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Original Research Article

Maternal haemoglobin and perinatal outcome in a tertiary care hospital in Jammu city, India

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ABSTRACT

Background: Maternal anemia is a common problem worldwide. The objective of this study was to assess the prevalence of anemia in women attending a tertiary care centre in their third trimester of pregnancy and to study the relation of maternal hemoglobin with perinatal outcome.

Methods: This study was conducted in the Department of Obstetrics and Gynecology, SMGS Hospital, Jammu for a period of one year from Nov. 2015 to Oct. 2016. A total of 767 women in their third trimester (>28 weeks) were enrolled and were followed till delivery. Their hemoglobin levels were noted and its association with adverse maternal and fetal outcomes was studied.

Results: It was seen that out of 767 patients, 193 (25.16%) were non-anemic and 574 (74.83%) were anemic out of which 343 (44.71%) were mildly anemic, 160 (20.86%) had moderate anemia and 70 (9.12%) had severe anemia. There was increased incidence of preterm delivery, PPH, preeclampsia, eclampsia, CCF, mortality & blood transfusions in the anemic group as compared to the non-anemic group. Among the adverse fetal outcomes, there was increased incidence of intrauterine deaths, intrauterine growth restriction, NICU admissions, meconium stained liquor, low birth weight babies and APGAR scores <7/10 among the anemic group as compared to the non-anemic group.

Conclusions: Maternal anemia is a significant risk factor for adverse maternal and perinatal outcome and its prevalence continues to be high especially in developing countries like India. So, correction of maternal anemia still remains one of the most important step towards better obstetrical care.

Keywords: Anemia, Intrauterine growth restriction, Preterm birth, PPH, Preeclampsia

INTRODUCTION

Anemia is defined as a condition of low circulatory hemoglobin in which hemoglobin concentration has fallen below the threshold lying at 2SD below the median of a healthy population of same age and stage of pregnancy.¹ According to World Health Organization (WHO), anemia in pregnancy is defined as hemoglobin concentration <11gm% and further categorized into three levels

- Mild: 9-10.9gm/dl
- Moderate: 7- 8.9gm/dl
- Severe: <7gm/dl.²

Maternal anemia is a common problem worldwide. According to the 2008 WHO analysis, anemia affected 24.8% of the world's population. In India, in one of the studies conducted on a large population, it was estimated that 87% of the women are anemic.³

Maternal anemia in pregnancy is commonly considered as risk factor for poor pregnancy outcomes and can threaten the life of mother and fetus.⁴ Studies have documented a strong association between low hemoglobin before delivery and adverse outcomes.⁵ Antepartum complications associated or aggravated by anemia are pre-eclampsia, antepartum hemorrhage, preterm deliveries and maternal mortality.⁶ Maternal anemia is also considered a risk factor for poor perinatal outcome like low birth weight babies, low APGAR scores at one min, meconium stained liquor and NICU admissions.⁷

So, the aim of present study was to evaluate the impact of maternal anemia on various perinatal outcomes in our hospital.

METHODS

This study was conducted in the Department of Obstetrics and Gynecology, SMGS Hospital, Government Medical College, Jammu for a period of one year from November 2015 to October 2016.

A total of 767 women in their third trimester (>28 weeks of gestation) were enrolled after briefing them about the purpose of the study. These were followed till delivery.

Inclusion criteria

- Women attending Government Medical college in their third trimester (>28 weeks)
- Singleton pregnancy
- Age 18 years and above

Exclusion criteria

- Multiple pregnancies
- Other associated medical complications
- Antepartum hemorrhage
- Anemia due to acute blood loss.

All the participants were subjected to thorough history and general physical and systemic examinations.

The following investigations were carried out: CBC, Red Blood Indices, Iron studies.

Subjects were then categorized into following groups depending upon hemoglobin level according to WHO standards:

- Non-anemic: >11gm/dl
- Mild: 9-10.9gm/dl
- Moderate: 7-8.9gm/dl
- Severe: <7gm/dl

Adverse perinatal outcome was measured as occurrence of: Meconium stained liquor, Low birth weight, APGAR

score <7/10, Intrauterine growth restriction, Admission in NICU, Intrauterine death

Adverse maternal outcome was measured as occurrence of: Preterm delivery, Preeclampsia, Blood transfusions, PPH, Congestive cardiac failure, Maternal mortality.

