anemia in Pregnancy

Anemia is one of the most prevalent yet alarming health problems affecting more than 56 million women globally, where two-thirds of whom are Asians [3]. WHO regards anemia as a public health significance if population studies show a prevalence of ≥ 5%. Moreover, if the prevalence is ≥ 40%, it is then classified as a severe public health problem. The global prevalence of anemia in pregnancy is estimated to be approximately 41.8%, varying from as low as 5.7% in the United States to as high as 75% in Gambia [1].

Global data shows 56% of pregnant women in low- and middle-income countries have anemia [4]. Another study shows that about 52% of pregnant women from underdeveloped and developing countries are anemic as compared to 20% from developed nations. The prevalence of anemia in pregnancy is highest in India (88%), followed by Africa (50%), Latin America (40%), and the Caribbean (30%) [5].

Anemia in pregnancy imposes many adverse effects on maternal and child health. It increases the risk of both maternal and perinatal morbidity and mortality. According to [4], some studies have shown that anemia in pregnancy contributes to 23% of indirect causes of maternal deaths in developing countries. In research from [6], low BMI, ascarisiasis infection, insufficient dietary consumption of foods enriched with iron, low socioeconomic conditions, and high parity are associated factors that contribute to the prevalence of anemia. As an integrated effort, in the 'Comprehensive Implementation Plan on Maternal, Infant, and Young Child Nutrition’, WHO has set Global Target 2 which aims to reduce anemia among women of reproductive age by 50%, by 2025 [7]. However, a multifactorial and multisectoral approach is necessary to achieve this global target.

B. Burden of Anemia in Pregnancy in Malaysia

In Malaysia, antenatal care is provided to pregnant mothers starting from early gestation until the end of postpartum period. According to the Department of Statistics Malaysia, the number of live births in 2021 was 439,744 [8]. Contrarily, the prevalence of anemia among women of reproductive age and pregnant women in Malaysia is at alarming rates. According to the global health observatory data from WHO [1], the prevalence of anemia in women of reproductive age in Malaysia was 24.9 % whereas that of pregnant women was 37.05%. Reference [5] stated that anemia prevalence among pregnant teenage mothers in Malaysia was 53.1%. According to the National Health and Morbidity Survey carried out by the Malaysian Ministry of
Health [9], in every ten women of reproductive age (between 15 to 49 years old), three were found anemic.

This statistic is rather troubling, especially when considering the negative implications of anemia on maternal and neonatal outcomes. The national target of Key Performance Indicator (KPI) for anemia in pregnancy has been revised several times over the last few years, to consecutively lower values, which has led to more challenges in achieving it. Global KPI for anemia in pregnancy will be revised to < 5% by 2025 [10].

II. LITERATURE REVIEW

Anemia is a global public health concern affecting both developing and developed countries worldwide. It is one of the most common hematological disorders related to pregnancy. The adverse effects it exerts, especially during pregnancy, can affect both mother and fetus. Furthermore, these effects are confined to intrauterine growth period and may also prolong during later stages of life. Successful reduction in the prevalence of anemia in pregnancy may improve children's school performance and women's work productivity and pregnancy outcomes for mothers and neonates, resulting in intergenerational benefits for individual well-being, economic potential, and community development [10].

A. Definition of Anemia

In humans, blood makes up 8% of the total weight. Red blood cells (erythrocytes), white blood cells (leucocytes), platelets (thrombocytes), plasma, clotting factors, and low molecular weight proteins are some of the many components that make up whole blood. The blood of an average adult is about 5 liters in volume and is made up of plasma and several different types of cells. Erythrocytes lack nuclei and are filled with hemoglobin (a protein and iron compound called globin). They make up roughly 45% of whole blood by volume [11].

According to WHO, anemia is defined as hemoglobin (Hb) levels < 13.0 g/dL in men, < 12.0 g/dL in non-pregnant women and < 11.0 g/dL in pregnant women [12]. Anemia in pregnancy is potentially associated with various maternal and adverse fetal outcomes. However, according to Stephen et al. [12], in pregnancy, contributions of each of these factors vary due to geographical location, dietary practices, ethnicity, and socio-cultural background.

