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Original Research Article

Study of maternal and foetal outcome in labouring women with severe and moderate anaemia

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ABSTRACT

Background: Anaemia, a significant public health concern in India. This study has evaluated the differences in maternal and foetal effects of moderate and severe maternal anaemia in Indian context.
Methods: This prospective observational study was conducted among adult, term pregnant women with moderate and severe anaemia at the department of Obstetrics and Gynecology in a tertiary medical college between August and June 2024. A convenient sampling was used to recruit the patients after written informed consent. Detailed history, and clinical findings recorded, and descriptive statistical analyses were performed.
Results: We recruited a total number of 245 pregnant women. The mean age was 25.3 years (SD 3.9 years). The prevalence of moderate anaemia was 63.3% (n=155) and severe anaemia was 36.7% (n=90). Severe anaemia had higher rates of packed cell and whole blood transfusions, and ICU admissions compared to moderate anaemia. Iron sucrose requirement was higher in the moderate anaemia group. Newborn had more frequent incidence of low-birth weight babies, and foetal distress in the severe anaemia group compared to the moderate anaemia group. No significant differences were found in foetal maturity, APGAR scores, meconium-stained liquor, or neonatal deaths between the moderate and severe anaemia groups.
Conclusions: This study highlights the high prevalence of anaemia among pregnant women, with both moderate and severe cases posing significant risks. Effective management strategies like early screening and diagnosis, nutritional interventions, iron supplementation, medical management, education and awareness, and further research are required to reduce the prevalence and combat the condition.

Keywords: Anemia, India, Iron supplementation, Pregnancy complications, Pregnancy outcome

INTRODUCTION

Anaemia, characterized by low haemoglobin levels and reduced oxygen-carrying capacity of the blood, is a significant global public health concern.[1] Women of childbearing age are particularly vulnerable, with the World Health Organization (WHO) estimating that one-third of them suffer from anaemia.[2] Anaemia can be classified based on its cause, including nutritional anaemia-caused by deficiencies in iron, vitamin A, vitamin B12, folate, and riboflavin and hereditary forms such as sickle cell anaemia and thalassemia.[3]

Anaemia is a common complication during pregnancy, affecting 40% of pregnant women globally, with a 27.3% prevalence in Saudi Arabia as of 2019.[2,4] The WHO defines anaemia in pregnant women as haemoglobin levels below 11 g/dl.[5]

Due to its high prevalence, anaemia in pregnancy has been widely studied to assess its impact on maternal and fetal

health. Severe anaemia, especially with haemoglobin levels below 6 g/dl, is associated with significant adverse outcomes for both mother and baby.[1] For instance, Kavle et al.'s study in Tanzania found a strong correlation between moderate-to-severe anaemia at 28 weeks gestation and increased blood loss during childbirth and the immediate postpartum period.[6] Similarly, Kumar et al. reported that maternal anaemia in India leads to poorer fetal outcomes compared to non-anaemic mothers, including a 6.5% rise in low birth weight (LBW) infants and an 11.5% increase in preterm deliveries when the mother is anaemic in her third trimester.[7] Furthermore, Stephan et al. identified several risk factors for maternal anaemia, including deficiencies in iron, folate, vitamins A and B12, and infections like malaria, hookworm, tuberculosis, and HIV.[8]

However, some studies have found no significant association between maternal anaemia and adverse pregnancy outcomes.[9-11] Malhotra et al even suggested that mild anaemia may offer some protection against low birth weight.[12] Despite extensive research, there remains a lack of consensus on the true impact of maternal anaemia on pregnancy outcomes.

METHODS

Study design and setting

This was prospective observational study. The study was conducted at the Department of Obstetrics and Gynecology, Shri B. M. Patil Medical College Hospital and Research Centre, Vijayapura, Karnataka, India.

Study period

The study was conducted between August 2022 and June 2024. This duration includes planning, ethics committee clearance, data collection, data analysis, and writing the thesis.

Study population

The study recruited pregnant women aged 18 years and above, presenting with either moderate (hemoglobin: 7.0 - 8.9 gm/dL) or severe (hemoglobin: <7.0 gm/dL) anemia during their delivery.

Sampling technique

Convenience sampling will be employed to select pregnant women visiting the obstetric unit who meet the inclusion criteria and have been cleared of exclusion criteria. Adult (>18 years) pregnant women with moderate or severe anaemia presented in term gestation for vaginal delivery, were recruited in the study. Pregnant women with history of medical illnesses such as known diabetes mellitus, heart disease, renal disease, TORCH infections, and malaria during pregnancy were excluded. We also excluded babies born with major congenital anomalies or syndromes, hemorrhagic and bleeding tendencies, and thalassemia.

Sample size determination

Using G*Power ver 3.1.9.4 software, a total sample size of 238 (per group 119) was calculated to achieve a power of 80% for detecting a difference in proportion (Exact - Proportions: Inequality, two independent groups) with a 5% level of significance.

