Research Article

HAEMATOLOGICAL PROFILE IN ANTENATAL CASES AT GOVERNMENT HOSPITAL

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A R T I C L E   I N F O

A B S T R A C T

Normal pregnancy is accompanied by a number of alterations in maternal physiology with resultant changes in haematological variables. Documented changes include increase in maternal blood and plasma volume by about 40–50% with accompanying red cell mass increase, albeit to a lesser extent, leading to a fall in haematocrit and a consequent dilutional anaemia. In pregnancy, hematological changes occur in order to meet the demands of the developing fetus and placenta, with major alterations in blood volume. Abnormal hematological profile affects pregnancy and its outcome. Although physiological in nature, abnormal hematological profile affects pregnancy and its outcome. One of the most important underlying cause of maternal mortality is due to underlying hematological complications. Anemia and thrombocytopenia are the most frequent hematologic complications during pregnancy.

This study aimed to assess hematological profiles of pregnant women at Government hospital, Mahabubnagar.

Materials & Methods: This cross sectional study was conducted among 200 pregnant antenatal cases at Government hospital, Mahabubnagar. About 4 ml of venous blood was aseptically collected into tri-potassium ethylene di-amine tetra-acetic acid (K3-EDTA) containing blood sample bottles. Samples were kept at room temperature until processing within 4 h of collection and hematological parameters were analyzed using SYSMEX X-1000 and peripheral blood film review. Excluded from the study were hypertensives, diabetics, asthmatics and those with history of sickle cell disease (SCD) or bleeding disorders. Also excluded were women who had febrile illness over the last 2 weeks or on medication that could affect blood cell counts such as antibiotics, anticoagulants or steroids.

Results: A total of 200 pregnant women were recruited for the study with mean ages and gestational ages of 20.50 ± 5.67 years and 22.62 ± 5.52 weeks, respectively. The distribution of study participants according to trimesters of pregnancy were 24 (48%), 59(118%) and 117 (234%) for first, second and third trimesters, respectively. There were differences in mean hematological parameters between trimesters: specifically differences in mean values of WBC Hb, HCT ,RDW ,neutrophil and lymphocyte . The prevalence rates of anemia and thrombocytopenia were 17.62 and 11.7%, respectively .

On the bases of blood picture, we classified anemia's of pregnancy as Microcytic Hypochromic (51.5%), Normocytic Hypochromic (27.3%), Normocytic Normochromic (18.2%), and Dimorphic (3%).

INTRODUCTION

Normal pregnancy is accompanied by changes in maternal physiology with resultant alterations in haematological variables. These changes include expansion in maternal blood volume and accompanying red blood cell (RBC) mass increase, albeit to a lesser extent, leading to a fall in haematocrit and consequent dilutional anaemia. Pregnancy is associated with normal physiological changes that assist nurturing and survival of the fetus.

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Haematological parameters reflect these adaptive changes which become very important in the event of complications.

Haematological profile is considered one of the factors affecting pregnancy and its outcome. Anemia is the most common haematological problem in pregnancy, followed by thrombocytopenia. Leukocytosis is almost always associated with pregnancy [1]. This study is designed to evaluate the overall mean values of seven major haematological parameters and their mean values at different trimesters of pregnancy. Haematological profile is a reliable indicator and is simple, fast and cost-effective test. During pregnancy, changes occur and can be observed in haematological indices such as red blood cell (RBC) count, hemoglobin (Hb) concentration,

platelet (PLT) count, and white blood cell (WBC) count. Some of these are decreased for example; RBC and PLT counts-partly as a result of the physiological hemodilution that occurs in pregnancy, while others are increased, such as the WBC count. There are subtle and substantial changes in haematological parameters during pregnancy and the puerperium, total blood volume increases by about 1.5 liter mainly to supply the needs of the new vascular bed.[2] Pregnancy put extreme a stress on the haematological system. It therefore is very essential that understanding of the physiological changes is obligatory in order to interpret any need for therapeutic intervention.[3]

In pregnancy, hematological changes occur in order to meet the demands of the developing fetus and placenta, with major alterations in blood volume. The plasma volume increase by 40 to 45% on average, this increase is mediated by a direct action of progesterone and estrogen on the kidney causing the release of renin and thus an activation of the aldosterone renin-angio-tensin mechanism. This leads to renal sodium retention and an increase in total body water. This increase occurs faster in the late second trimester. Red blood cell mass increases by 15–20% as a result of the increase in the production of erythropoietin. As the increase in red cell mass is relatively smaller than that of plasma volume, the net result of hemoglobin (Hb) concentration falls by 1–2 g/dl leading to physiological anemia of pregnancy.

In pregnancy, the peripheral blood count of white blood cell (WBC) is raised due to pregnancy induced physiological stress. Neutrophils contribute most to the overall higher WBC count. However, the platelet count decreases during pregnancy because of hemodilution, increased platelet activation and consumption, particularly in the third trimester .Although physiological in nature, abnormal hematological profile affects pregnancy and its outcome. One of the most important underlying cause of maternal mortality is due to underlying hematological complications. Anemia and thrombocytopenia are the most frequent hematologic complications during pregnancy.