B. Classification of Anemia

According to World Health Organization [10], anemia can be classified as mild, moderate, and severe. Mild anemia is where Hb ranges between 9.0-10.9 g/dL whereas moderate anemia denotes a Hb value between 7.0–8.9 g/dL. HB value less than 7.0 g/dL is considered severe anemia and needs immediate action.

Ideally, the most crucial way to classify anemia is based on the red cell indices. Two critical indices are Mean Corpuscular Hemoglobin (MCH) and Mean Corpuscular Volume (MCV). MCH is the average mass of Hb per RBC in a blood sample which depicts the Hb concentration within whereas MCV is the average volume of RBC. The latter depicts its size. To categorize anemia as microcytic, normocytic or macrocytic, a combination of MCH and MCV must be reported [13]. Anemia can also be diagnosed by estimating the Hb concentration and examining a peripheral blood smear for the characteristic of erythrocytes [14].

Generally, microcytic anemia occurs when MCV is below 80fL whereas macrocytic anemia occurs when MCV is above 95fL. On the other hand, normocytic anemia occurs when MCV is between 80fL and 95fL, while hypochromic anemia occurs when MCH is below 27 pg/cell. For example, microcytic hypochromic anemia has an MCV below 80 and MCH below 27 [13]. Some examples of microcytic, hypochromic anemia are such as iron deficiency anemia, thalassemia, and sideroblastic anemia whereas types of macrocytic anemia are megaloblastic anemia (such as folate or vitamin B12 deficiency) and aplastic anemia.

In one-third of anemic patients, the condition is due to nutritional deficiency, including iron, folate, or vitamin B12 deficiency [15]. Among these classifications, during pregnancy, Iron Deficiency Anemia (IDA) prevails as the most common type. In addition, the prevalence of IDA is high in both women of reproductive age as well as pregnant mothers [16].

C. Risk factors of Anemia in Pregnancy

During pregnancy, the body undergoes various physiological changes. Some of these changes affect maternal laboratory results. Some of these changes include the reduction in hematocrit and hemoglobin levels, termed physiological or hemodilution anemia [17]. Hemodilutional anemia is normocytic, normochromic in nature. As there is a simultaneous increase in iron requirement during pregnancy, this hemodilutional state warrants a preemptive approach to mitigate further Hb reduction [18]. Compared to first and second trimesters, anemia is usually more prevalent in third trimesters.

Due to pregnancy’s economic, sociological, and health variables, anemia among pregnant women in developing nations is substantially higher than in developed countries [19]. Women from underdeveloped nations typically report more cases of anemia during pregnancy, which signifies their bodies’ ability to meet the increasing demands during pregnancy and that their pre-existing iron stores are insufficient [20].

Antacids and a lack of certain micronutrients, such as vitamin A, vitamin C, zinc, and copper insufficiency, are other variables that can hinder iron absorption in addition to inadequate nutrition [16]. According to Noronha et al. [21], anemia is more common due to related factors like low Body Mass Index (BMI), vitamin B12 deficiency, infection with ascariasis, inadequate dietary intake with iron, low socioeconomic status, and high parity.

As anemia is the most frequent pregnancy-related maternal problem, young age, poor living environment, low educational level, inadequate birth spacing, and non-compliance to iron and folate acid supplements are some of the major risk factors for developing an anemic state during pregnancy. The higher prevalence of anemia in developing nations, especially in women and children of reproductive age, is primarily caused by malnutrition and low micronutrient bioavailability, which are frequently brought on by poor dietary practices and insufficient consumption of

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foods high in micronutrients, such as fresh fruits and vegetables [22].

