TO ACKNOWLEDGE IMPORTANCE OF PLATELET COUNT AND TO EVALUATE PREVALENCE OF ANEMIA IN WOMEN RECEIVING IRON SUPPLEMENTATION DURING DIFFERENT TRIMESTERS OF PREGNANCY

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Abstract : Introduction: Platelets play an important role in primary and secondary hemostasis. Therefore thrombocytopenia can be hazardous for pregnant women. Neonates are exposed to a great mechanical stress during passage through the birth canal, and they may be affected by maternal thrombocytopenia. It has also been observed that **65% to 75%** of pregnant women in India suffer from some type of anemia (Iron deficiency in particular) at some stage during nine months of gestational stage. Aim and objectives: 1. to acknowledge the importance of periodic monitoring of platelet count because of their role in hypertension and hypertension related pre-eclampsia during pregnancy. 2. To know the prevalence of anemia in pregnant women receiving iron supplements with normal singleton pregnancy in all trimesters with the help of hematological parameters. Methodology: The present study was conducted at G.G. Hospital and Shri M.P.Shah medical college, Jamnagar. A total of 100 cases were studied including 25 non pregnant controls and 75 pregnant females, 25 from each trimester of pregnancy. 75 subjects selected were from the age group between 17 to 32 years amongst those attending the outpatient department of Obstetrics and Gynaecology, Guru Govind Singh Hospital and M.P. Shah medical college, Jamnagar. Observation and Results: All the hematological parameters decreased from first trimester to third trimester as compared to controls except ESR which increased significantly as the pregnancy progressed to third trimester as compared to control group. Conclusion: periodical monitoring of platelet count together with other routine hematological parameters must be considered at all health centers. Pregnant women should be educated more about importance of dietary iron supplementations or additional supplements should be given to anemic women.

Key words: blood indices, Coagulation, Hemostasis, high risk pregnancies, platelets, Thrombocytopenia

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INTRODUCTION:

Platelets play an important role in primary and secondary hemostasis. Any decrease in their count in peripheral blood causes justifiable concern. This is particularly the case during pregnancy, when bleeding problems, during first and third trimesters, as well as during and after delivery, often occur. Therefore thrombocytopenia can be hazardous for pregnant women with such complications. As well, neonates are exposed to a great mechanical stress during the passage through birth canal, and they may be affected by maternal thrombocytopenia. Because of such hazards to both mother and neonates, Platelets levels should be known to safeguard them[1].

It has also been observed that **65% to 75%** [2] of pregnant women in India suffer from some type of anemia (Iron deficiency in particular) at some stage during nine months of gestational period. World Health Organization (WHO)/World Health Statistics data shows that 40.1% of pregnant women worldwide were anemic in 2016. The condition is prominent in Southeast Asian countries where about half of all global maternal deaths are due to anemia and India contributes to about 80% of the maternal death due to anemia in South Asia. There is marginally decrease in prevalence of anemia in pregnant women in India from 58% in NFHS-3 (National Family Health Survey-2005-06) to 50 % in NFHS-4 survey (2015-16)[3, 4].

AIMS AND OBJECTIVES

1. To acknowledge the importance of periodic monitoring of platelet count because of their role in hypertension and hypertension related pre-eclampsia during pregnancy.
2. To evaluate the prevalence of anemia in pregnant women receiving iron supplements with normal singleton pregnancy in all trimesters with the help of haematological parameters.

Material and Methods:

I had started this project in 2004 in Physiology department of Shri M.P. Shah medical college, Jamn
agar as part of my dissertation when I was doing post graduation there. I completed it in 2006 after extensive research and thorough study of related text. Now I am working in JNUIMSRC , Jaipur after child care leave for 7 years.

For this study, a total of 100 cases were studied including 25 non pregnant controls and 75 pregnant females, 25 from each trimester of pregnancy.

75 subjects were selected from the age group between 17 to 32 years taking 25 subjects from each trimester of pregnancy amongst those attending the outpatient department of Obstetrics and Gynaecology, Guru Govind Singh Hospital and M.P. Shah medical college, Jamnagar.

All the pregnant females belonged to lower socio-economic hindu strata.

Control group comprised of 25 non – pregnant women of the corresponding age group. The pregnant as well as non pregnant females were not suffering from any infectious diseases at the time of examination.

The blood samples were collected by venous puncture and approximately 5 ml of blood collected and transferred to K -3 EDTA tubes.

All the collections were made in the morning hours between 9 a.m. to 11 a.m. to avoid diurnal variations.

