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Hematological parameters in anaemic pregnant women attending the antenatal clinic of tertiary care hospital

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Abstract: Background: Anaemia during pregnancy can lead to morbidity and mortality in mother as well as fetus. Anaemia cannot be diagnosed based upon the clinical picture alone and blood test is a definitive evidence of the same. The hematologic status in pregnant women can be evaluated by measuring different blood indices. **Aim**: The aim of our present study was to determine the effect of pregnancy on haematological parameters and to compare the haematological parameters at different stages of pregnancy. **Settings:** Tertiary care hospital. **Study design:** Prospective study. **Methodology**: A prospective study was carried out in the Department of Pathology at MMIMSR, Mullana, Ambala, from May 2011 to September 2013. The antenatal cases reporting to the Department of Obstetrics and Gynaecology of M.M.I.M.S.R. Mullana were included in the study. The blood samples from all cases were analysed for various hematological parameters on automated cell counter. **Results:** The mean RBC (10^3/µl) were 3.23, 3.46, 3.29 and 3.25 in the age group <19, 20-25, 26-30 and 31-35 respectively. Mean MCV (fl) were 83.06, 76.45, 80.65, and 85.36, MCH (pg) were 26.9, 27.42, 27.67, 28.05 and MCHC (gm/dl) were 30.06, 30.89, 30.99 and 32.38 in the above age groups. Mean PCV (%) were 30.2, 28.73, 30.33 and 33.93 in the age group < 19, 20-25, 26-30 and 31-35 respectively. TLC was significantly higher in 68 (77.5%) cases and remained elevated throughout pregnancy. **Conclusion**: Anaemia can be easily diagnosed and responds quickly to intervention and treatment that is both inexpensive and readily available.

Key words: Anaemia; Hematological parameters; Iron; Pregnancy; Physiological anemia

Introduction

Anaemia during pregnancy is a major public health problem throughout the world, particularly in the developing countries. Anaemia is defined as decreased hemoglobin level, or circulating red cells mass and is the most common hematological disorder during pregnancy. The WHO definition of anemia in pregnancy is hemoglobin of less than 110 g/L (11 g/dL) but many laboratories will define their own pregnancy normal ranges that may be as low as 100 g/L (10 g/dL).

WHO has estimated the prevalence of anaemia in pregnant women as 14% in developed and 51% in developing countries (65-70% in India) [1]. About one third of the global population (over 2 billion) is anaemic.

The prevalence of anaemia during pregnancy is much higher and has far reaching consequences, especially the severe degrees of anaemia. It is estimated that about 60 million pregnant women worldwide are anaemic. Only 4 million of these are in developed countries. In developing countries, the

prevalence of anaemia in pregnant women varies anywhere between 50-90% among different population groups. In contrast to this, 18 to 20% of pregnant women in developed countries are anaemic. Throughout Africa 50% of pregnant women are anaemic. In Latin America, prevalence of anaemia in pregnant women is about 40%. The prevalence is high in the Caribbean, reaching 60% in pregnant women on some islands. South Asia has highest prevalence of anaemia. In a steering committee report from India, 13% women were reported to have haemoglobin less than 5 gm% and 34% had haemoglobin less than 8gm% [2].

Anaemia contributes to intrauterine growth restriction, preterm labour, abortions and it is also a primary cause of low immunity in both the mother and the baby, which makes them prone to several life threatening infections. It is a startling fact that about half of the global maternal deaths due to anaemia occur in South Asian countries [3]. In India 16% of maternal deaths are due to anaemia [4].

Physiologic anemia is well recognized during pregnancy, resulting from an expansion of maternal plasma volume that occurs to a greater degree than the pregnancy-induced expansion of red cell mass. Maternal anemia can also be present or develop during pregnancy because of deficiencies of essential hematinics such as iron, vitamin B12 and folate. Such pathologic anemia can adversely affect fetal growth and development and also increases the risk of maternal morbidity and mortality mainly at delivery if postpartum hemorrhage occurs. Severe anemia is common in women from resource poor countries with an estimated 75% of women having anemia. However, even in industrialized countries, anemia mainly due to iron deficiency is common, especially in less advantaged groups. The increased hematinic requirements during normal pregnancy can further compound deficiency states and anemia in women. Correction of anemia in the antenatal period may improve maternal and fetal outcomes. Thus, routine screening tests for anaemia are recommended in pregnant women [5,6].

There are several types of anaemia, produced by a variety of underlying causes. Anaemia can be classified in a variety of ways, based on the morphology of RBCs, underlying etiologic mechanisms, and discernible clinical spectra. The diagnosis of anaemia in pregnancy is difficult to establish based on clinical picture alone; yet it is important that treatment should be initiated early because of the high morbidity and mortality associated with anaemia during pregnancy.

