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A Cross Sectional Study to Assess the Status of Hemoglobin and Other Blood Indices among Pregnant Women Attending Tertiary Care Hospital of Vadodara

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Authors' contributions

This work was carried out in collaboration between both authors. Conceptualization and Supervision: Author JDL; Methodology, Formal analysis and investigation: Author VP; Writing - original draft preparation: Author VP; Writing - review and editing: Authors JDL, VP. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: A number of adaptations happen in the anatomy, physiology and metabolic processes within the mother which aids in successful progression of the pregnancy. The different blood indices such as haemoglobin concentration, packed cell volume (PCV), red blood cell count; total WBC count etc. can be measured to evaluate haematological status in a pregnant woman. The hematological profile of the pregnant women has an impact on both pregnancy and its outcome. Anaemia in pregnancy can be leads to morbidity and mortality in mother and fetus. The current study was designed to determine the variation in status of hemoglobin and other blood indices in anemic and non-anemic pregnant women.
Aims ans Objectives: 1. To study the hematological and other blood indices among pregnant women, 2. To assess the degree of anemia in pregnant women, 3. To compare the Various hematological parameters between anemic and non -anemic pregnant women.

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Materials and Methods: A Cross-sectional comparative descriptive survey design and quantitative approach was adopted to achieve the goal of the study. The study was conducted at the tertiary care hospital of Vadodara, Gujarat. Total 300 pregnant women were recruited and socio demographic information was collected. Hemoglobin concentration (Hb), total leucocyte count (TLC), differential leucocyte count (DLC), and platelet count, blood indices of the recruited samples were studied.Mean and SD of Haematological parameters were calculated and unpaired t-test was used to compare the pregnant anaemic women data with non-anaemic pregnant women.

Results: Out of 300, 204 pregnant women were found anemic and most of the pregnant women 84% belonged to rural area. In accordance with severity of anemia, Moderate degree of anemia was found to be highest (41%) in anemic pregnant women. Comparison of non - anaemic pregnant women with anaemic pregnant women shows significant changes in haematological parameters ($p < 0.05$).

Conclusion: It can be concluded that there is significant changes in hematological parameters in each trimesters of pregnancy as well compare to non-anemic to anemic pregnant women. Most of the hematological changes occur in order to physiological adaptation of pregnancy but abnormal status of Haemoglobin and other blood indices cause adverse outcome of the pregnancy.

Keywords: Haemoglobin; other blood indices; erythrocytes indices; anemia; pregnancy; hematological parameters.

1. INTRODUCTION

Haematological profile is a reflection as well as reliable indicator of general health along with being a simple, fast and cost-effective test [1]. A number of adaptations happen in the anatomy, physiology and metabolic processes within the mother which aids in successful progression of the pregnancy [2]. The body can generally compensate for these changes in the absence of disease however, in the presence of conditions such as anaemia, clotting/bleeding abnormalities, preeclampsia and trauma, compensation may not be possible [3]. Anemia is one of the most common haematology disorders during pregnancy. According WHO, anaemia in pregnancy is present when the haemoglobin concentration in the peripheral blood is 11 gm / 100ml or less [4]. The prevalence of anaemia in pregnancy is high in developing countries which lead to various deleterious effects on the mother and the fetus causing high maternal mortality and foetal complications. The many factors that influence pregnancy among of which includes culture, environment, socioeconomic status, and access to medical care, the impact of haematological indices on pregnancy and its outcome is significant [5]. Iron deficiency anaemia (IDA) is very common in India. Poor dietary intake and nutritional deficiency, multiple pregnancies, hookworm infestation, poor iron store and excessive menstruation in teenagers and young females, excessive sweating due to hot climate, mal-absorption and others may be the cause of IDA. There are reported cases of iron deficiency in sickle cell disorder. Tribal population of India has sickle cell disorder and nutritional iron deficiency; both very common, which may result in “double trouble”, contributing to severity of anaemia [6].

At this point, laboratory blood values significantly skewed from the values normally noted during pregnancy. Healthcare providers should be aware of both the normal and abnormal changes take place during pregnancy and the resulting laboratory values.

2. MATERIALS AND METHODS

A Cross-sectional comparative descriptive survey design and quantitative approach was adopted for this study. Total of, 300 pregnant women were recruited by Simple sequential probability sampling method at tertiary care hospital Vadodara, Gujarat and data was collected by January 2020. Data collection permission was obtained from concern hospital authority. The Data collection tools included two sections: socio-demographic variables, structured analysis Performa. The women aged 20-40 years and gestational age of 8^{th} to 38^{th} weeks with no any Clotting/bleeding disorder, Respiratory tract infection, cardiac renal or haemolytic disorders and multiple gestations were selected for this study. Data were analysed using SPSS-22 software. Descriptive statistics - Frequency, percentage, mean &standard deviation were used to study hematological values and inferential statistics - Student’s unpaired ‘t’ test was calculated to compare the values of anemic pregnant women with non-anemic pregnant women.