The routine followed in investigating these patients was as under:

- Complete history regarding:
  - i) The education
  - ii) Economic status
  - iii) Living conditions
  - iv) Age
  - v) Past obstetric history
  - vi) Past and present complaints
- Haematological parameters
  - i) Platelet count
  - ii) Hemoglobin level
  - iii) Total Red Blood cell Count (TRBC).
  - iv) Packed Cell Volume (PCV)
  - v) Blood indices such as Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH) and Mean Corpuscular Hemoglobin Concentration (MCHC)
  - vi) Erythrocyte Sedimentation Rate (ESR)

Patients suffering from any infectious or inflammatory diseases were not included.

All counts were done on automated blood cell counter from a private pathology laboratory.

RESULT:

Table 1: Mean Platelets concentration and intergroup comparisons among the four groups

GROUPS	**Mean**	**S.D.**	**Range**	**95% CI**
Control	2.78	0.62	1.85-4.71	2.52-3.03
First trimester	2.29	0.51	1.57-3.83	2.08-2.50
Second trimester	2.15	0.54	0.96-3.61	1.93-2.38
Third trimester	1.70	0.56	0.75-3.24	1.47-1.93
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	0.018		Significant	
Control v/s Second trimester	0.001		Significant	
Control v/s Third trimester	0.001		Significant	
First v/s second trimester	1.00		Non Significant	
First v/s third trimester	0.002		Significant	
Second v/s third trimester	0.033		Significant	

Table 2: Mean haemoglobin concentration and intergroup comparisons among the four groups

GROUPS	Mean	S.D.	Range	95% CI
Control	12.41	1.00	10.4-14.0	12.00-12.83
First trimester	11.73	0.93	9.4-12.8	11.35-12.12
Second trimester	10.10	0.94	8.6-12.2	9.71-9.66
Third trimester	9.20	1.11	6.6-12.0	8.73-9.66
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	0.110		Non Significant	
Control v/s Second trimester	0.001		Significant	
Control v/s Third trimester	0.001		Significant	
First v/s second trimester	0.001		Significant	
First v/s third trimester	0.001		Significant	
Second v/s third trimester	0.012		Significant	

Table 3: Mean TRBC concentration and intergroup comparisons among the four groups

GROUPS	Mean	S.D.	Range	95% CI
Control	4.36	0.23	4.0-4.80	4.26-4.45
First trimester	3.95	0.27	3.50-4.42	3.84-4.06
Second trimester	3.63	0.40	2.09-4.38	3.47-3.80
Third trimester	3.37	0.34	2.75-3.98	3.23-3.51
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	0.001		Significant	
Control v/s Second trimester	0.001		Significant	
Control v/s Third trimester	0.001		Significant	
First v/s second trimester	0.004		Significant	
First v/s third trimester	0.001		Significant	
Second v/s third trimester	0.026		Significant	

Table 4: Mean PCV concentration and intergroup comparisons among the four groups

GROUPS	Mean	S.D.	Range	95% CI
Control	38.68	2.15	34-42	37.79-39.57
First trimester	35.24	2.68	29-40	34.13-36.35
Second trimester	31.56	2.63	26-36	30.47-32.65
Third trimester	29.20	2.48	24-34	28.17-30.23
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	0.001		Significant	
Control v/s Second trimester	0.001		Significant	
Control v/s Third trimester	0.001		Significant	
First v/s second trimester	0.001		Significant	
First v/s third trimester	0.001		Significant	

Second v/s third trimester	0.007	Significant

Table 5: Mean MCV concentration and intergroup comparisons among the four groups

GROUPS	**Mean**	**S.D.**	**Range**	**95% CI**
Control	88.18	3.89	79-98	86.58-89.79
First trimester	86.16	5.97	73-98	83.70-88.63
Second trimester	83.81	6.19	68-91	81.25-86.37
Third trimester	82.91	3.79	76-89	81.35-84.48
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	0.979		Non Significant	
Control v/s Second trimester	0.018		Significant	
Control v/s Third trimester	0.002		Significant	
First v/s second trimester	0.634		Non Significant	
First v/s third trimester	0.158		Non Significant	
Second v/s third trimester	1.00		Non Significant	