Statistical analysis

Pearson's Chi-squared test was used to test the difference between two categorical variables and the level of significance was determined by calculating p-value for various maternal and perinatal outcomes in the anemic and non-anemic group. Student t-test was used to determine the mean and standard deviation values for the mean birth weight, APGAR scores at birth etc.

RESULTS

Table 1 shows that out of 767 patients, 193 (25.16%) were non-anemic and 574 (74.83%) were anemic out of which 343 (44.71%) were mildly anemic, 160 (20.86%) had moderate anemia and 70 (9.12%) had severe anemia.

Table 1: Distribution of patients according to hemoglobin levels.

Anemia (Hb g%)	No. of patients	%	p-value	Remarks
Severe (<7%)	70	9.12	<0.0001	S
Moderate (7- 8.9%)	160	20.86		
Mild (9-10.9%)	344	44.71		
Non-anemic (>11%)	193	25.16		

NS = Non-significant, S = Significant

Table 2 shows that among the anemic patients, there were 10 cases (1.74%) in the age group <20 years, 296 (51.57%) in 20-25 years, 211 (36.76 %) in 25-30 years, 42 (7.32%) in 30-35 years, and 15 (2.61%) in age group >35 years. Among the non-anemic, 6 cases (3.11%) were <20 years, 98 (50.78%) in 20-25 years age group, 66 (34.20%) in 25-30 years age group, 17 (8.81%) in age group 30-35 years and 6 (3.11%) above 35 years age.

Table 2: Distribution of patients according to age.

Age (years)	No. of patients			
	Anemic (n=574)		Non-anemic (n=193)	
	No.	%	No.	%
<20	10	1.74	6	3.11
20-25	296	51.57	98	50.78
25-30	211	36.76	66	34.20
30-35	42	7.32	17	8.81
>35	15	2.61	6	3.11
Mean age	25.84±4.02		25.91±4.19	
p-value	0.838			
Remarks	NS			

NS = Non-significant, S = Significant

Table 3: Group comparison of anemic patients according to gravidity.

Obstetrical History	No.	Multigravida		Primigravida		p-value	Remarks
		No.	%	No.	%		
Mild anemia	344	232	67.44	112	32.55	<0.0001	S
Moderate anemia	160	111	69.37	49	30.62	<0.0001	S
Severe anemia	70	55	78.57	15	21.42	<0.0001	S
Total Anemic	574	398	69.33	176	30.66	<0.0001	S

NS = Non-significant, S = Significant

The mean age in the anemic group was 25.84±4.02 while in the non-anemic group it was 25.91±4.19 which was statistically non-significant.

Table 3 shows the distribution of the anemic patients according to their parity. Among the patients with mild

anemia, 232 cases i.e. 67.44% were multigravida and 112 cases i.e. 32.55% were primigravida. In the moderately anemic group, 111 cases (69.37%) were multigravida and 49 cases i.e. 30.62% were primigravida. Among the cases with severe anemia, 55 cases i.e. 78.57% were multigravida and 15 cases i.e. 21.42% were primigravida.

Table 4: PBF examination among the anemic and non-anemic patients.

PBF	No. of patients (%)		p-value	Remarks
	Anemic (n=574)	Non-anemic (n=193)		
Normocytic normochromic	256(44.59)	146(75.65)	<0.0001	S
Microcytic Hypochromic	273 (47.56)	47 (24.35)	<0.0001	S
Macrocytic	42(7.32)	0 (0.00)	<0.01	S
Dimorphic	3 (0.52)	0 (0.00)	0.684	NS

NS = Non-significant, S = Significant

Table 4 shows the distribution of patients according to PBF. 256 anemic cases i.e. 44.59% showed Normocytic normochromic blood picture, 273 cases i.e. 47.56% showed Microcytic Hypochromic blood picture, 42 cases i.e. 7.32 % showed macrocytic blood picture and 3 cases i.e. 0.52% showed Dimorphic blood picture on PBF.

Among the non-anemic patients, 146 patients i.e. 75.65% showed Normocytic normochromic blood picture, 47 cases i.e. 24.35% showed Microcytic Hypochromic blood picture, 0 cases i.e. showed macrocytic blood picture and none had Dimorphic blood picture on PBF.

Table 5: Comparison of anemic and non-anemic group for red cell indices.

