Original Research Article

Clinicohaematological study of anaemia in antenatal patients

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ABSTRACT

Background: According to WHO, approximately 75% of pregnant women in developing countries and 18% in developed countries are anaemic. In India prevalence of anaemia is reported to be 33%-89% and is one of the important causes of maternal morbidity and mortality. The present study was done with the objective to study the socio-demographic factors related to anemia and the distribution of different types of anaemia in antenatal patients.
Methods: A prospective analytical study was done on 205 pregnant females who presented with anemia (Hb <11 gm/dl) in 1st, 2nd and early 3rd trimester (up to 30 weeks of gestation) in the department of obstetrics and gynecology of Swaroop Rani Nehru Hospital, Prayagraj from September 2017 to September 2018.
Results: The rural background with lower socio-economic status comprised majority of the anemic patients (65.9%) with the major cause being iron deficiency anemia (68.8%). The patients mainly presented with anemia at late second or early third trimester (82.4%). Clinical signs like pallor, oedema and symptoms like palpitations and dyspnoea were more associated with severe anemia than mild and moderate anemia.
Conclusions: Anemia prevention and prompt detection is the need of the hour with effective management. In India, major cause of anaemia are nutritional deficiencies which can be treated by proper diet and medications. The advises of routine iron supplementation during pregnancy, regardless of whether the mother is anemic or not, is strongly recommended by this study.

Keywords: Anaemia, Antenatal women, Hemoglobin, Iron deficiency anemia

INTRODUCTION

Anaemia in pregnancy is one of the most important cause of maternal morbidity and mortality in developing countries. Normally pregnancy is a state of "hydremic plethora". There is disproportionate increase of plasma volume as compared to red blood cell mass which leads to apparent reduction of RBC, Haemoglobin, and haematocrit values. The dilution picture is normocytic normochromic- known as "Physiological Anaemia of Pregnancy".

According to WHO, more than 75% of pregnant women in developing countries and 18% in developed countries are anaemic. In India prevalence of anaemia is reported to be 33%-89% which is more in the adolescent age group with variations in the different regions of the country. In India iron and folate deficiencies are the common causes of anaemia in pregnant women.[1-5]

According to WHO, the acceptable haemoglobin level taken during pregnancy is 11 g/dl. Hb less than 11 g/dl is considered to be anaemia. According to CDC, criteria Hb <11 g/dl in first trimester, Hb <10.5 g/dl in second trimester and Hb <11 g/dl in third trimester is considered to be anaemic. Correspondingly, it causes a detectable change in the mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular volume (MCV).[5-9]

Iron deficiency in pregnancy is, in principle, identifiable, treatable and possibly preventable with iron

supplementation. Systematic, screening and treatment for iron deficiency in pregnancy would improve maternal and infant outcomes.[10-14] MCV, MCH and RDW are the iron parameters of CBC which is cost effective, easily accessible and can be useful in areas with limited resources and a high prevalence of the disease.[15-16]

The present study was done in the department of obstetrics and gynaecology of Swaroop Rani Nehru Hospital, Prayagraj, Uttar Pradesh, India procuring the complete clinico haematological work up of all anaemic antenatal patients in the 1st, 2nd and early 3rd trimester up to 30 weeks with the objective to study the socio demographic factors related to anaemia and the distribution of different types of anaemia in antenatal patients.

METHODS

A prospective analytical study was done on 205 pregnant females who presented with anemia (Hb <11 gm/dl) in 1st, 2nd and early 3rd trimester (up to 30 weeks of gestation) attending antenatal clinics in the department of obstetrics and gynecology of Swaroop Rani Nehru Hospital, Prayagraj, Uttar Pradesh, India from September 2017 to September 2018.

Inclusion criteria

- Pregnant women willing to participate
- Pregnant women up to 30 weeks of gestational age
- Pregnant women with hemoglobin <11 gm/dl were included in the study.

Exclusion criteria

- Pregnant women not willing to participate, pregnant women in late third trimester (>30 weeks of gestation).