The present study was undertaken to assess the blood parameters and to grade severity of anaemia in pregnant women.

Aims and Objectives:

1) To assess the level of blood parameters in pregnant women.
2) To grade the severity of anaemia in pregnant women

Material and Methods

This study was conducted on 80 women with anaemia from the outpatient/inpatient, Department of Obstetrics and Gynaecology of Maharishi Markendeshwar Institute of Medical Sciences and Research, Mullana, Ambala from May 2011 to September 2013. It is a prospective study.

Inclusion Criteria: 1) All pregnant women with Hb level below 11 gm%.

Exclusion Criteria: 1) Obesity, 2) Diabetes, 3) Any complication of pregnancy like APH, PIH, Preterm labour

Cases were selected according to criteria mentioned above. Also, detailed history taking and clinical examination was done. This was followed by investigations. Following hematological investigations were performed: Hemoglobin (Hb), Red blood cell (RBC) count, Total leucocyte blood cell (TLC) count, Differential count (DLC), Platelet count, Erythrocyte sedimentation rate (ESR), PCV (packed cell volume), Mean Corpuscular volume (MCV), Mean Corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC) and Leishman stained peripheral smear (PBF). Hb, TLC, DLC, Platelet count and RBC indices were estimated using automated cell counter. ESR was done by Westergren's method. PBF was carried out by Leishman's stain.

This prospective study consisting of 80 anaemic pregnant women was undertaken to evaluate the hematological parameters. The antenatal cases reporting to the Department of Obstetrics and Gynecology of M.M.I.M.S.R. Mullana were included in the study. The degree of anaemia was graduated as mild, moderate or severe according to W.H.O criteria. The hemoglobin levels for each of these types of anaemia in pregnancy was taken at 10.0-10.9 gm/dl for mild anaemia, 7.0-9.9 gm/dl; moderate anaemia, and < 7 gm/dl, as severe anaemia.

Ethical approval: Prior permission from the ethical committee of the hospital was taken. Written and informed consent was taken from each patient

included in the study.

Results

The present study was carried out on total 80 anaemic pregnant women (Hemoglobin level below11 gm/dl), attending the Department of Obstetrics and Gynaecology of M.M.I.M.S.R. Mullana Hospital, to evaluate the hematological parameters of anaemic pregnant women.

Out of 80 cases of anaemic pregnant women, 03 (3.75%) were < 19 years of age, 50 (62.5%) of 20-25 years, 19 (23.75%) 26-30 years and 8 (10%) belonged to 31-35 years of age. 43 (53.75%) were primigravida and 37 (46.25%) were multigravida. Among them, 8 (10%) women were in first trimester, while 25 (31.25%) and 47 (58.75%) were in second and third trimester respectively.

Severity of anaemia:

Based on the W.H.O criteria, pregnant women were graded according to the severity of anaemia. It was observed that 23 (28.75%) had mild anaemia, 44 (55.0%) were moderately anaemic, while 13 (16.25%) had severe anaemia (Table1).

RBC Count:

Out of total 80 pregnant women, Red blood cell counts were within normal limits in 24 (30%), while 54 (67.5%) had RBC count below normal range (Table 2).

RBC Indices:

The hematological profile of anaemic pregnant women to according to age groups is shown in Table 3.

Type of anaemia:

Five types of anaemia were seen in anaemic pregnant women as shown in Table 4. The most common was microcytic & hypochromic 38 (47.5%), followed by normocytic & hypochromic 26 (32.5%), normocytic & normochromic 5 (6.25%), microcytic & macrocytic anaemia (dimorphic) 6 (7.5%) and macrocytic anemia 5 (6.25%).

Total leucocyte count (TLC):

Out of 80 anaemic pregnant women, increased leucocyte count was seen in majority of 68 (77.5%) cases. It was normal in 10 (20%) and decreased in 2 (2.5%) cases.

ESR:

It was observed that ESR was increased in majority of 69 (86.25) patients while normal in 11 (13.75%) patients.

Platelet count:

Platelet count was within normal range in majority of 72 (90%) cases in all trimesters of pregnancy whereas 06 (7.5%) had mild thrombocytopenia and only 02 (2.5%) patients had moderate thrombocytopenia. In the present study no case of severe thrombocytopenia was detected.