Anemia of pregnancy is said to occur when Hb concentration is less than 110 g/l , as per World Health Organization (WHO) recommendation. Global prevalence of anemia in pregnant women is 41.8%. Africa and Asia are the most heavily affected region.The functional consequences of anemia are serious and include an increased risk of maternal, fetal, and neonatal mortality. Poor pregnancy outcomes such as low birth weight and preterm birth; impaired cognitive development, reduced learning capacity, and diminished school performance in children; and decreased productivity in adults are among the consequences . Thrombocytopenia is one of the most common hematologic abnormalities encountered during pregnancy. About 8–10% of pregnant women are affected by thrombocytopenia (platelet count $< 150 \times 10^9$/L), particularly in the third trimester. Approximately 75% of these cases are due to a benign process of gestational thrombocytopenia which is mild and have no significance for mother or fetus. But, in some instances, thrombocytopenia can also be associated with a complex clinical disorder such as preeclampsia and hemolysis, elevated liver enzymes, low platelets (HELLP) syndrome (20%), or idiopathic thrombocytopenic purpura (ITP) (5%). There can also be profound and even life-threatening results for both mother and baby.

As several studies showed pregnancy may have effect on hematological parameter and essential to monitor these parameters at any stage of the pregnancy.

Aims & Objectives: This study was conducted to assess hematological profile of pregnant women at Government hospital, Mahabubnagar.

The study provide the information about the magnitude of anemia, morphological type of anemia, thrombocytopenia and change of hematological values at different trimesters which is important to detect hematological complication early and to administer appropriate therapy.

MATERIALS & METHODS

This cross sectional study was conducted among 100 pregnant women at a Government hospital, Mahabubnagar. About 4 ml of venous blood was aseptically collected into tri-potassium ethylene di-amine tetra-acetic acid (K_3-EDTA) containing blood sample bottles. Samples were kept at room temperature until processing within 4 h of collection and hematological parameters were analyzed using SYSMEX X-1000 and peripheral blood film review. The principle of cell count employed was that of electronic impedance in which changes in electric resistance, between two electrodes and produced by diluent-suspended cells traversing a small aperture were measured and correlated with specific cells sizes and count.

RESULTS

A total of 200 pregnant women with a mean age of 20.50 ± 5.67 years (ranges from 18 to 40) were included in the study. About 117 (234%) were in their third trimester, 59 (118%) in second trimester, and 24 (48%) in first trimester. Majority of the study groups 118 (41.5%) were in the age range of 26–30 years and rural residents (81.9%).

Table 1: The mean haematocrit, white blood cell (WBC) counts and platelet counts across pregnancy were $28.00 \pm 3.42\%$, $9.28 \pm 1.61 \times 10^9$/l and $180.51 \pm 33.18 \times 10^9$/l, respectively. The mean corpuscular volume (MCV), the mean corpuscular haemoglobin (MCH) and the mean corpuscular haemoglobin concentration (MCHC) were 70.00 ± 2.18 fl, 21.40 ± 2.40 pg and 27.84 ± 3.49 g/dl, respectively.

Table 1

Variables	Frequency	Percentage (%)
Age group (years)		
≤20	13	6.5
21–25	59	29.8
26–30	128	64
31–35	22	11
≥36	07	3.5
Residence		
Rural	17	8.5
Urban	183	91.9
Trimester		
1st trimester	24	12
2nd trimester	59	29.5
3rd trimester	117	57.5

Pregnancy put extreme stress on the haematological system. It therefore is very essential that understanding of the physiological changes is obligatory in order to interpret any need for therapeutic intervention. Haematological parameters reflect these adaptive changes which become very important baseline parameters to evaluate all impending complications during pregnancy. Any abnormality from the normal baseline

in pregnancy of various parameters like Hemoglobin reflect anemia, red blood cells indices reflect type of anemia, morphological changes in RBC and WBC also reflect type of anemia and infection, platelet count will reflect impending eclampsia in pregnancy.

