A Study of Total Leucocyte Count and Platelets in Antenatal Care Centre in Tertiary Care Hospital Punjab

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Abstract

A study involving the pregnant females, who came for antenatal care checkups during the period of six months was conducted in a tertiary care hospital(Rajindra Hospital Patiala) to evaluate trimester pattern of change and reference ranges of hematological profile among Punjabi females with normal pregnancy. The study was conducted with an aim to define changes in TLC and platelets as the pregnancy progresses. 850 normal pregnant females have been selected. Out of which 320 in first trimester, 250 in second trimester and 280 in the third trimester were included in the analysis. We have found that leukocytosis is almost always associated with normal pregnancy. Platelet count and lymphocytes were reduced slightly as the pregnancy progresses.

Keywords: Total leucocyte count, Antenatal care.

Introduction

Normal pregnancy is characterized by intense changes in every organ and system of female's body to accommodate the demands of fetoplacental unit. Hematological profile is a reliable, simple and cost effective test to estimate general health; hence they are used all over the world.[1] Trimester specific reference ranges of hematological indices were already described in other populations; however, comparable reports among Punjabi women with normal pregnancy are lacking. Regular assessment of hematological parameters during pregnancy is an essential practice in all antenatal care clinics.[2]

Hematological profile leads to the knowledge of nutritional, immunological, hemostatic status of pregnant female and it also act as an important predictor of pregnancy outcomes.[3,4] Activation of renin-angiotensin-aldosterone system during pregnancy leads to increase in extracellular fluid and hence the plasma volume.[5] Maternal erythropoiesis, platelet activation and clearance are increased during pregnancy.[6] All hematological parameters used to change, depending upon the degree of plasma volume expansion.[5] Our study emphasize on change in white blood corpuscles (WBC) and platelets (PLT). Studies on total leucocyte counts have suggested a 'physiological' leukocytosis confined to neutrophils only, in pregnancy. [7] The rise in neutrophil count is seen with the rise of estrogen levels in normal menstrual cycle and if fertilization takes place, neutrophils count continue to rise. A maximum is reached on the 15th post ovulation day followed by a fall.[8] By 4th week post-delivery, WBC ranges become similar to those in healthy non-pregnant women. In pregnancy, leukocytosis rise is seen till 30th weeks which then plateau in the third trimester. Analysis of platelet count show a statistically significant fall as pregnancy progresses.[9-11] The exact pattern of trimester change of hematological indices is ill defined. The present study aimed to evaluate trimester pattern of change and reference ranges of TLC and PLT in Punjabi women with normal pregnancy. We believed the findings of this study would help in precise interpretation of laboratory results, correct diagnosis and appropriate management of blood disorders among pregnant Punjabi women.

Materials and Methods

This study is a cross sectional study of 850 normal pregnant females who came to Antenatal Care Centre (ACC), of our institution, for routine antenatal checkups between their first, second and third trimesters during the period of six months from August 2017 to January 2018.

Females who had anemia (<10 gm./dl), those suffering from infections or disease state, those on drugs known to alter platelets or white cell counts, females with thyroid, renal, liver disease, hypertension, diabetes mellitus and other medical problems were excluded.

The study population includes women of all socioeconomic levels, majority of whom were of low socioeconomic strata. Age limit was 18-45 and all parities were included.

First trimester was defined as 'first day of last period till end of week 12'. Second trimester was the span from week 13 to week 27 and third trimester was from week 29 to week 40.

After signing an informed consent, questionnaires were used to collect the medical and obstetrics history which include women's age, parity, gravidity and gestational age. Ethical clearance was obtained from the Institutional Ethical Committee.

Pregnancy and its duration were confirmed by ultrasound. In ACC blood pressure was measured using a sphygmomanometer. The weight and height measured to calculate BMI, which was expressed as weight (kg)/height^2 (m^2).

3.5 ml of blood was taken from every woman in a vial containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant. The samples were analyzed immediately for complete hemogram. Total leucocyte counts and platelet counts were measured by Sysmex xp-100 automated analyzer. A standard test of significance (Z test) was applied.