3. RESULTS

The present study is a cross sectional study comprising of 300 pregnant women attending the antenatal outpatient department of tertiary care hospital. Age wise distribution of the patients showed a maximum of 53.2%cases in the age group 20-25 years followed by 35.8% in the age group 26-30 years. Out of the 300 pregnant women majority 68% had anemia with Hb less than 11 gm/dl while 32% pregnant women were non-anemic. (Table 1) Haemoglobin value of the participants is divided according to WHO classifications of anemia. (Fig. 1. Distribution of cases according to Haemoglobin level).

Table 1. Distribution of sample according to Haemoglobin level

Category	No. sample	Percentage
Anaemic (Hb < 11 gm%)	204	68
Non-anaemic (Hb > 11 gm%)	96	32
Total	**300**	**100**

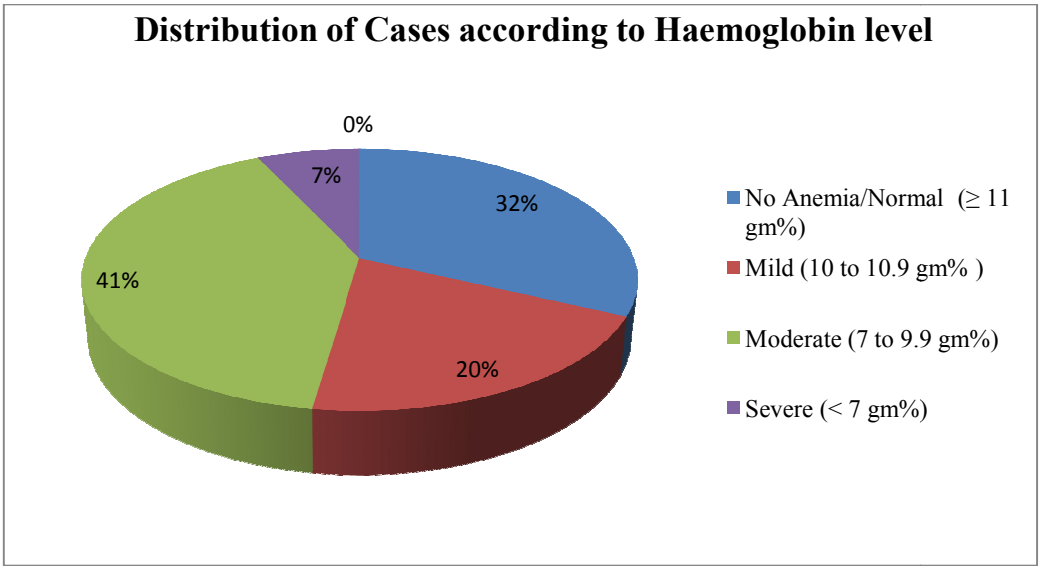

Fig. 1. Distribution of cases according to Degree of anemia on basis of Haemoglobin level of pregnant women N=300

Table 2. Hematological parameters of the pregnant women N=300

Parameters (Unit)	Reference Interval	Minimum value	Maximum value	Mean	SD
Hb (gm%)	11-17	5.3	12.3	9.41	1.94
Total W.B.C. (cell/cumm)	4000-11000	5600	14900	8904.17	2402.17
Neutrophils (%)	60-70	62	82	69.63	7.49
Lymphocytes (%)	20-35	11	44	22.58	6.91
Eosinophils (%)	1-4	2	23	4.25	4.11
Monocytes (%)	2-6	0	5	3.42	1.38
Platelet count (lacs/cu/mm)	1.5-4.5	2.11	4.47	2.98	0.67
PCV (%)	36-47	20.1	36.4	30.13	4.05
MCV (fl)	82-92	52.5	83.5	66.68	9.82
MCH (pg)	27-31	13.8	29.2	21.30	5.23
MCHC (%)	32-36	26.4	35.7	31.43	3.23
RBC (Mil/uL)	4.4-5.9	3.66	5.07	4.12	0.42
RDW (%)	13-15	12.7	22.9	16.41	2.92

Table 3. Ranges of blood indices

Blood Indices	Parameters	Frequency	Percentage
PCV (%)	Below normal (< 36%)	279	93
	Normal (36-47%)	21	7
	High (> 47 %)	0	0
MCV (fl)	Below normal (<82 fl)	268	89.33
	Normal (82-92 fl)	32	10.66
	High (> 92 fl)	0	0
MCH (pg)	Below normal (< 27 pg)	274	91.33
	Normal (27-31 pg)	26	8.66
	High (> 31 pg)	0	0

Table 4. Comparison of hematological parameters of anemic pregnant women with Non-anemic pregnant women