Table 2

Parameters	Trimester			
	Overall	1st trimester	2nd trimester	3rd trimester
WBC x 10⁹/L	9.93 ± 2.48	6.02 ± 2.81	8.83 ± 2.92	9.22 ± 2.98
RBC × 10¹²/L	3.18 ± 2.34	3.61 ± 4.41	5.36 ± 0.88	4.46 ± 0.47
Hb (g/l)	110.1 ± 12.4	106.5 ± 12.9	102.2 ± 13.2	99.7 ± 17.8
HCT (%)	30.07 ± 3.15	41.59 ± 4.47	36.92 ± 4.17	34.08 ± 3.39
MCV (fl)	83.60 ± 3.59	90.26 ± 5.68	89.24 ± 5.28	84.45 ± 4.56
MCH (pg)	28.32 ± 2.42	29.58 ± 2.41	27.53 ± 2.16	26.16 ± 2.83
MCHC %	30.33 ± 1.45	32.72 ± 1.42	33.30 ± 1.31	29.43 ± 1.14
RDW (%)	11.34 ± 1.31	12.25 ± 1.12	13.51 ± 2.02	13.01 ± 1.39
PLT x 10⁹/L	167.36 ± 78.08	207.62 ± 98.89	156.02 ± 69.06	160.39 ± 68.29
MPV (fl)	9.42 ± 1.37	9.18 ± 1.92	8.20 ± 1.41	8.76 ± 1.28
Lymphocyte (%)	24.31 ± 8.64	23.42 ± 10.68	24.22 ± 8.16	23.18 ± 7.84
MID WBC (%)	7.57 ± 2.34	8.07 ± 2.5	7.11 ± 2.12	7.61 ± 2.35
Neutrophil (%)	67.72 ± 9.17	66.52 ± 11.27	68.91 ± 8.33	70.82 ± 8.52

It is proposed that present study will bring out various haematological changes in pregnant women . The deviation in parameter may be used as surrogate markers for impending pathophysiological changes in mother and fetus.

Primary blood indices were provided in table 2.Hemoglobulin content and hematocrit value were significantly lower in pregnant women. And RBC count is also lower in pregnant women. Secondary blood indices (MCV, MCH and MCHC) of the study population Table 2 shows There was no significant change in MCV among pregnant women, on the other hand, MCHC and MHC showed significant decrease in pregnant women.

Platelets of the study population Platelet count of the study population is indicated in table 2. There was a significant decrease in platelet count in pregnant women.

WBC of the study population: WBC count of the study population is indicated in Table2. There was a significant increase in WBC count in pregnant women compared to non-pregnant women. Neutrophils are significantly increased in pregnant women compared to non-pregnant women.

Hematological profile of the study population White blood cells and neutrophil were progressively increased whereas lymphocyte count was decreased in pregnant women as pregnancy proceeded. Such findings are in concurrent with that obtained by Kuhunert *et al.* (1998); James *et al.* (2008) and Osonuga *et al.* (2011). Also findings are consistent with previous study which reported that the decreases in hemoglobin and red cell indices concentration are common findings during pregnancy and results from increased plasma volume combined poor iron intake. The finding in agreement with present study reported that total leukocyte count rising in early pregnancy and remained elevated through pregnancy. This may be as a result of the body building the immunity of the fetus and it is achieved by a state of selective immune tolerance, in the presence of a strong antimicrobial immunity. Similarly to the present study reported that pregnancy leucocytosis, primarily related to increased circulation of neutrophils in the second month of pregnancy (Rouse *et al.*, 1998).

Red blood cell count, hemoglobin content and hematocrit value were significantly lower in pregnant womenDuring pregnancy, an increased plasma volume with the lack of an adequate increase in erythrocytes mass results in a decrease in haemoglobin level and the development of anemia, which is defined as dilution anemia. In addition the general decrease in different blood indices is more likely explained by increased needs during pregnancy. Therefore, the increase in these blood indices is a reflection of adequate iron supply resulting in increased haem oglobin production.

Table 3 Comparison of Mean Neutrophil and mean platelets value between the groups.

Parameter	First Trimester (n=24)	Second Trimester (n=59)	Third Trimester (n=117)
Neutrophil	70.79± 7.18	75.69± 7.22	72.44± 9.22
Mean Platelet	2.02± 0.69	1.92± 0.70	2.05± 0.69

Platelet count was progressively decreased in pregnant women as the pregnancy advanced. Mean platelet counts of pregnant women may be slightly lower than in healthy non pregnant women (Verdy *et al.*, 1997).

It is partly due to hemodilution and partly due to increased platelet activation and accelerated clearance.

Gestational thrompocytopenia does not have complication related to thrompocytopenia and babies do not have severe thrompocytopenia.

CONCLUSIONS

In conclusion, in this study WBC, Hb, HCT, RDW, lymphocyte and neutrophil counts showed statistically significant difference between trimesters ($P < 0.05$). The prevalence of anemia and thrombocytopenia, both predominantly of mild type, were 17.62 and 11.7%, respectively. Therefore, the pregnant women should be monitored and their hematological parameters properly interpreted to recognize and avoid pregnancy complications early.

White blood cells and neutrophils were progressively increased whereas lymphocyte count, RBC count, hemoglobin, hematocrit, MCHC and platelet were decreased in pregnant women as pregnancy advanced

More direct dependence on hemoglobin for pregnant women in their second and third trimesters, along with a more aggressive approach to the level of iron stores at which iron supplementation should be prescribed.The estimation of anemia prevalence is an important step as hemoglobin estimation is most important parameter to start supplementation of iron or removing other cause of anemia to prevent unfavorable outcome.

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