Vitamin B12 and folic acid deficits are uncommon among non-pregnant women, except for malabsorption and some bowel illnesses. In global public health's view, iron deficiency is the primary cause of nutritional anaemia. A vegetarian diet with insufficient heme iron (since only 3-5% of dietary iron is absorbed in a typical, healthy individual) is one example of a poor diet that can contribute to IDA [16].

D. Signs and Symptoms

Normal physiologic changes in pregnancy cause relative or absolute reduction in Hb concentration, leading to various signs and symptoms. Manifestations of anaemia during pregnancy may involve the spinal and peripheral nervous systems. These include slowness of thought, memory problems, hallucinations, and tingling or numbness in the limbs [23]. Fatigue, tachycardia, dyspepsia, poor exercise tolerance, and poor work performance are clinical signs of IDA [16].

The extent of the signs and symptoms can vary depending on the severity of anaemia, gestation of pregnancy and associated complicating factors [16]. Generally, pregnant mothers suffering from anaemia complain of easily lethargic and reduced activeness. IDA is also associated with increased infection susceptibility [23]. However, pathologic anaemia may lead to various symptoms such as fatigue, headache, palpitation, dizziness, shortness of breath, poor memory, and hair loss. Other common signs include pallor, tachycardia, glossitis, stomatitis, edematous feet, and even soft systolic murmur in the mitral area [24].

Clinical characteristics (weakness, headache, irritability, and varying degrees of fatigue and exercise intolerance), the incidence of bleeding, and a positive family history of hematological diseases are considered when making the diagnosis. The complete blood picture Hb 11, low serum ferritin levels, increased transferrin (Tf) levels, and total iron binding capacity were also considered when making the diagnosis [23].

With a net iron balance of 580 mg during pregnancy, the total iron requirement is 1,190 mg, which translates to a daily need of 2 mg [16]. This is most often difficult to meet, causing IDA. IDA is primarily a laboratory diagnosis that can be made through four tests; Serum iron (SI), Serum transferrin saturation (TS) or total iron binding capacity (TIBC), Serum ferritin (SF), and Hemoglobin level.

The history and physical examination can help identify the condition and establish its etiology. According to [14], all pregnant women should be thoroughly assessed at the start of their pregnancy so that any problems, such as anaemia, will be picked up and treated. Investigations are done to detect the degree of anaemia, the type, and the respective causes [24].

E. Complications

Anaemia in pregnancy is a significant contributor to maternal mortality and morbidity as well as low birth weight, which may increase the percentage of infant deaths. Complications of anaemia in pregnancy can be categorized into maternal and fetal adverse effects. It is responsible for 20% of maternal deaths in developing countries [14]. A recent study revealed that infants born to mothers with IDA during pregnancy had a greater frequency of iron deficiency than those born to mothers with normal iron status. This may lead to growth and developmental delays among children [23].

Iron deficiency is also associated with increased prenatal and neonatal mortality, postpartum depression, poor maternal-infant behavioral interaction, reduced lactation, preterm births, and intrauterine growth restriction (IUGR) [16]. Preterm labor, preterm birth, placental abruption, preeclampsia, eclampsia, and cesarean delivery are among the maternal effects of IDA [25]. Maternal IDA is linked to a higher risk of postpartum depression, lower quality of life, severe postpartum hemorrhage, maternal shock, increased admission to the maternal intensive care unit, hysterectomy antenatal and postnatal maternal sepsis, need for blood transfusions, slow wound healing, cardiac failure, and even maternal mortalities [26].

Low vitamin B12 increase the risk of congenital disabilities such as neural tube defects [23]. The fetal cardiovascular system has been demonstrated to be affected by iron shortage, with diminished circulation, slower cardiovascular development, and larger hearts among the effect [25]. Fetal distress is also attributed to maternal iron deficiencies. The heart, skeletal muscles, brain, and gastrointestinal tract are just a few of the major organ systems that iron shortage can adversely affect in terms of growth and function [26].