Parameters	Anemic (N=204)	Non-Anemic (N=96)
Hb (gm%)	8.50±1.53	11.61±1.14*
Total W.B.C. (cell/cumm)	9066.66±2105.59	8700.0±1183.67*
Neutrophils (%)	69.6±5.65	69.67±8.56*
Lymphocytes (%)	21.26±3.56	19.16±4.56*
Eosinophils (%)	5.06±5.06	2.88±1.23
Monocytes (%)	3.47±1.68	3.37±0.78*
Platelet count (lacs/cu/mm)	3.13±0.68	2.71±0.66*
PCV (%)	28.07±3.74	33.56±3.12*
MCV (fl)	61.07±7.32	76.04±6.61*
MCH (pg)	18.03±3.43	27.84±3.19*
MCHC (%)	29.41±2.26	34.78±2.45
RBC (Mil/uL)	4.61±0.41	4.38±0.26
RDW (%)	18.06±2.30	14.65± 1.48

*Hb- hemoglobin concentration, WBC- white blood count, PCV- packed cell volume, MCV- mean corpuscular volume, MCH- mean corpuscular hemoglobin, MCHC- mean corpuscular hemoglobin concentration, RBC- red blood cells, RDW-red cell distribution width. *Significant (p<0.05)*

Table 2 mentioned the Haemoglobin and other blood indices values of the pregnant women. The normal reference value was compared with 300 pregnant women minimum, maximum value of the test as well mean and standard deviation of all value was calculated. While distributions of cases in ranges of blood indices were denoted in Table 3. The data related to Comparison of hematological parameters of anemic pregnant women with Non-anemic pregnant women was reflected on Table 4.

4. DISCUSSION

4.1 Prevalence of Anemia in Pregnancy

The present study was carried out among pregnant women out of 300, 204 (68 %) women were anemic. The degree of anemia was noted that 20% of women having mild, 41% had moderate and 7% of women had severe anemia according to WHO classifications. The study conducted by Mangla M et al. have reported that the prevalence of anemia was 98% among the pregnant females in this region of rural India. Out of these 41.76% had mild anemia, 37.05% had moderate anemia, 15.88% had severe anemia and 3.29% very severe anemia [7].

The high prevalence of anemia in our study attributed from tribal rural area women due to lower socio economic status, late antenatal registration, failure to utilize medical services and nutritional deficiencies. 2.8% anemic women had diagnosed with sickle cell Haemoglobinopathies.

4.2 Types of Anemia in Pregnancy and its Differentiation

In present study, ranges blood indices of pregnant women indicates that most of cases having value of MCV, MCH & PCV were below then normal value. So, majority of women had microcytic hypochromic anemia which occurs due to iron deficiency or β – Thalassemia

Haemoglobinopathies [8]. Iron deficiency anaemia (IDA) is very common in India. The cause of IDA are Poor dietary intake and nutritional deficiency, multiple pregnancies, hookworm infestation, poor iron store and excessive menstruation in teenagers and young females, excessive sweating due to hot climate, mal-absorption, less than two years gaps between two pregnancies and others [9,10]. There are reported cases of iron deficiency in sickle cell disorder. Tribal population of India has sickle cell disorder and nutritional iron deficiency; both very common, which may result in "double trouble", contributing to severity of anaemia [6].

4.3 Variations of Hematological Parameters in Pregnant Women

The present study result shows the substantial variations of hematological parameters of pregnant. The minimum hemoglobin was 5.3 gm % and the maximum hemoglobin was 12.3 gm % (Table 2). The mean Hb of anemic pregnant women was 8.50±1.53 while in non-anemic women it was 11.61±1.14. There was significant difference found in value of Hb, Total WBC, Differential count, Platelet count, PCV, MCV, MCH in anaemic pregnant women then non anaemic pregnant women (Table 4).

4.4 Blood Indices and its Applicability in Anemia

The main purpose of using red blood cell discrimination indices is in differentiation of thalassemic and non thalassemic microcytosis. Iron deficiency anaemia and Beta Thalassemia are the two main common causes of microcytic anaemia. These indices are derived from RBC count, MCV and RDW. There are various indices which are being used since two to three decades but Mentzer index and Srivastava index have proved to be the most accurate and reliable of all [11,12]. The red blood cell indices play an important role in determining the type of anaemia. They are derived by calculating and relating Haematocrit, red blood cell count and Haemoglobin [13,14].

5. CONCLUSION

The haemoglobin and other blood indices provide basis in the assessment of the health status of pregnant women and focused diagnostic evaluation of various conditions and similarly in the diagnosis of complications or challenges during pregnancy. The ongoing need is to monitor the hematological profile during pregnancy as to detect haemoglbinopathies and reduce deleterious effects on both mother and fetus.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was approved from ethical committee of Sumandeep Vidyapeeth institutional ethical committee and ethical approval number is SVIEC/ON/ RP/20005.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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