



## ROLE OF RBC INDICES IN CATEGORIZATION OF ANEMIA IN ANTENATAL WOMEN

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**ABSTRACT** **BACKGROUND:** Anemia is one of the most common hematological abnormality diagnosed during pregnancy. In India, anemia is the second most common cause of maternal death. This study was undertaken to determine the prevalence of anemia in antenatal women and to analyse the risk factors for anemia in pregnancy.

**MATERIAL AND METHODS:** This study was conducted on 500 pregnant women coming to a tertiary teaching hospital in western Uttar Pradesh, for their first antenatal visit, over a period of one year. Blood samples were taken in plain vacutainers for serum ferritin estimation and in EDTA vacutainers for red cell indices and peripheral smear examination.

**RESULTS:** Prevalence of anemia was found to be 55.8%. Majority of the women were moderately anemic, normocytic normochromic anemia being the commonest type. Prevalence of anemia was high in second and fourth or more gravida and increased with increase in age of gestation. Serum ferritin levels were found to be decreased in all the trimesters. Prevalence of anemia was more in vegetarian women and in those who were not taking iron and folic acid supplements.

**CONCLUSION:** The prevalence of antenatal anemia is high in India as compared to developed countries. Diet, intake of iron and folic acid, gravidity and age of gestation have significant role in causation of anemia.

**KEYWORDS :** Prevalence, Anemia, Antenatal women, Serum ferritin, Red cell indices

### INTRODUCTION

Anemia is one of the most common hematological abnormality diagnosed during pregnancy and it is one of the most common indirect cause of maternal mortality.

In pregnancy, the criteria to diagnose anemia has been relaxed by WHO because some amount of dilution occurs as there is more increase in plasma volume as compared to increase in red blood cell volume.

#### Anemia in pregnancy is defined as<sup>1</sup>-

- Hemoglobin less than 11gm% in first and third trimester (hematocrit less than 33%).
- Hemoglobin less than 10.5 gm% in second trimester (hematocrit less than 32%).

Increased risk of anemia in pregnancy is due to increase in demand of iron and folic acid, fluid retention leading to dilution of blood and postpartum anemia due to heavy bleeding or multiple births. Females with poor nutrition, frequent pregnancies and abortions, high parity and those commencing antenatal care after the first trimester are at high risk for developing anemia<sup>1</sup>.

Anemia contributes significantly to maternal mortality<sup>2,3</sup> and to both maternal and fetal morbidity<sup>4</sup>. Furthermore, anemia during pregnancy is a risk factor of iron deficiency anemia for infant<sup>5</sup> and unsolved anemia can be associated with adverse behavioral and cognitive development of infant<sup>6</sup>.

In present study we studied about the prevalence of anemia and various contributory factors.

### MATERIAL AND METHODS

This study was conducted on 500 pregnant women coming to a tertiary teaching hospital in western Uttar Pradesh for their first antenatal visit, over a period of one year (February 2019-January 2020) to assess the prevalence and type of anemia, its correlation with various parameters (diet, religion, occupation, gravidity, iron and folic acid intake and months of gestation) and serum ferritin levels wherever possible.

Antenatal women with any major illness and chronic diseases were excluded from the study.

Appropriate history was taken and blood samples were taken in plain vacutainers for serum ferritin estimation and in EDTA vacutainers for red cell indices and peripheral smear examination. Red cell indices were measured by automated cell counter. Serum ferritin estimation was done by using ELISA technique, using CALBIOTECH kit.

### RESULTS

Out of 500 cases studied, 444 (88.8%) were in the age group of 20-29 years. 60% of the cases in the age group of 30 or above were anemic, followed by 55.6% in the age group of 20-29 years and 50% in the age group of 19 or less than 19 years (Fig-1). This difference in prevalence of anemia in relation to age group of pregnant women was not found to be statistically significant (p-value=0.78).

230 (46%) pregnant women were in third trimester of pregnancy and only 67 (13.4%) pregnant women were in first trimester. Anemia was seen in 17 (25.3%), 114 (56.1%) and 148 (64.3%) pregnant women in their first, second and third trimester respectively. The difference in prevalence of anemia in pregnant women is highly significant (p-value<0.001) in different trimesters.