Table 1: Distribution according to the degree of severity of anaemia

Anaemia	No.of Patients	Percentage (%)
Mild anaemia (10.0-10.9gm/dl)	23	28.75%
Moderate anaemia (7-9.9 gm/dl)	44	55%
Severe anaemia (<7 gm/dl)	13	16.25%
Total	80	100%

Table 2: Distribution according to red blood cell count in pregnant women

RBC Count	No.of Patients	Percentage
Normal (4.0-5.2 million/cumm)	24	30%
Increased (> 5.2 million/cumm)	02	2.5%
Decreased (< 4.0 million /cumm)	54	67.5%
Total	80	100%

Table 3: Blood indices according to age group

Age group	No. of Patients	Hb gm/dl	RBC (10^6/µl)	PCV (%)	MCV (fl)	MCH (pg)	MCHC (gm/dl)
< 19	03 (3.75%)	8.6 ±2.08	3.23 ±0.06	30.2 ±7.93	83.06 ±14.37	26.9 ±1.1	30.06 ±1.68
20-25	50 (62.5%)	8.08 ±1.46	3.46 ±0.86	28.73 ±4.84	76.45 ±8.78	27.42 ±2.57	30.89 ±2.15
26-30	19 (23.75%)	7.98 ±1.48	3.29 ±0.66	30.33 ±6.64	80.65 ±8.77	27.67 ±2.91	30.99 ±2.46
31-35	8 (10%)	8.18 ±1.76	3.25 ±0.27	33.93 ±7.02	85.36 ±11.61	28.05 ±2.88	32.38 ±0.78

Table 4: Type of anaemia in pregnant women

Types of anaemia	No. of patients	Percentage (%)
Microcytic & Hypochromic	38	47.5%
Normocytic & Hypochromic	26	32.5%
Normocytic & Normochromic	05	6.25%
Microcytic & Macrocytic (Dimorphic)	06	7.5%
Macrocytic	05	6.25%
Total	80	100%

Discussion:

Anaemia is the reduction in the number or volume of circulating red blood cells (erythrocytes) or an alteration in haemoglobin level. There are many types of anaemia, but some of them are rare. Anaemia is responsible for considerable morbidity and mortality. The provision of iron supplements to pregnant women is one of the most widely practices public health measures. Many diagnostic tests are currently available in assessment of anaemia in pregnant women e.g. haemoglobin concentration (Hb), total leucocyte count (TLC), differential leucocyte count (DLC), blood indices, haematocrit (HCT), peripheral blood smear which have important diagnostic role. Anaemia in pregnant women is considered as the major health problems with the greatest impact on the safety of the pregnant women and her fetus [7].

In the present study, out of 80 cases of anaemic pregnant women, 03 (3.75%) were < 19 years of age, 50 (62.5%) of 20-25 years, 19 (23.75%) 26-30 years, 8 (10%) belonged to 31-35 years of age. In the study by Patra et al [8], the mean age of the women with severe anaemia was 27.5±4.5 years. The majority of cases were of the age between 20 and 24 in their study [8]. 12% were teenagers. Similar to the present study, Shah et al [9] found that, out of 51 anaemic pregnant women, 2 (3.9%) were of the age > 20, while 26 (51%) women were of the age between 20-25years. Women in the age group 26-30 were 17 (33.1%).

In the present study, 8 (10%) cases belonging to the category of first trimester, 25 (31.25%) cases were in second trimester, whereas 47 (58.75%) in third trimester. In a similar study, by Kapil et al [7] 10 (19.7%) cases belonging to the category of 1st trimester, 20 (39.2%) cases were in 2nd trimester, whereas 21 (41.1%) in the category of 3rd trimester.

According to present study, out of 80 anaemic pregnant women, 23 (28.75%) were mildly anaemic, 44 (55%) were moderately anaemic, and 13 (16.25%) were severely anaemic corroborating with study by Shah et al [9]. The degree of severity was classified on the basis of WHO classification. Kapil et al [7] found that 78.8% pregnant women were suffering from anaemia. The percentages of mild, moderate and severe anaemia in pregnant women were 29%, 48%, and 2% respectively in their study [7].

The highest percentage of types of anaemia revealed by this study is microcytic & hypochromic anaemia. These types of anaemia were identified depending on the morphology of cells in peripheral smear and blood indices which in most cases is iron deficiency anaemia. Iron deficiency anaemia (IDA)

is a global health issue with disproportionately high prevalence in women in the developing countries. In addition to being an independent risk factor for decreased quality of life and increased morbidity and mortality, IDA in women has been linked to unfavorable outcome of pregnancy. It is the most common nutritional disorder in the world affecting 2 billion people worldwide with pregnant women particularly at risk. WHO data indicates that iron deficiency anaemia is a significant problem throughout the world ranging from 1% (average of 14%) in the industrialized countries to an average of 56% (ranging from 35-75%) in developing countries. The most common causes include; nutritional deficiencies of iron, parasitic diseases such as malaria and hookworm, haemoglobinopathies such as sickle cell disease [10]. In the present study, occurrence rate was found to be 47.5%. The iron deficiency is not the only reason in cases of anaemia, but there is food and other essential materials which contribute to the process of red blood cell formation, including vitamin B_{12} and folic acid.