Variables	Mean±SD		p-value	Remarks
	Anemic (n=574)	Non-anemic (n=193)		
MCV (fL)	87.03±27.84	88.94±8.22	0.144	NS
MCH(pg)	27.42±6.18	28.53±3.15	0.018	S
MCHC (g/dl)	29.15±4.29	29.95±2.95	0.017	S

NS = Non-significant, S = Significant

Table 5 shows the comparison of red blood indices in the anemic and non anemic group. The mean value of MCV in the anemic group was 87.03±27.84; MCH 27.42±6.18; and MCHC was 29.15±4.29.

S.Fe mean value was 61.30±21.30. In the non-anemic group, MCV was 88.94±8.22; MCH was 28.53±3.15 and MCHC was 29.95±2.95.

S.Fe (mcg/dL) mean value in the anemic group was 61.30±21.30 and non-anemic group was 77.03±13.15. Mean TIBC (mcg/dL) levels in anemic group was 319.02±90.68 and non-anemic group was 233.54±43.01.

The incidence of preterm delivery in the anemic group was 14.46% and in the non-anemic group was 2.07%.

The percentage of patients with PPH was 9.06 in the anemic group and 2.07 in the non-anemic group.

Table 6: Comparison of anemic and non-anemic groups for iron studies.

	S. Fe (mcg/dL)	TIBC (mcg/dL)
Anemic (n=574)	61.30±21.30	319.02±90.68
Non-anemic (n=193)	77.03±13.15	233.54±43.01
p-value	<0.0001	<0.0001
Remarks	S	S

NS = Non-significant, S = Significant

Table 7: Adverse maternal outcome in anemic and non-anemic group.

Adverse maternal outcome	No. of patients (%)		p-value	Remarks
	Anemic (n=574)	Non-anemic (n=193)		
Preterm	83 (14.46)	4 (2.07)	<0.0001	S
PPH	52 (9.06)	4 (2.07)	0.044	S
Pre-eclampsia	54 (9.41)	2 (1.04)	0.011	S
Eclampsia	2 (0.35)	0 (0.00)	0.553	NS
CCF	10 (1.74)	0 (0.00)	0.191	NS
Mortality	3 (0.52)	0 (0.00)	0.682	NS
Blood transfusions	103 (17.94)	5 (2.59)	<0.0001	S

NS = Non-significant, S = Significant

The percentage of anemic patients with preeclampsia was 9.41 and in the non-anemic group was 1.04. 0.35% anemic patients suffered from eclampsia and none in the non-anemic group. 1.74% patients suffered from CCF in the anemic group as compared to none in the non-anemic group. There were 0.52% maternal mortalities in the anemic group and none in the non-anemic group. 17.94% of the patients in the anemic group received blood transfusions in the anemic group as compared to only 2.59% in the non-anemic group.

Table 8: Group comparison for adverse fetal outcome.

Adverse fetal outcome	No. of patients (%)		p-value	Remarks
	Anemic (n=573)	Non-anemic (n=192)		
IUFD	55 (9.60)	2 (1.04)	0.011	S
IUGR	48 (8.38)	3 (1.56)	0.032	S
NICU	97 (16.93)	3 (1.56)	<0.0001	S
MSL	73 (12.74)	2 (1.04)	<0.0001	S

NS = Non-significant, S = Significant

Among the adverse fetal outcomes, 9.60% of the anemic group had intrauterine deaths and only 1.04% among the non-anemic group. 8.38% fetuses of the anemic group

suffered from intrauterine growth restriction as compared to 1.56% in the non-anemic group. In the anemic group, 16.93% of the babies were admitted in NICU while only 1.56% in non-anemic group. 12.74% of the anemic patients had meconium stained liquor as compared to 1.04% in the non-anemic group.

Table 9: Group comparison for fetal weight (kg's).

Fetal weight (kg's)	No. of patients (%)		p-value	Remarks
	Case (n=574)	Control (n=193)		
Low birth weight (<2.5 kg)	181 (31.53)	13 (6.74)	<0.0001	S
Mean±SD	2.58±0.49	2.97±0.41	<0.0001	S

NS = Non-significant, S = Significant

Among the anemic group, 181 patients i.e. 31.53% had low birth weight infants and only 13 i.e. 6.74% in the non-anemic group. The mean birth weight in the anemic group was 2.58±0.49 and in the non-anemic group was 2.97±0.41.

Table 10: Group comparison for APGAR scores.