Results

The total number of pregnant females studied were 850, out of which 320 were in first trimester, 250 in their second trimester and 280 were in their third trimester. Out of 320 females in the first trimester 148 (46.2%) had leukocytosis which were showing TLC as more than 10,000. These values increased to 54.4% in second trimester and 58.2% in third trimester. The mean TLC was 10.02 in first trimester (range 5.0 to 16) increasing to 11.61 in second trimester (range 5.4 to 16.6) and 12.06 in the 3rd trimester (range 4.4 to 18). The mean granulocyte count rose from 6.6 in the 1st trimester to 7.2 in the 3rd trimester and

the change is statistically highly significant (Z test=5.81 P <0.001). Lymphocyte count was reduced throughout pregnancy, but was least (Z test=20.38 P<0.001) during the third trimester, which is statistically highly significant. There was a wide range in platelet counts in all three trimesters of pregnancy. Mean values were similar (293.8 in trimester 1, 289.5 in trimester 2, 281.2 in trimester 3) with a drop in average platelet count in the third trimester compared with the first trimester.

Table 1: Total and differential leucocyte counts in pregnancy trimesters.

Trimester	Total patients (n)	No. with total count > 10000/cu.mm.	Mean total leucocyte count /dl ± SD	Mean granulocyte count /dl ± SD	Mean lymphocyte count/dl ± SD
Trimester 1	320	148(46.2%)	10.02± 1.44	6.65± 1.09	2.61± 0.59
Trimester 2	250	136(54.4%)	11.61 ± 1.54	6.89± 1.17	2.21± 0.44
Trimester 3	280	163(58.2%)	12.06 ± 1.73	7.26± 1.29	1.21± 0.50

Table 2: Platelet count in pregnancy trimesters

Trimester	Total patient (n)	Platelet counts range (thousands/ cu.mm.)	Mean value ± SD
Trimester 1	320	240-350	293.80± 32.73
Trimester 2	250	221-355	289.54± 40.43
Trimester 3	280	205-382	281.25± 43.89

Table 3: Platelet and leucocyte counts in pregnancy trimesters.

Parameter	Comparison	Z	P value	Significance
Mean total leucocyte count/dl	Trimester 1 vs Trimester 2	10.919	<0.001	HS
	Trimester 2 vs Trimester 3	3.163	0.002	S
	Trimester 1 vs Trimester 3	12.935	<0.001	HS
Mean granulocyte count/dl	Trimester 1 vs Trimester 2	2.385	0.017	S
	Trimester 2 vs Trimester 3	3.385	0.001	S
	Trimester 1 vs Trimester 3	5.810	<0.001	HS
Mean lymphocyte count/dl	Trimester 1 vs Trimester 2	7.116	<0.001	HS
	Trimester 2 vs Trimester 3	16.900	<0.001	HS
	Trimester 1 vs Trimester 3	20.388	<0.001	HS
Mean platelet count/dl	Trimester 1 vs Trimester 2	1.206	0.228	NS
	Trimester 2 vs Trimester 3	2.273	0.023	S
	Trimester 1 vs Trimester 3	3.283	0.001	S

NS (p > 0.05, Not significant); S (p<0.05, Significant); HS (p <0.001, Highly significant)

Discussion

Similar studies have already been conducted in different parts of the world. The aim of the present study was to evaluate the hematologic changes that occur during normal pregnancy. Findings in our study are in line with the similar study conducted by Karim S *et al*. in 1992.[12] The current study showed 46.2% leukocytosis in normal pregnant woman in their first trimester which increases to 58.2% in the third trimester. Mean total leucocyte count is high normal (10.02-12.06) at all stages of pregnancy.

The rise in total white cells is due to increase of granulocyte as the pregnancy progresses. The relatively increased total WBC count demonstrated in this study is supported by several previous reports.[13]In study conducted by Karim S *et al.*[12]trimester vise change in mean TLC was not significant, while in this study *P* value came out to be <0.001, which is considered as highly significant in trimester 1 and trimester 3. Similar results were seen in another study by Rayis DA.*et al*[14] which showed significant rise in total WBC count during last two third of pregnancy compared with the first trimester.According to local and international studies total WBC count is hardly less than 7000/mm^3 during normal pregnancy till now. The exact cause of leukocytosis during gestation is not known; however, the possible cause could be the associated physical and emotional stress and depressed neutrophil apoptosis.[15]

