Study of Haematological Parameters in Advanced Pregnancy

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Research Article

Abstract: **Background**:-Anaemia in pregnancy is very common in India and one of the major cause of maternal mortality. Gujarat having majority of population, vegetarian that has non-haem Iron which is less absorbed. Pregnancy leads to physiological anaemia but may turn into pathological anaemia in advanced pregnancy. **Methodology**:-In the present study Haematological parameters 100 pregnant females in advanced pregnancy (of gestational age 32 to 40 weeks) were analyzed and the results were compared with that obtained in 25 controlled cases which were of reproductive age group and same range of age as pregnant females. **Result** :- As per our study ,out of 100 cases 15 cases having Hb level between 10.1 to 12 grams which could be considered as normal according to the criterion of Dawn [3]. 38 patients were found to have haemodilution as one of the factors. The remaining 47 patients appeared to have Iron and/or Folic acid deficiency as important factor in the causation of anaemia, out of these 47, 20 females had microcytic hypochromic, 5 had macrocytic normochromic and 23 had normocytic hypochromic. **Conclusion**: - Anaemia was common in pregnant females below 20 years of age and above 30 years of age. It was clearly observed that mean Hb level was inversely related to parity. They should be subjected to routine haematological and should go for regular ante-natal visits and take proper medications to prevent anaemia and its further consequences.
Key words: Haematological parameters, pregnancy, Fe deficiency, physiological anaemia.

Introduction

The Importance and significance of the knowledge of haematological parameters in advanced pregnancy stems from the fact that anaemia especially iron deficiency anaemia is the most common ailment affecting pregnant women of India. Most of the data available about the haematological parameters of pregnant women are the result of studies carried out in western countries which does not apply for Indian women. The cultural and socio-economic differences between the western countries and India have contributed to the differences in basic physiological values there and here. For instance a Hb level of 11 gms per 100 ml in an adult Indian women is considered as average whereas a similar value in the West may be a cause for concern. Because of these differences it becomes essential to carry out a study on the haematological parameters in advanced pregnancy in India. Moreover, this study has been carried out in the state of Gujarat where the majority of the population is vegetarian. The study of haematological parameters in pregnancy also helps to differentiate between the physiological anaemia of pregnancy, which is a result of haemodilution, which occurs normally during pregnancy and the pathological anaemia. A mild anaemia is usually observed during pregnancy and this becomes more pronounced as pregnancy approaches term. This is called physiological anaemia of pregnancy and is caused by haemodilution due to increase in plasma volume. The R.B.C. mass is also increased but this increase is not of the same magnitude as that of plasma volume. This disproportionate increase in plasma and R.B.C. volume produces a state of haemodilution. In addition, there is marked demand of extra iron during pregnancy especially in the second half. Thus the fall in haemoglobin concentration during pregnancy is due to combined effect of haemodilution and negative iron balance that is due to increased demand. Anaemia is the commonest haematological disorder complicating pregnancy in India and is much more common in the less privileged group. Anaemia is major cause of maternal mortality in our country. Thus anaemia is a highly, around 80% of pregnant women in India suffer from anaemia. This is due to the fact that diet in India is predominantly cereal based and iron absorption is very poor because of its non-haem nature (of vegetarian diet) and also due to the presence of iron absorption inhibitors in the form of phytates and phosphates in the diet. In our hospital class of patients, majority of who belong to low socioeconomic group, anaemia is very common and usually precedes pregnancy. Iron deficiency is the most frequent cause of anaemia. Factors contributing to the causation of anaemia, especially iron deficiency, include dietary inadequacy, deficient absorption, and excessive iron loss through sweat, worm infestations, chronic malaria, bleeding episodes and increased demands for iron as in pregnancy which is aggravated by repeated pregnancies without proper spacing.

Material and Method

The present study was conducted with the permission of hospital administration to collect & analyze the various haematological parameters: Hb, RBC, WBC (TC, DC) PCV, ESR in advanced pregnancy from case reports and Blood indices was calculated. An attempt had been made to study the relationship between these parameters & the maternal age, parity, diet (in relation to appropriate calories, iron, Ca & protein considering gestational age) & gestational age of the mother. Also the results were compared with haematological parameters of 25 non pregnant females of the same age group. For the study 100 pregnant women of gestational age between 32-40 weeks were selected. Majority of the subjects belong to the poor socio-economic group (as per modified Prasad's classification). None of them had any special complaint and regarded themselves in good health. According to the parameters, the blood indices were calculated and then the type of anaemia was found.