A/S	No. of patients (%)			
	A/S at 1 min		A/S at 5 min	
	Anemic (n=574)	Non-anemic (n=193)	Anemic (n=574)	Non-anemic (n=193)
<7	68 (11.85)	8 (4.15)	48 (8.38)	2 (1.04)
>7	505 (88.15)	184 (95.85)	525 (91.62)	190 (98.96)
Mean A/S	9.22±2.27	9.79±1.00	9.37±2.12	9.92±0.57
p-value	0.040		0.011	
Remarks	S		S	

NS = Non-significant, S = Significant

The percentage of anemic patients with APGAR score <7/10 at 1 minute was 11.85 and in the non-anemic group was 4.15. Mean APGAR score in the anemics at 1 min was 9.22±2.27 and in the non-anemic group was 9.92±0.57. APGAR scores at 5 min were <7/10 in 48 patients i.e. 8.38% in the anemic group and in 2 patients i.e. 1.04% in the non-anemic group.

DISCUSSION

Maternal anemia in pregnancy is commonly considered a risk factor for poor pregnancy outcome such as preterm delivery, low birth weight, intrauterine growth restriction.

In present study, the prevalence of anemia in the women attending SMGS hospital in third trimester of pregnancy was found to be 74.83%. This finding is in correlation with the Task Force Study of ICMR in which the prevalence of anemia in Indian pregnant women was found to be 88%.⁸ DLHS-2 on RCH also showed that the prevalence of anemia among pregnant women is high

(96.2%).⁹ Thus, prevalence of anemia in pregnant woman is very high.

While studying the age pattern of the pregnant women it was observed that the majority of women in both the groups belonged to 20–25 years age group which is the common reproductive age group; 51.57% in the anemic group and 50.78% in the non-anemic group. Mean age group of the anemic group was 25.84 ± 4.02 and the non-anemic group 25.91 ± 4.19 ; difference was statistically not significant. So, in present study age was not a risk factor for anemia. Verhoeff FH et al and Owais MA et al had similarly concluded in their study that age was no longer associated with increased risk of anemia when adjusted with gravidity.^{10,11}

As seen in Table 3, in the anemic group, proportion of multigravida was more i.e. 69.33% as compared to primigravida which was 30.66%. This is because with increasing number of pregnancies the mothers become depleted of their iron stores. Many of them never have full regained a good blood picture, and anemia may persist, and worsens with subsequent pregnancies. This was consistent with the studies of Mann LI et al and Viengsakhone L et al, which showed that parity is a significant risk factor for low birth weight infant.^{12,13}

Mean maternal hemoglobin of women in anemic group was 9.20 ± 1.81 gm/dl and in the non-anemic group was 11.69 ± 0.68 gm/dl. On examination of peripheral blood film as shown in Table 4, maximum women in the anemic group had microcytic hypochromic blood picture (47.56%). The other types of blood pictures seen were macrocytic (7.32%) and dimorphic (0.52%). In the non-anemic group, 75.65% of the women were normocytic normochromic. The difference was statistically significant.

Among the red blood indices, the mean value of MCV, MCH and MCHC in the anemic group were lower than in the non-anemic group and the difference was statistically significant. Mean maternal serum iron levels were lower in the anemic group than in the non-anemic group; the difference being statistically significant. Also, the mean total iron binding capacity in the anemic group was higher than in the non-anemic group which was also statistically significant. Thus, the predominant blood picture among the anemic patients was microcytic hypochromic with decreased red cell indices; decreased serum iron levels and increased TIBC suggesting iron deficiency anemia.

Rangnekar AG et al, revealed that microcytic hypochromic anemia was more prevalent suggesting nutritional inadequacy as a cause of anemia.¹⁴ Milman N et al, had also concluded in his study that iron deficiency anemia is the most common type of anemia in pregnant women.¹⁵ The patients in the anemic and non-anemic group were compared for the maternal and the fetal outcomes.

Table 7 shows the comparison of the percentage of adverse maternal outcomes in anemic and non-anemic groups. The percentage of preterm labor in the anemic group was 14.46% and 2.07% in the non-anemic group which was statistically significant. The percentage of incidence of postpartum hemorrhage was 9.06% among the anemics as compared to 2.07% among non-anemic, which also was statistically significant. The percentage of anemic patients with pre-eclampsia was also significantly increased i.e. 9.41% v/s 1.04% among non-anemics. The difference in the incidence of eclampsia, however, was not statistically significant (0.35% v/s 0.0%). 1.74% of the anemics patients suffered from congestive cardiac failure as compared to none in the non-anemic group the difference being statistically non-significant.