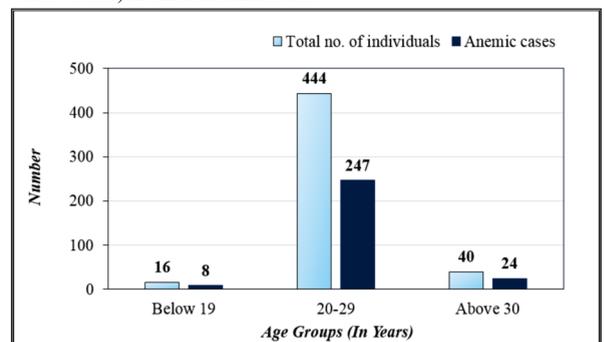


Figure-1: Age wise distribution of cases

The study shows that majority 427 (85.4%) cases belonged to Hindu community and only 73 (14.6%) cases were Muslims. Anemia was seen in 241 (56.4%) and 38 (52.1%) cases of Hindu and Muslim religion respectively. The difference in prevalence of anemia in pregnant women belonging to different religion was not found to be statistically significant (p-value=0.48).

Out of 500 cases studied, 236 (47.2%), 128 (25.6%), 96 (19.2%) and 40 (8%) pregnant women were first, second, third and fourth or more gravida. Anemia was seen in 110 (46.6%), 84 (65.6%), 56 (58.3%) and 29 (72.5%) pregnant women in order of increasing gravidity. We have seen that prevalence of anemia is higher in second and fourth or more gravida as compared to first and third. The difference in prevalence of anemia in pregnant women in relation to gravidity was found to be highly significant (p-value=0.0004).

We also studied the association of prevalence of anemia with dietary habits. Out of 500 cases studied, 275 (55%) were vegetarians and 225 (45%) were non-vegetarians. 175 (63.6%) of vegetarian and 104 (46.2%) of non-vegetarian cases were anemic. The difference in prevalence of anemia in women with different dietary habits was found to be statistically significant (p-value<0.001).

Out of 500 cases, only 169 (33.8%) cases were consuming iron and folic acid tablets and anemia was seen in 74 (43.7%) cases of them. 205 (61.9%) cases were found to be anemic among those who were not consuming iron and folic acid tablets (Table-1). This difference in prevalence of anemia in relation to iron and folic acid intake was found to be highly significant (p-value=0.0001).

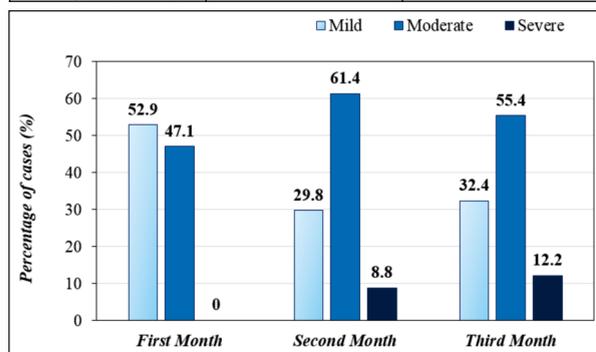
**Table-1: Distribution of cases according to iron and folic acid consumption (n=500)**

Iron + Folic acid intake	Total Cases		Anemic Cases		p-value
	No.	%	No.	%	
Yes	169	33.8	74	43.7	0.0001

According to WHO criteria, pregnant women were classified as mild (10-10.9g/dl), moderate (7-9.9g/dl) and severe (6.9g/dl) anemic. Majority 160 (57.3%) were moderately anemic, followed by 91 (32.6%) mildly anemic and 28 (10.1%) severely anemic (Table-2). Out of 17 anemic women in first trimester, majority (9, 52.9%) were mildly anemic. Moderate anemia was predominantly seen in second and third trimester (Fig-2).

**Table-2: Hemoglobin-wise distribution of cases of anemia as per WHO criteria (N=279)**

Hemoglobin	Anemic Cases	%
10-10.9g/dl (Mild)	91	32.6
7-9.9g/dl (Moderate)	160	57.3
<6.9g/dl (Severe)	28	10.1



**Figure- 2: Trimester-wise distribution of anemic cases**

Anemia was classified according to morphology and chromicity and it was seen that the maximum number of cases 91 (32.6%) were normocytic normochromic, followed by normocytic hypochromic 80 (28.6%), microcytic hypochromic 76 (27.2%), dimorphic 24 (8.6%) and macrocytic normochromic 8 (2.9%).

Analysis of red cell indices shows that MCV ranged from 57.1-107 fl. Maximum cases had MCV 80-100 fl, i.e.71.2%, followed by 26.2% with MCV <80 fl and remaining 2% with MCV more than 100 fl. MCH ranged from 15.1-46.8 pg. Maximum cases had MCH 27-32 pg i.e. 53.2%, followed by 36.8% with MCH less than 27 pg and remaining

10% with MCH >32 pg. Maximum cases had MCHC 32-36 i.e.70.8%, followed by 27.6% with MCHC <32 and remaining 1.6% with MCHC >36 (Table-3).