Table 6: Mean MCH concentration and intergroup comparisons among the four groups

GROUPS	**Mean**	**S.D.**	**Range**	**95% CI**
Control	29.12	1.79	26.5-33.3	28.38-29.86
First trimester	28.78	2.05	23.5-32.0	27.93-29.63
Second trimester	26.47	5.16	6.6-38.7	24.34-28.60
Third trimester	25.59	2.22	21.1-28.3	24.67-26.51
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	1.00		Non Significant	
Control v/s Second trimester	0.021		Significant	
Control v/s Third trimester	0.001		Significant	
First v/s second trimester	0.061		Non Significant	
First v/s third trimester	0.003		Significant	
Second v/s third trimester	1.00		Non Significant	

Table 7: Mean MCHC concentration and intergroup comparisons among the four groups

GROUPS	**Mean**	**S.D.**	**Range**	**95% CI**
Control	31.7	1.96	27-35	30.92-32.54
First trimester	31.56	1.08	29-34	31.11-32.01
Second trimester	30.92	1.55	26-34	30.28-31.56
Third trimester	30.30	1.69	26-33	29.60-31.00
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	1.00		Non Significant	
Control v/s Second trimester	0.462		Non Significant	
Control v/s Third trimester	0.013		Significant	
First v/s second	0.955		Non Significant	

trimester		
First v/s third trimester	0.039	Significant
Second v/s third trimester	1.00	Non Significant

Table 8: Mean ESR and intergroup comparisons among the four groups

GROUPS	**Mean**	**S.D.**	**Range**	**95% CI**
Control	4.84	1.65	2-9	4.16-5.52
First trimester	14.92	6.01	10-40	12.44-17.40
Second trimester	21.12	3.74	14-27	19.57-22.67
Third trimester	28.60	5.73	20-39	26.23-30.97
INTERGROUP COMPARISON	**p-value**		**Significance**	
Control v/s First trimester	0.001		Significant	
Control v/s Second trimester	0.001		Significant	
Control v/s Third trimester	0.001		Significant	
First v/s second trimester	0.001		Significant	
First v/s third trimester	0.001		Significant	
Second v/s third trimester	0.001		Significant	

All the parameters decreased from first trimester to third trimester as compared to controls except ESR which increased significantly as the pregnancy progressed to third trimester as compared to control group. The intergroup comparison among the different trimesters and the control group has been presented along with.

Data was statistically analysed using SPSS version 24.0. mean and standard deviation was calculated for all the parameters. One way ANOVA followed by post hoc Bonferroni tests were employed to assess the significance among the mean values of different groups. P-value was considered to be significant at $p<0.05$.

DISCUSSION

During gestation, progressive haematological changes occur due to blood volume expansion, which shows disproportionately more increase in blood volume than cellular elements.

Normal platelets changes in pregnancy: pregnancy is characterized by a physiological rise in the strain exerted upon the endothelium. Maternal constitutional factors giving rise to endothelial stress may represent a predictive value on pregnancy outcome regarding the development of hypertensive disorders in high-risk pregnancies. Normal pregnancy is as such characterized by an increase in platelet aggregation and a decrease in the number of circulating platelets with gestation[5]. Platelet lifespan declines and the mean platelet volume (MPV) increases minimally during pregnancy[6]. Increased consumption of platelets in the uteroplacental circulation has been suggested to be the explanation of the reduction in the number of circulating platelets.

Hypertension in pregnancy and platelets: platelet count falls early in hypertension and precedes renal changes, proposing an active role of platelet consumption in the pathophysiology of this disorder. A reduction in platelet count and an elevated platelet size are common features of hypertension in pregnancy[7,8]. In the early stages of hypertension in pregnancy, platelet aggregation is increased. In established severe hypertension, because of this platelet aggregation, number of circulating platelets is decreased[9]. In the clinical phase of hypertension in pregnancy, the typical case picture is one of a vasoconstrictive state with low plasma volume and cardiac output, high blood pressure and systemic vascular resistance in combination with signs of organ damage [proteinuria, hemolysis elevated liver enzymes low platelets (HELLP) syndrome]. Hemodynamic

management is necessary in severe disease to prevent maternal complications[10,11,12].

Insufficiency of the uteroplacental circulation due to failure of trophoblastic invasion of the spiral arteries is supposed to be a common etiological factor in both hypertension and IUGR [10]. Inadequate cytotrophoblast invasion may constitute the impetus to endothelial cell dysfunction and increased activation of platelets. It is well known that there is platelets consumption because of uncontrolled intravascular platelets activation and fibrin deposition in hypertension in pregnancy [13,14]. Increased platelets turnover and consequently more immature platelets in the maternal circulation may explain why MPV is increased. Several studies have proved that the changes in PTL aggregation and MPV occur in association with hypertensive states[15-18] . Although an accepted model is abnormal placentation leading to widespread maternal endothelial dysfunction, interest has also been demonstrated in the role of platelets in the pathophysiology of hypertension in pregnancy.