The study also showed that the occurrence of another type of anemia among pregnant women, but to a lesser extent is macrocytic anaemia or megaloblastic anaemia. This type of anaemia is a group of disorders characterized by the existence of formal manifestations characteristic of red blood cells formed in the bone marrow and the reason is lack of vitamin B_{12} or folic acid. This type of anaemia may result from disorder in the metabolism of these vitamins or because of mistakes in the process of formation of the DNA, which is not related to vitamin B_{12} or folic acid. Deficiency of folic acid is the main reason for development of megaloblastic anaemia in pregnancy as stores of vitamin B_{12} are adequate for several years. Shawi et al [11] reported the incidence of megaloblastic anaemia 21.8%, where as in the present study incidence was 6.25%.

In the present study, mean RBC (10^6/µl) were 3.23, 3.46, 3.29 and 3.25 in the age group <19, 20-25, 26-30 and 31-36 respectively. Mean MCV (fl) were 83.06, 76.45, 80.65, and 85.36, MCH (pg) were 26.9, 27.42, 27.67, 28.05 and MCHC (gm/dl) were 30.06, 30.89, 30.99 and 32.38 in the above age group respectively. Mean PCV (%) were 30.2, 28.73, 30.33 and 33.93 in the age group < 19, 20-25, 26-30 and 31-35 respectively. In the similar study by Sharma et al [12], mean RBC were 3.52, 3.78, and 3.56 in the age group < 20, 20-25 and > 25 respectively; MCV were 77.79, 79.49, 76.23; MCH were 21.17, 24.47, 23.03; MCHC were 27.42, 27.67, and 28.04 and PCV were 29.43, 31.24 and 32.20 in the age group < 20, 20-25 and > 25 respectively, thus corroborating with our study.

In the present study, the value of ESR was significantly increased in majority of 69 (86.25%) patients and was normal in 11 (13.75%) patients. Das et al [13] revealed mean ESR value of 32.40±8.68 mm/1h in 30 healthy pregnant women. This may be a result of anaemic state of studied group due to plasma volume expansion and decrease in PCV in normal pregnancy. It may also be due to increased level of fibrinogen in pregnancy.

Thrombocytopenia is a common problem during pregnancy that is not frequently detected and as a result is often inappropriately managed. The obvious concern with thrombocytopenia during pregnancy is the risk of significant bleeding at the time of delivery. Platelets are non- nucleated cellular fragments of megakaryocytes, they play a critical role in haemostasis. In pregnancy, most cases are due to gestational thrombocytopenia, idiopathic thrombocytopenic purpura or pre-ecalmpsia. Other causes include infections such as malaria, folate deficiency, and diseases such as leukaemia and aplastic anaemia. Although the pathogenesis of gestational thrombocytopenia is not well understood, it may involve factors such as haemodilution and/or accelerated platelet clearance [14]. Confirmation of a normal platelet count prior to pregnancy decreases the probability of underlying immune thrombocytopenia purpura [14]. Pregnant women with thrombocytopenia have a higher risk of bleeding excessively during or after childbirth, particularly if they need to have a caesarean section or other surgical intervention during pregnancy, labour or in the puerpurium. Such bleeding complications are more likely when the platelet count is less than 50×10^3/µl. The prevalence of gestation thrombocytopenia in our study is 10% lower than the figure of 15.3% as reported by Olayemi et al [15]. The higher prevalence in their study may be as a result of malaria infections.

Conclusion:

Anemia is the most prevalent hematologic abnormality in pregnancy, one that most commonly is caused by factors associated with poverty and social deprivation. It is associated with significant fetal and maternal morbidity and mortality. It can be easily diagnosed and responds quickly to intervention and treatment that is both inexpensive and readily available. Efforts to improve maternal and infant mortality could be addressed by diagnosis

and treatment of anemia that on a global scale will have most impact in resource-poor countries but that could also lead to significant improvements in pregnancy outcome and maternal well-being for less advantaged women in more industrialized countries.

The present study revealed predominance of microcytic hypochromic anaemia indicating iron deficiency anaemia. Since the hematological parameters can be easily performed, therefore it is important to monitor these parameters during pregnancy. Also, when these parameters are properly interpreted, it can aid in early recognition of type of anaemia during pregnancy. In essence, while individual parameters have their limitations, a combination of different parameters certainly improves their usefulness in antenatal care.

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