Additionally, children of iron-deficient mothers are more likely to experience hypertension, obesity, and modifications in their lipid metabolism. However, these findings may be complicated by the effect of maternal obesity on fetal iron reserves [27]. Additionally, neurological conditions, including autism spectrum disorder, attention deficit disorder, and other intellectual difficulties, are more common in offspring [28]. With 14% of term babies delivered to iron-deficient mothers having serum ferritin concentrations below 30 g/L at delivery, fetal iron insufficiency is also linked to an elevated risk of early postnatal iron deficiency [27]. Even if their iron levels appear to be adequate at birth, infants of women with mild to moderate IDA are still at risk for iron insufficiency throughout the first year of life [25].

III. RECOMMENDATIONS

Anemia causes significant negative impacts on the productivity of the community. These demands direct resources to the antenatal health care system and highlights the importance of prophylaxis iron supplementation. The failure to monitor and evaluate associated programs is one of the leading causes. An integral part of prenatal care and paediatric treatment includes anaemia screening and iron-folate therapy administered in the right amounts and via the right routes for preventing and controlling anaemia in these vulnerable groups [21].

In nations with limited resources, improving the standard of maternal and reproductive health services is a significant programmatic challenge. The Malaysian Perinatal Care Manual urges pregnant women to take 100 mg of elemental iron daily as a preventative measure. Both recommendations are stated in the Clinical Practice Guidelines [29].

This proclaims a call for a systematic review of the nutritional supplementation policy for the female population

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in Malaysia. Rigorous actions are required to comprehend and construct the preventive measures. The International Federation of Gynecology and Obstetrics (FIGO), in 2019, suggested several prophylactic measures as follows:

- Routine iron supplementation for all pregnant mothers according to local health policies
- All pregnant women should be given dietary information to maximize iron consumption.
- Referral to secondary care upon severe anemia (hemoglobin < 7.0 g/dL), late gestation (> 34 weeks), or if there is failure to respond to a trial of oral iron.
- Parenteral iron should be considered from the second trimester onwards for those who fail to respond or are intolerant to oral iron.

The Ministry of Health (MOH), in Malaysia, has taken various interventions to reduce the burden of anemia in pregnancy in the country. These include anemia screening during pregnancy with different anemic cut-offs when indicated, supply of a combination of folic acid and iron supplements to pregnant mothers during antenatal visits, interactive diet counseling by nutritionists or dieticians, repetitive health education on anemia during health clinic visits, availability, and administration of parenteral iron in local health clinics, and early prevention of anemia through Pre-Pregnancy Care program. The national target for the prevalence of anemia in pregnancy set by MOH in 2020 was < 7%. This elucidates that the total percentage of pregnant mothers whose hemoglobin level is below 11 g/dl at 36 weeks of gestation should be less than 7%.

High-quality antenatal care plays a crucial role in preventing anemia. There is a need to raise the standard of healthcare services. Efficient plans, such as enlisting peer groups for expectant women, enhancing antenatal care visits through digital media, and enhancing the knowledge of health professionals, are some measures that should be thoroughly looked into by health policy makers. Antenatal care and efforts should be geared toward the early detection and treatment of anemia before delivery, especially in pre-pregnancy care services. Nutritional sessions should be provided efficiently for the community through mass media, school educational sessions, home visits, and other health campaigns.

IV. CONCLUSION

In conclusion, it is highly recommended that pregnant mothers receive a range of standard investigations during antenatal clinic visits. In the government health clinics in Malaysia, the first antenatal screen, known as booking request for blood investigations, includes Full Blood Count (FBC), blood grouping, Rhesus grouping, Syphilis serology, and HIV screening and screening for malarial parasites. Hence, early booking ensures early detection of any abnormalities of these investigations that may avoid complications during pregnancy.

Anemia is an issue that antenatal care should attempt to spot as early as possible. Additionally, measures to influence behaviour through efficient informational counselling sessions have shown decreasing trends in the prevalence. A review of health care delivery, clinical management, health promotion initiatives in rural areas, and related factors are warranted for these concerns.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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