**Table-3: Distribution of cases according to red cell indices (n=500)**

Red cell indices	Values of different indices			Ranged from
	Number of cases (%)			
MCV	<80	80-100	>100	57.1-107
	134(26.8%)	356(71.2%)	10(2%)	
MCH	<27	27-32	>32	15.1-46.8
	184(36.8%)	266(53.2%)	50(10%)	
MCHC	<32	32-36	>36	17.1-56.8
	138(27.6%)	354(70.8%)	8(1.6%)	

Serum ferritin was measured in 57 anemic women. It was found to be decreased in 41 cases (71.9%) and all degrees of anemia showed low serum ferritin.

**DISCUSSION**

Anemia in pregnancy continues to be the major public health problem in the world and is the commonest medical disorder in pregnancy that has a varied prevalence, etiology and degree of severity in different population. In the present study, out of 500 cases studied, 279 cases (55.8%) were found to be anemic [according to WHO criteria]. Similar results have been reported by NFHS-3<sup>7</sup> and in studies of Taseer et al.<sup>8</sup> and Panghal et al.<sup>9</sup>. Various other studies, Desalgen et al.<sup>10</sup>, Gillespie et al.<sup>11</sup>, Dim et al.<sup>12</sup>, Mc lean et al.<sup>13</sup>, reported the prevalence of anemia in antenatal women ranging from 40-52%. However, Saxena et al.<sup>14</sup> in his study had reported a lower prevalence of anemia (36.7%) among pregnant women. This might be due to difference in selection criteria.

Out of 500 cases studied, most of the women (444, 88.8%) were between 20-29 years of age, while =>30 years accounts for 8% (40 cases) and only 3.2% (16 cases) were 19 years or less than 19 years of age. Anemia was found to be more prevalent (60%) in women >30 years of age followed by 55.6% in 20-29 years of age and 50% in women of 19 years or less than 19 years of age.

In the present study, out of 500 pregnant women studied 169 women (33.8%) were taking and 331 women (66.2%) were not taking iron and folic acid tablets. Anemia was found in 74 women (43.7%) and 205 women (61.9%), taking and not taking iron and folic acid tablets respectively. The difference in prevalence of anemia in relation to intake of iron and folic acid was found to be statistically significant (p-value=0.0001). Yip et al.<sup>15</sup> concluded that daily iron supplementation during pregnancy can prevent and control the maternal anemia. Bisoi et al.<sup>16</sup> found anemia in 73.8% of antenatal women, not taking iron and folic acid. 47.7% of the women who consumed iron folic acid developed anemia, this could be due to inappropriate dosage, poor compliance and poor absorption.

Out of 279 anemic cases, 160 cases (57.3%) had moderate anemia, followed by 91 cases (32.6%) of mild anemia and 28 cases (10.1%) of severe anemia in the present study. Moderate anemia was also found to be more prevalent by Agarwal et al. (47%)<sup>17</sup>, Pathak et al. (53.2%)<sup>18</sup> and Toteja et al. (60.1%)<sup>19</sup>.

Saxena et al.<sup>14</sup> found the moderate anemia in pregnancy to be the most common type. Gautam et al.<sup>20</sup> also reported high prevalence (50.9%) of moderate anemia. Taseer et al.<sup>8</sup> concluded that moderate anemia (60.14%) was the most common among pregnant women of Multan. In contrast to present study, Bisoi et al.<sup>16</sup> reported 50.9%, 12.4% and 4.5% prevalence of mild, moderate and severe anemia respectively.

Out of 500 case studied, majority 230 cases (46%) were in third trimester, followed by 203 cases (40.6%) in second and only 67 cases (13.4%) were in first trimester. This shows that majority of women register during third trimester. Sharma et al.<sup>21</sup> also recorded that most of the women were in third trimester followed by second trimester.

In present study the prevalence of anemia was found to be 64.3% (148 cases), 56.1% (114 cases) and 25.3% (17 cases) in women in their third, second and first trimester respectively. All degrees of anemia were found to be more prevalent in women in their third trimester. This difference in prevalence of anemia in relation to gestational age was found to be statistically significant (p-value<0.001). This indicates that chances of anemia increases with increase in gestational age, this might be due to the fact that demand of nutrients increases with

increase in gestational age.

The present study showed that out of 57 anemic women, 41 (71.9%) were found with low serum ferritin levels. Most of the severely anemic women [7/8 (87.5%)] had low serum ferritin levels. Serum ferritin was the lowest in second trimester when compared with first and third. This study showed that 59.1% women were iron deficient in second trimester. Low serum ferritin levels during second trimester predict low hemoglobin levels in late pregnancy. Similar findings were reported by other studies also.<sup>22-25</sup>

## CONCLUSION

It could be concluded from this study that the prevalence of antenatal anemia is high in India as compared to developed countries. Diet, intake of iron and folic acid, gravidity and age of gestation have significant role in causation of anemia.

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