After an informed oral consent, thorough general, systemic and obstetrical examination was done. Further, blood sampling was done for hematological parameters such as complete hemogram analyzed by a semiautomatic three-part hematology analyzer (Medonic M series), peripheral blood smear examination by Leishman's staining and reticulocyte count which was calculated using a supravital stain new methylene blue. Females with hemoglobin <9 g/dl and reticulocyte count 2.5% or more and MCV <75 fl were further investigated for serum iron, total iron binding capacity, serum ferritin and serum vitamin B12. Serum iron and TIBC was estimated on the semiautomatic chemical analyzer (Elitech Group Clinical System - Selectra Pro M). Total Ferritin was determined manually by ELISA procedure using BIOS human ferritin enzyme immunoassay test kit. The serum folate and serum vitamin B12 was determined by architect 1000 assay.

The pregnant females who had hemoglobin 9-11 g/dl with normal serum iron and serum ferritin were classified as Physiological anaemia of pregnancy, with Hb 7-9 g/dl with low serum ferritin were classified as moderate iron deficiency anaemia and with Hb <7 g/dl with low serum iron, low serum ferritin were classified as severe anaemia.

Statistical analysis

Chi square test was used to calculate the association between anaemia and socio- demographic factors and other hematological parameters. Statistical significance was set at 95% confidence level (p- value of less than or equal to .05). Continuous data were summarized as mean±SD while discrete (categorical) in number and percentage. Continuous groups were compared by student's t test and categorical groups by Chi Square and ANOVA test.

RESULTS

The present study was done on 205 anaemic antenatal patients, out of which 141 (68.8%) were Iron deficiency anaemia, 10 (4.9%) Vitamin B12/Folic acid deficiency anaemia, 46 (22.4%) Physiological anaemia of pregnancy and 8 (3.9%) Thalassemia trait. Mild anaemia was found in 22.4%, moderate anaemia in 57.1% and severe anaemia in 20.5% (Table 1).

Table 1: Distribution of type of anaemia.

Type of anaemia	No. (n = 205)	%	Mild 9-11 g%	Moderate 7-8.9 g%	Severe <7 g%
Iron deficiency anaemia	141	68.8%	2%	103%	36%
Vitamin B12/Folic acid deficiency anaemia	10	4.9%	-	4%	6%
Physiological anaemia of pregnancy	46	22.4%	40%	6%	-
Thalassemia trait	8	3.9%	4%	4%	-
Percentage of anaemic females with severity of anamia			22.4%	57.1%	20.5%

Table 2 shows that maximum patients, 140 (68.3%) were in the age group between 20-25 years, 50 (24.4%) were in the age group between 26-30 years and 15 (7.3%) were between 31-35 years. The mean age of the patients was 24.81±3.11.

Table 2: Age at pregnancy with anaemia.

Age in years	No. (n = 205)	%
20-25 years	140	68.3%
26-30 years	50	24.4%
31-35 years	15	7.3%
Mean		24.81±3.11

Table 3 shows that out of 140 (68.3%) anaemic pregnant women who were in the age group between 20 -25 years, 95 (46.3%) had Hb >7 g% and 45 (22%) Hb <7 g%. 50 (24.4%) women were found to be in the age group of 26-30 years out of which 17 (8.3%) had Hb >7 g% and 33 (16.1%) had Hb <7 g%. Out of 15 (7.3%) women

between the age group of 31-35 years, all of them had Hb >7 g%. The mean age of pregnancy was 24.81±3.11.
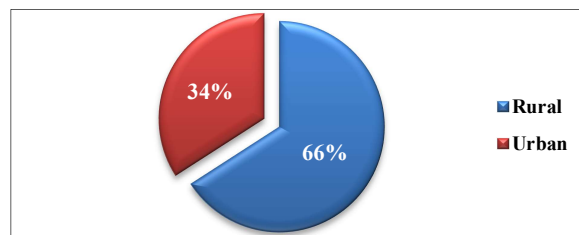

Figure 1: Relationship of domicile of patient with anaemia.

Table 3: Relationship of age in pregnancy with severity of anaemia.

Age at pregnancy (years)	No. of pregnant females (n = 205)		No. of pregnant females with Hb >7 g%		No. of pregnant females with Hb <7 g%	
	No.	%	No.	%	No.	%
20-25	140	68.3%	95	46.3%	45	22%
26-30	50	24.4%	17	8.3%	33	16.1%
31-35	15	7.3%	15	7.3%	0%	-
Total	205		127		78%	
Mean		24.81±3.11				

* For simplicity purpose, mild and moderate anaemia have been included in one group (Hb > 7 g%).