Aims and objectives:

(A) To study the haematological parameters during advanced pregnancy in relation to maternal age, parity, and gestational age.

(B) To differentiate physiological from pathological anaemia of pregnancy on the basis of these haematological parameters.

(C) To study the prevalence of anaemia in women during the last trimester of pregnancy and also the important causes that are responsible for such anaemia may be defined.

Results

Haematological changes in pregnancy are in response to the rapidly growing fetus placenta & their increasing demands with increase in maternal oxygen consumption, cardiac output(peak at 25-28weeks) & blood volume(peak at 12weeks). Alterations in cardiac output bear no relation to changes in blood volume. The major role in raising cardiac output is played by increased stroke volume, with small elevation of cardiac rate. The Hb level, RBC count & the heamatocrit fall progressively from the end of the first trimester until a few weeks, before term, returning to normal 1-2 months post-partum. Bone marrow hyperplasia with neutrophilic leukocytosis is seen during last trimester.[1] The plasma volume reaches its peak by the 7th month and varies only slightly during the 8th or 9th month .Though there is increase in RBC production, and so also an increase in Hb and PCV. But due to the presence of haemodilutional factor in pregnancy, Hb concentration, RBC count and PCV appears to be less as compared to non-pregnant females. Previous studies had found that during pregnancy there is 20% reduction in Hb, 50%. Haemodilution & a 40% increase in cardiac output [2]. According to Prof. C.S. Dawn, the cardio-vascular system is put to extra work with redistribution of peripheral blood flow.[3] In pregnant women blood volume at or near term is averaged about 40-45% above the normal[4]. Haemoglobin & PCV are decreased with comparatively little disturbance in MCHC.[5] The increase in plasma volume during pregnancy causes haemodilution that accentuates any pre-existing anaemia & may convert pre-existing mid anaemia to one of moderate severity during pregnancy. At term, the increase in plasma volume may amount to 40% & the increment in total blood volume may be 32% or greater but individual variations are great. This explains why loss of blood is borne so well by the increase is related to the size of the conceptus, particularly large increases being seen in association with multiple pregnancy [6].Low protein diet may cause a fatty change in the liver decreasing storage of anti-pernicious anaemia factor leading to macrocytic anaemia. The preexistence of intestinal parasitic infestation is also contributing. The ESR gradually increases & does not return to normal until the third or fourth week postpartum. This is due to decrease in viscosity and increase in fibrinogen. Increase in ESR is not diagnostic of anaemia in pregnancy.

Discussion

In the present study 100 pregnant females of gestational age 32 to 40 weeks were analyzed and the results were compared with that obtained in 25 controlled cases which were of reproductive age group and same range of age as pregnant females. The results obtained were comparable with previous studies. This study excluded all those suffering from known disability likely to influence general health. Age weight, height, and the parity of the subjects were recorded.

Table 1: Observed Values of Haemoglobin, RBC Count and PCV.

Variable	Subjects Mean±SD	Control Mean±SD	Level of Significance
Hb (gm %)	8.76±1.452	11.252±1.118	P<0.01
RBC	2.877±0.513	4.578±0.520	P<0.01
PCV	27.69±4.507	34.28±4.792	P<0.01
ESR	30.38±5.576	25.04±5.021	P<0.01

The present study revealed the presence of anaemia in majority of the cases. The results of present study are comparable to previous studies. The precise definition of the level of haemoglobin and other related parameters, to be considered as anaemia, are varying from author to author. The rate gradually increases and does not return to normal until 3rd or 4th week post-partum. According to Dawn's (1990) finding 10.0 gms per 100 ml , 3.2 mill per cumm RBC and 32% PCV indicates anaemia in pregnancy [3] .These variability of standards for consideration of anaemia would give us variable results.

Increase in RBC volume in pregnancy is accomplished via accelerated production [1] .Moderate erythroid hyperplasia is present in bone marrow and the reticulocyte count is elevated slightly during the pregnancy, due to 2 to 3 fold increase in maternal erythropoietin level studied iron and erythropoiesis in non pregnant and pregnant subjects and found that in pregnancy erythropoiesis is stimulated at a very early stage.[7, 8]

Table 2: Observed Values of White Blood Cell Count

Variable		Subject Mean±SD	Control Mean±SD	Level of significance
	TC	6133 ±1786.484	6044 ±946.080	P<0.05
DC	Neutrophil	65.490 ±4.896	60.760 ±3.140	P<0.05
	Eosinophil	4.0760± 2.123	5.800 ±1.658	P<0.05
	basophil	0.530 ±0.502	0.640± 0.490	P<0.05
	Lymphocyte	26.16 ±4.629	29± 3.279	P<0.05
	Monocyte	3.06 ±1.205	3.86 ±1.08	P<0.05