All women in anemic group with severe anemia received blood transfusion. In the non-anemic group only five women received blood transfusion to recover the blood loss in traumatic PPH whereas percentage of blood transfusion in anemic group was 17.94 which was statistically significant.

Naushaba R et al, concluded that in the anemic group, preterm delivery was in 56.25% and PPH in 4.1%.¹⁶ Maternal death occurred in 0.9%. All these were significantly higher in women of anemic group as compared to the normal hemoglobin group.

Also, the results of present study were comparable with the study performed by Ghimire et al, in which it was concluded that there was an increased risk of pregnancy induced hypertension, preterm labor, and postpartum hemorrhage among the anemic group.¹⁷ However there was no difference in maternal mortality among study groups.

In their study, Jain P et al, also found a significant correlation between anemia and development of preeclampsia, eclampsia, and preterm labor (P value < 0.05).¹⁸ The percentage of patients with intrauterine fetal death among the anemics was 9.60 and among the non-anemics it was 1.04% and this difference was statistically significant.

Sangeeta VB et al, observed that anemic patients had increased number of IUFDs.⁵ After statistical analysis of the impact of maternal anemia on IUGR, it was found that the risk of IUGR increased significantly with the severity of anemia i.e. 8.38% in the anemic group v/s 1.56% in the non-anemic group.

Bakhtiar UJ et al, observed 1.7 times greater risk of IUGR in anemic group as compared to non-anemic group.¹⁹ The percentage of baby of patients with NICU admissions among the anemics was 16.93% v/s 1.56% in the non-anemic group and this was also statistically significant.

Sangeeta VB et al, observed significantly higher rate of NICU admissions in anemic group as compared to non-anemic group.⁵ While comparing the presence of meconium stained liquor among the anemics and non-anemics, it was found that 12.74 % in the former had MSL as compared to 1.04% in the latter and this difference was statistically significant.

Anjanappa B et al, had similarly reported the presence of Meconium stained liquor to be more in anemic mothers ($p < 0.0227$) with RR 2.34.²⁰ After statistical analysis of the impact of maternal anemia on birth weight it was found that risk of low birth weight increased significantly i.e. 31.53% in the anemic group v/s 6.74% in the non-anemic group. The mean birth weight was 2.58 ± 0.49 kg in anemic group which was lower than 2.97 ± 0.41 in the non-anemic group; difference was statistically significant ($P < 0.0001$).

Kidanto HL et al, also observed increased risk of low birth weight with severity of anemia with OR of 1.2, 1.7 and 3.8 with mild, moderate and severe anemia respectively compared with women with normal Hb levels.²¹ Owais MO et al, observed significantly higher number of low birth weight in anemic group as compared to non-anemic group.¹¹

After statistical analysis of the impact of maternal anemia on APGAR score at 1 and 5 minutes, it was found that the risk of APGAR score < 7 was increased significantly in the anemic group as compared to the non-anemic group i.e. 11.85% v/s 4.15%. The mean APGAR score in the anemic group was 9.22 ± 2.27 at 1 minute and 9.79 ± 1.00 at 5 minutes with a p-value of 0.040, while the mean APGAR scores in the non-anemic group was 9.37 ± 2.12 at 1 minute and 9.92 ± 0.57 at 5 minutes with a p-value of 0.011; the difference being statistically significant.

Sangeeta VB et al, concluded that the newborns of anemic mothers had 1.6 times increased risk of having an APGAR score of < 5 at 1 min.⁵ Thus, this has been highlighted that maternal anemia is one of the most common and avoidable risk factors for adverse maternal and perinatal outcome.

Anemia is directly related to low birth weight, low APGAR scores at birth, preterm delivery, IUGR, NICU admissions as well as IUFD. In the mother, it is a significant risk factor for preterm delivery, pre-eclampsia, and post-partum hemorrhage. The most common type of anemia is nutritional, of which iron deficiency is the most prevalent type. A simple and effective strategy of supplementing the mother with iron and proper antenatal care could avert so many adverse consequences to the mother and the fetus.

So, it needs to be emphasized that correction of iron deficiency still remains one of the most important step towards better obstetrical care in developing country like ours. These measures are affordable and easily available

in our country and by effective implementation of these we can save many lives of both mother and child.

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