Figure 1 shows that 135 (65.9%) women were from the rural background whereas 70 (34.1%) belonged to the urban background.

Table 4: Socioeconomic status.

Socioeconomic status	Study group (n = 205)	
	No.	%
Upper middle class	18	8.8%
Middle class	50	24.4%
Lower middle class	23	11.2%
Lower class	114	55.6%

Table 4 shows that out of 205 antenatal women, 18(8.8%) belonged to upper middle class, 50 (24.4%) to middle class, 23 (11.2%) to lower middle class and 114 (55.6%) to lower class.

Table 5: Gestational age at presentation (in weeks).

Gestational age (in weeks)	No. (n = 205)	%
≤ 12 weeks	9	4.4%
13-20 weeks	27	13.2%
21-30 weeks	169	82.4%
Mean		24.11±4.22

Table 5 shows that out of 205 anemic pregnant women, 9 (4.4%) presented with gestational age <12 weeks, 27

(13.2%) had gestational age between 13 to 20 weeks whereas majority 169 (82.4%) had gestational age between 21 to 30 weeks. The mean gestational age at presentation was 24.11±4.22 weeks.

Table 6: Severity of anemia with clinical symptoms.

Clinical symptoms	No. of women		p value
Pallor	No.	%	
Yes	79	38.5%	0.004
No	126	61.5%	
Edema			
Yes	38	18.5%	0.03
No	167	81.5%	
Palpitations			
Present	23	11.2%	0.03
Absent	182	88.8%	
Dyspnoea			
Present	27	13.2%	0.03
Absent	178	86.8%	

Table 6 shows that out 205 patients, 79 (38.5%) had pallor and 126 (61.5%) had no pallor. The p value was significant 0.004. Edema was found in 38(18.5%) patients and 167 (81.5%) had no edema. The p value was significant 0.03. Palpitations was found in 23 (11.2%) and 182 (88.8%) patients had no palpitations. The p value was significant 0.03. Dyspnoea was found in 27 (13.2%)

and 178 (86.8%) had no symptoms of dyspnoea. The p value was significant 0.03.

Table 7 show the distribution of anaemic pregnant females according to blood indices. Out of 205 anaemic pregnant women 46 (22.5%) had MCV below normal range, 137 (66.8%) had MCV in the normal range and 22 (10.7%) had MCV above normal range. 145 (70.7%) patients had MCH below normal range and 60 (29.3%) patients had MCH in the normal range. 160 (78%) patients had MCHC below normal range and 45 (22%) had MCHC in the normal range.

Table 7: Distribution of anemic females according to blood indices.

Blood indices	Below normal range		Normal range		Above normal range	
	No.	%	No.	%	No.	%
MCV (75-95 fl)	46	22.5%	137	66.8%		
MCH (27-32 pg)	145	70.7%	60	29.3%	22	10.7%
MCHC (33-36 g/dl)	160	78%	45	22%		

Table 8: Comparison of haematological parameters between mild, moderate and severe anaemia on the basis of haemoglobin.

Parameter	Subtypes of anaemia			p value
	Mild (Hb 9-11 g %)	Moderate (Hb 7-8.9 g %)	Severe Hb (<7 g %)	
Hb (> 11g %)	9.39±0.26	8.15±1.25	6.02±0.95	0.001
RBC (3.5-5.5 × 10^{12}/L	4.30±0.38	3.50±0.41	2.86±0.24	0.0001
RDW (11.5-14.5%)	15.29±1.3	16.40±2.35	17.51±3.10	0.001
MCV (75-95 fl)	83.43±7.6	78.24±9.48	72.11±13.13	0.001
MCH (28-32 pg)	28.24±2.7	24.83±2.35	23.16±3.21	0.0001
MCHC (33-36 g/dl)	33.03±0.93	29.65±1.28	24.45±0.99	0.0001
S.Iron (40-150 ug/dl)	56.33±14.64	40.26±12.21	23.74±4.71	0.0001
S.Ferritin (15-150 ng/ml)	19.00±26.54	10.32±17.31	4.035±0.82	0.0001
TIBC (200-400 ug/dl)	323.58±64.51	400.46±28	477.7±32.75	0.0001

Table 9: Association of subtypes of anaemia with haematological parameters.