Our study shows neutrophilic leucocytosis ranging up to 15,000/cmm increase in granulopoiesis with or without shift to more immature granulocyte form during last trimester & 1st postpartum month as mentioned in old study [9]

Table 3: Values of Blood Indices and Hb

Variables	Subject	control	Level of significance
	Mean±SD	Mean±SD	
Hb (gm %)	8.76± 1.452	11.252± 1.118	P<0.05
MCH(picogm)	30.589± 2.471	24.793 ±3.035	P<0.05
MCHC (%)	31.699± 2.299	33.488 ±5.905	P>0.05
MCV(microgm)	96.528 ±8.939	76.356 ±16.553	P<0.05

Our study shows downward trend in haemoglobin, MCV and MCH and this fall seems to be due to Iron deficiency. However no significant change is found in MCHC as fall in MCHC only appears with more severe degree of iron depletion [10].

Table 4: Distribution of Pregnant Females in Each Group Showing Type of Anaemia

Group (Hb gm%)	micro-cytic hypo-chromic	normo-cytic normo-chromic	micro-cytic normo-chromic	macro-cytic hypoch-romic	total (100)
5.0 to 6.5	3	4	0	4	11
6.6 to 8.0	8	9	0	4	21
8.1 to 10.0	9	25	5	15	54
10.1 to 12.0	1	7	1	5	14

In 38% of cases of anaemia haemodilution has been found which is due to disproportionate fall in MCHC as compared to haemoglobin value and RBC count. Similar observation of haemodilution of the order of 23% was found. In addition to this factor of haemodilution the present study has revealed the existence of iron deficiency as an important factor in all the cases studied. The dietetic deficiency may result either because of poverty or dietetic idiosyncrasies or because of already existing other pathological problems which may lead to anaemia like intestinal infestations, chronic malaria etc. He found an incidence of 80% females having dimorphic iron deficiency anaemia showing both microcytic hypochromic as well as macrocytic hypochromic anaemia comparable to old study .[9]

The results of the comparison of Hb with maternal age are as given below:

Table 5: Relationship of Hb Range and Maternal Age

Hb gm%)	age group (years)					Total
	< 20	21 to 25	26 to 30	31 to 35	> 35	
5 or < 5	0	1	0	1	0	2
5 to 6.5	2	1	2	4	1	10
6.5 to 8	5	4	3	6	2	20
8 to 10	12	23	13	5	0	53
10 to 12	2	6	7	0	0	15

This study reveals that if the maternal age is below 20 or above 30 than the incidence of anaemia is more.This results are comparable to old study. [12]

Table 6: Relationship of Haemoglobin Level with Parity

Hb range	Gravid					Total
	1	2	3	4	≥ 5	
< 5.0	0	0	0	1	1	2
5.1 to 6.5	2	0	2	3	3	10
6.6 to 8	2	6	3	3	6	20
8.1 to 10.0	14	23	12	4	0	53
10.1 to 12.0	6	5	4	0	0	15

According to present study incidence of anaemia is more if parity is 5 or more than 5.

Table 7: Relation of Age at 1st Pregnancy (in Primi's) and Hb Level

Age of 1st Pregnancy	No of Primipara	Hb (gm %)	Mean Hb (gm %)
< 20	16	6 to 11	8.93
21 to 25	7	8 to 11	9.96
26 to 30	1	10.5	10.5
>30	0	0	0

The present study reveals that, if the primipara is of less than 20 years of age, than incidence of anaemia is more and results are comparable to old study.[12]

Conclusion

As per our study, out of 100 cases 15 cases having Hb level between 10.1 to 12 grams which could be considered as normal according to the criterion of Dawn. 38 patients were found to have haemodilution as one of the factors. The remaining 47 patients appeared to have Iron and/or Folic acid deficiency as important factor in the causation of anaemia, out of these 47 patients 20 were microcytic hypochromic. 5 macrocytic normochromic & 23 were normocytic hypochromic .Anaemia was common in pregnant females below 20 years of age and above 30 years of age. It was clearly observed that mean Hb level was inversely related to parity. The study revealed high ESR & neutrophilic leukocytosis suggesting bone marrow hyperplasia due to increased level of erythropoietin. It is concluded that incidence of anaemia is common in Indian pregnant females, especially low socio-economic group. They should be subjected to routine haematological check up & should go for regular ante-natal visits and take proper medications to prevent anaemia and its further consequences.

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