The contact of platelets with the injured endothelium may represent the initial step of a coagulatory cascade which leads to increased consumption of platelets in the uteroplacental circulation with resultant reduction in the number of circulating platelets in the first phase of the process. Subsequently, there may be a compensatory increase in bone marrow production. In fact, there is evidence that in hypertension in pregnancy, the platelets production time is significantly reduced in comparison with normal pregnancies [19,20]. Young platelets thrown in circulation are bigger and present a higher tendency to aggregation. Other studies showed previously that pregnancies with abnormal Doppler and linked hypertension show an enhancement of MPV and platelets aggregation [21].

Although the essential pathogenetic mechanism of preeclampsia is only partly understood, there is general according about a central role for dysfunctional endothelium in with increased platelet aggregation and decreased circulatory platelets triggering the typical clinical symptoms[22].

All the parameters done to detect anemia viz. Hb estimation,TRBC count, PCV, MCV, MCH & MCHC decreased from first trimester to third trimester as compared to controls except ESR which increased significantly as the pregnancy progressed to third trimester as compared to control group.

The **Hb levels** are within normal range during 1st trimester, fall in 2nd trimester and continue to fall in 3rd trimester. In 2nd and 3rd trimesters 52% and 80% women were having Hb levels < 10.4 gm% as all the women belonged to lower socio- economic hindu strata.**Total red blood cell count** has shown decrease from first trimester and continues to decrease to the third trimester. As the anemia is known to be present when count is less than 4 million per cubic millimeter, in present study mean count is 3.90 million cubic milliliter in first trimester which decreases further 3.24 million/ mm^3 in third trimester. **Mean corpuscular volume (MCV)** showed a significant fall from first trimester to third trimester. **Mean corpuscular haemoglobin (MCH)** showed a decrease in pregnant group as compare to non-pregnant values. **Mean corpuscular haemoglobin concentration (MCHC)** also showed a decrease of 1.2% from 1st to 3rd trimester in pregnant females.

Anemia is widely prevalent in India. The factors, which are commonly incriminated, are low socio-economic status, dietetic habits in hindu population and ignorance about a balanced diet. Pregnancy imposes an extra demand on nutrients, hence, anemia is rather a constant association of pregnancy in India. Factors such as, food, which is chiefly derived from local ingredients and secondly, higher prevalence of parasitic infestations and infectious diseases[23,24].

From above mentioned Para meters it is evident that anemia is present in all the trimesters in cases and anemia may affect maternal and fetal outcome in various ways. Nutritional anemia are as such common in India and pregnancy poses a extra burden on it. Further antenatal checkups for suspected cases for early detection of anemia, additional iron supplementation, proper guidance about nutritional supplementations with iron and folic acid rich diet and surveillance are must throughout pregnancy period. There is a rise in erythrocytes sedimentation rate (ESR) throughout pregnancy which can be explained by presence of anemia and possible subclinical infections which are largely prevalent in India.

SUMMARY AND CONCLUSIONS

The present study comprised of hundred subjects, out of which 25 were healthy non-pregnant women and 75 were pregnant women.

1. As stated in this research paper, platelets functions and their important role in coagulabity in pregnancy must be well understood, not only in thrombosis related complications in pregnancy (i.e., hypertension, diabetes, thrombophilia). Clinical findings suggest that a periodical monitoring of platelet count together with other routine hematological parameters must be considered at all health centers.

2. Hematological parameters for anemia are within normal range during first trimester and fall during second trimester. All the levels continue to fall in third trimester even when the patients are on iron therapy. In second and third trimesters 52 % and 80% women were anaemic even with iron supplementations.

During pregnancy, a woman needs 27 milligrams of iron a day. As such that requirement is provided with iron tablets. If women are still anemic with further screening, in those cases health care provider might recommend a separate iron supplement. Or they can be educated more about importance of dietary iron supplementations as dietary sources of iron include lean red meat, poultry and fish. Other options include iron-fortified breakfast cereals, prune juice, dried beans and peas. The iron from animal products, such as meat, is most easily absorbed. To enhance the absorption of iron from plant sources and supplements, pair them with a food or drink high in vitamin C — such as orange juice, tomato juice or strawberries. If they take iron supplements with orange juice, avoid the calcium-fortified variety. Although calcium is an essential nutrient during pregnancy, calcium can decrease iron absorption.

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