Haematological parameters	Subtype of anaemia						p value
	(n = 46) mild (Hb 9-11 g%)		(n = 117) moderate (Hb 7-8.9 g %)		(n = 42) severe (Hb < 7 g %)		
	No.	%	No.	%	No.	%	
Serum iron (40-150 ug/dl)							
Abnormal	9	19.6%	68	58.1%	42	100%	0.001
Normal	37	80.4%	49	41.9%	-	0%	
Serum ferritin (15-150 ng/ml)							
Abnormal	42	91.3%	113	96.6%	42	100%	0.04
Normal	4	8.7%	4	3.4%	-	0%	
TIBC (200-400 ug/dl)							
Abnormal	-	0%	47	40.2%	42	100%	0.001
Normal	46	100%	70	59.8%	-	0%	
Serum VitB12 (200-400 pg/ml) mean value = 324.85±107.49							
Abnormal	-	0%	6	5.1%	9	21.4%	0.003
Normal	46	100%	111	94.9%	33	78.6%	
Serum folate (2-20 ng/ml) mean value = 5.21±1.19							
Abnormal	-	0%	4	3.4%	6	14.3%	0.001
Normal	46	100%	113	96.6%	36	85.7%	

Table 8 shows that the mean value of Hb in mild anaemia was 9.39±0.26, in moderate anaemia 8.15±1.25 whereas in severe anaemia it was 6.02±0.95. Likewise, the mean value of RBC count was 4.30±0.38 in mild anaemia whereas in moderate anaemia it was 3.50±0.41 and in severe anaemia it was 2.86±0.24. The mean value of

RDW in mild anaemia was 15.29±1.3 whereas in moderate anaemia it was 16.40±2.35 and in severe anaemia, 17.51±3.10. Mean MCV in mild anaemia was 83.43±7.6, in moderate was 78.24±9.48 and in severe anaemia was 72.11±13.13. The p value came out to be significant = 0.001. The mean of MCH in mild anaemia came to be 28.24±2.7, in moderate anaemia 24.83±2.35 and in severe anaemia it was 23.16±3.21. The mean value of MCHC in mild anaemia came out to be 33.03±0.93, in moderate anaemia it was 29.65±1.28 and in severe anaemia 24.45±0.99. The mean Serum iron value in mild anaemia was 56.33±14.64, in moderate anaemia was 40.26±12.21 and in severe anaemia was 23.74±4.71. The mean of serum ferritin in mild anaemia was 19.00±26.54 in moderate anaemia was 10.32±17.31 and in severe anaemia was 4.035±0.82. The mean value of serum TIBC in mild anaemia was 323.58±64.51, in moderate anaemia was 400.46±28 and in severe anaemia it was 477.7±32.75.

Table 9 shows that 205 anaemic antenatal patients were grouped under mild moderate and severe anaemia on the basis of haemoglobin and were evaluated further on the basis of Serum iron, ferritin, TIBC, vitamin B12 and folate levels. 46 patients were classified as having mild anaemia in which abnormality was detected in serum iron in 9 (19.6%) patients, serum ferritin in 42 (91.3%) patients while no abnormality was detected in TIBC, vitamin B12 and folate levels. 117 patients were detected as having moderate anaemia which were further analysed on the same basis as above. Abnormal serum iron levels were found in 68 (58.1%) patients, abnormal serum ferritin was found in 113 (96.6%) patients, TIBC was found to be abnormal in 47 (40.2%) patients, and 6 (5.1%) patients had abnormal serum vitamin B12 levels and abnormal serum folate levels were detected in 4 (3.4%) patients. 42 patients out of 205 had severe anaemia which on further analysis showed that all 42 (100%) patients had abnormal serum iron, serum ferritin and TIBC levels. 9 (21.4%) patients had abnormal serum vitamin B12 levels and 6 (14.3%) had abnormal serum folate levels. The distinction made between the mild, moderate and severe category of anaemia on the basis of above parameters had a significant p value in every case i.e. serum iron (p = 0.001), serum ferritin (p = 0.04), TIBC (p = 0.001), serum vitamin B12 (p = 0.003) and serum folate (p = 0.001).