In a longitudinal study, Pitkin *et al.* showed the rise in total WBC count to synonymous increase in the number of neutrophils.[10] In study conducted by Karim S *et al.*[12] mean granulocyte count was not significant in first and second trimester, but was significant in third trimester, when compared with trimester 1. In this study mean granulocyte count was significant in trimester 1 and 2 while it was highly significant (*P*<0.001) in trimester 3.In pregnancy, neutrophil chemotaxis and phagocytic activity got depressed due to some inhibitory factors present in serum.[16] There is also evidence of increased oxidative metabolism in neutrophils. Immature forms as myelocytes and metamyelocytes may be seen in the peripheral blood film of women with normal pregnancy. It does not have any pathological significance.[17] Rising WBC count in pregnancy should not be taken as reliable indicator of infection in subclinical conditions (chorioamnionitis). Rather; clinical methods such as pyrexia, offensive vaginal discharge and fetal tachycardia should be used for detection of preterm labor and membrane rupture. The stress of delivery itself may lead to severe leukocytosis. It is seen that after few hours of delivery, a healthy pregnant women can have WBC count varying from 9000 to 25000/cumm. After fourth week post-delivery, WBC levels become similar to those in non-pregnant healthy female.

Kühnert *et al.* demonstrated slight elevation of lymphocytes count at the starting of pregnancy but gradual decrease over the following trimesters.[18] In study conducted by Karim S *et al.*[12], Mean lymphocyte count was not significant in all the trimesters. This study showed continuous fall in lymphocyte count throughout the pregnancy, which is statistically 'highly significant'. In study conducted by Rayis DA *et al.*[14] lymphocyte count followed reverse pattern of change, being comparable during the first two trimesters but dropped significantly in the third trimester. In study conducted by PC Ichipi-Ifukor *et al.* [19] in 2013 in Nigerian population show elevated mean lymphocyte count throughout the pregnancy.

Anemia is most common abnormality in pregnancy. Thrombocytopenia is the second most common hematologic abnormality that occurs during pregnancy. "Thrombocytopenia" is classically defined as a PLT count of less than $150,000 \times 10^9$/L. Counts from 100,000 to 150,000 $\times 10^9$/L are considered mildly depressed; from 50,000 to 100, 000 $\times 10^9$/L, moderately depressed; and of less than 50,000 $\times 10^9$/L, severely depressed. The overall incidence of thrombocytopenia in pregnancy is 8%, but when patients with obstetric and other medical conditions are excluded, the incidence drops to 5.1%. In study conducted by Karim S *et al*. Mean platelet count was not significant. In this study mean platelet count was not significant in the first trimester, while there was significant decrease in mean platelet count in second and third trimester. In another study conducted by Rayis DA *et al.* showed steady decrease in platelet count as the pregnancy progress. Akinbami *et al*. also showed that platelet count in normal pregnancies may decrease by approximately 10% with most of this decrease occurring during the third trimester.[20] Overall, about 75% cases of PLT changes in normal pregnancy are due to gestational thrombocytopenia, 15%–20% occurs secondary to hypertensive disorders, 3%–4% due to an immune process, and the remaining 1%–2% comprises

rare constitutional thrombocytopenias, infections, and malignancies. Platelet counts have been shown to decrease slightly but significantly during pregnancy.[21] We have found the platelet count to be normal in the first trimester and reduce significantly in the second and third trimester. Decrease of platelet count during pregnancy is called "gestational thrombocytopenia". Reduction in platelet count was explained by increased platelet activation and accelerated clearance.[22]Fay RA *et al*. explain, reduced platelet count is due to dilution effects and accelerated destruction of PLTs passing over the scarred and damaged trophoblast surface of the placenta.[23]Gestational thrombocytopenia does not lead to complications related to thrombocytopenia and babies of these mothers do not suffer from severe thrombocytopenia (platelet count <20,000/cu mm). It has hence been recommended that the lower limit of platelet count in late pregnancy should be considered as 1.15 lac/cu mm.[24]

Conclusion

The present study establishes detailed trimester specific reference range for TLC and platelets in Punjabi women with normal pregnancy. We have concluded that increase in TLC count is common feature of pregnancy and that; it is increasing from early pregnancy to third trimester in normal pregnant females. It is therefore a normal feature of pregnancy. We also have concluded that increase in TLC is due to progressive increase in granulocytes from early to late pregnancy. We have also found that there is slight fall in average platelets count as the pregnancy progresses. These findings in Indian population confirm the previous studies in the western countries.

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Conflict of interest: None declared

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