DISCUSSION

Ante partum anaemia is a very important issue that needs aggressive attention to treat. India contributes to 80% of maternal deaths caused by anaemia in South Asia. In this study 68.8% patients had iron deficiency anaemia, 4.9% had VitB12/Folic acid deficiency and 22.4% had physiological anaemia of pregnancy which is similar to the study by Tripathi R et al, in which iron deficiency was an important cause of anaemia (48.1%).[9] A similar prevalence of anemia was found in North Indian region in the study done by Somdutta et al.[10] This study findings

also correlated with studies done by Sinha M et al, in which 65% of patients had iron deficiency anemia, 18.3% had dimorphic anemia and 5% had megaloblastic anemia.[11]

In this study maximum patients belonged to the age group of 20- 25 years with the mean age group of 24.81±3.11. The findings of this study were comparable to Dutta S et al and Ugunju et al, who found that most anemic women were in their twenties with age group of 21-24 years.[10,12] Kumar et al, in his study found the mean age of anemic population to be 24.12±3.75 years which correlated with this study.[6]

In this study the prevalence of anemia was maximum in the age group between 20-25 years with moderate anemia. This could be due to pregnancy in young age and most of them being only primigravida; the demand of iron is more in this period of growth which is further augmented due to pregnancy. Severe anemia in this study was more as compared to other studies because the study institution is a tertiary referral institution. This study was discordant with the study done by Bereka et al, where the antenatal women above 35 years were anemic.[1] Vivek RG et al, in their study observed a high prevalence of anemia with majority (50.4%) having moderate degree of anemia (Hb = 7-10 g%) and 7% had severe anemia.[7]

In this study we found that the people belonging to the rural community 135 (65.9%) were more anemic as compared to people from urban areas 70 (34.1%).This is in accordance with a study done by Kundap RP et al, and Shedole DT et al.[2,3] The high prevalence of anemia in rural population can be attributed to their food habits, hygiene, lower literacy rates and limited access to the health care system. In this study 55.6% patients were from the lower socio-economic status. Over the years various other studies have also shown significant association of anaemia with lower socio-economic class like Fullerton et al, and Bodnar LM et al.[13,14]

In this study, the mean gestational age of presentation with anaemia was 24.11±4.22 weeks which is similar to the study done by Taner CE et al, where they found the prevalence of anaemia to be more in the antenatal women in later pregnancy than in early pregnancy.[4] Contrary to this, Kumar V et al, found the antenatal women in the 1st trimester to be more anaemic as compared to late trimester.[6] Low antenatal care coverage at the rural Primary health care center coupled with poor screening for anaemia without appropriate therapy might be the contributing factors for the increased prevalence in later half.

In this study, the mean value of MCV, MCH and MCHC were on a lower range in severe and moderate anaemia than in mild anaemia and p value was also found to be very significant (0.001) which is similar to the study by Jadhav MV et al, who found that highest diagnostic accuracy in correctly classifying anaemia into etiological

groups was offered by MCH followed by MCV, MCHC, RDW.[5] On the contrary, Broek VD et al, examined the diagnostic accuracy of iron parameters like MCV and found it to be quite low.[16]

In this study, the lower values of serum iron and ferritin in anaemic patients came out to be statistically significant and found to be very much diagnostic of iron deficiency anaemia. Out study was supported by Shah et al, where serum ferritin was normal in 39.2% anaemic pregnant women while 60% had below normal range.[8] Similarly, in another study by, Dreyfuss MI et al, 83% of the pregnant women with mild anaemia and 100% of the pregnant females with moderate anaemia had low serum ferritin.[15]

CONCLUSION

- The major cause of anemia in majority of the population was iron deficiency anemia with a prevalence of 68.8% with most of the patients in the age group between 20-25 years (68.3%, 24.81±3.11). It may be due to increased demand during adolescence which gets augmented because of pregnancy.
- The rural background comprised majority of the anemic patients (65.9%). This may have been because of lack of facilities and health care system in these areas. The severity of anemia was inversely proportional to socioeconomic class maybe because of lack of antenatal check-ups.
- The patients mainly presented with anemia at late second or early third trimester (82.4%). This may have occurred as patients in the late gestation might have shown up for the first time and would not have taken any health supplementation from the beginning of their pregnancy.

Anemia prevention is the need of the hour and needs several programmes along with effective management for detection. In India, major cause of anaemia are nutritional deficiencies which can be treated by medications. The advice of routine iron supplementation during pregnancy, regardless of whether the mother is anaemic or not, is strongly recommended by this study.

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