Study variables

Anaemia: Anemia will be categorized as moderate (Hemoglobin: 7.0 - 8.9 gm/dl) or severe (Hemoglobin: < 7.0 gm/dl) based on hemoglobin levels. Anemia severity will be assessed at the first trimester.

Maternal and fetal outcomes: Maternal and fetal outcomes including maternal morbidity, birth weight, gestational age at delivery, and perinatal mortality will be evaluated.

Data collection: Written and informed consent was obtained from all participants. Detailed history and clinical findings were recorded in the prescribed proforma by trained personnel in the ward. All laboratory information related to the participants were

Statistical analysis

Data was entered into a Microsoft Excel sheet and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20. Descriptive statistics was used to summarize the data. Continuous variables were compared using independent sample t-tests or Mann-Whitney U tests, while categorical variables will be analyzed using Chi-square tests or Fisher's exact tests. A p-value of less than 0.05 will be considered statistically significant.

Ethical considerations

Ethical approval was obtained prospectively from the Institutional Ethics Committee (IEC) of Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapura, Karnataka, India. Besides, informed consent was obtained from all the participants.

RESULTS

A total of 245 pregnant women were recruited in the study. The mean age of the participants was 25.3 years (SD 3.9 years). While 155 (63.3%) of them had moderate anaemia, 90 (36.7%) had severe anaemia.

Antenatal characteristics

In the moderate anaemia group, 109 (70.3%) women were multi and 46 (29.7%) were primi. In the severe anaemia group, 60 (66.7%) women were multi and 30 (33.3%) were

primi. Birth spacing was available for 169 participants. Majority of them had a birth spacing of one year (n=78, 48.6%), followed by two years (n=66, 41%). Sixty-eight (27.7%) participants had at least one associated factor in pregnancy. In the moderate anaemia group, the common associated factors were- previous LSCS (n=12, 41.4%), breech (n=8, 20.5%), and Rh negative (n=6, 13.6%) and HbSAg positive (n=3, 10.3%). In the severe anaemia group, the common associated factors were- previous LSCS (n=15, 38.5%), breech (n=4, 13.8%), and Rh negative (n=9, 15.4%) and HbSAg positive (n=3, 10.3%) (Table 1).

Table 1: Intranatal characteristics of the participants.

Variables	Category	Frequency (%)	
		Moderate	Severe
Gravida	Primi	46 (29.7)	30 (33.3)
	Multi	109 (70.3)	60 (66.7)
Birth spacing	One year	21 (19.3)	24 (40.0)
	Two years	66 (60.6)	29 (48.3)
	Three years	20 (18.3)	7 (11.7)
	Seven years	2 (1.8)	0 (0)
Associated factors	Present	29 (18.7)	39 (43.3)
	Absent	126 (81.3)	61 (56.7)
Type of delivery	Normal	97 (62.3)	60 (66.7)
	CS	58 (37.4)	28 (31.1)
	Vacuum delivery	0 (0)	2 (2.2)

Intranatal characteristics

The proportion of different types of deliveries were compared in moderate and severe anaemia groups. Normal delivery was common in both the groups. In the moderate anaemia group, 97 (62.3%) underwent normal delivery. In the severe anaemia group, 60 (66.7%) underwent normal delivery. C-Section was more (n=58, 37.4%) in the moderate anaemia group compared to the severe anaemia group (n=28, 31.1%). Two (2.2%) vacuum delivery took place in the severe anaemia group. The proportion of Iron sucrose requirement were compared in moderate and severe anaemia group. A total number of 137 participants (55.9%) required iron sucrose out of 245 participants. The requirement was more in the moderate anaemia group (n=107, 69.0%) than the severe anaemia group (n=30, 33.3%). The mean number of iron sucrose vial required was high among the severe group (2.9, SD 0.5) compared to the moderate group (2.5, SD 0.5). A total number of 130 participants (53.1%) required blood transfusion out of 245 participants. The requirement was more in the severe anaemia group (n=81, 90%) than the moderate anaemia group (n=49, 31.6%). Packed cell was transfused to 49 (31.6%) participants in the moderate anaemia group, 81 (90%) participants received packed cell in the severe anaemia group. (Table 8, figure 19). However, the mean number of packed cell units required was similar in the moderate anaemia groups (mean 2.0, SD 0.7) and the severe anaemia group (mean 2.1, SD 0.9). Whole blood was transfused to 5 (3.2%) participants in the moderate anaemia group but 40 (44.4%) participants in the severe anaemia group. While 29 (18.7%) participants had meconium-stained liquor in the moderate anaemia group, 17 (18.9%) participants in the severe anaemia group had Meconium-stained liquor. 31 (20%) newborns had foetal distress in the moderate anaemia group, 23 (25.6%) newborns in the severe anaemia group had foetal distress. 3 (1.9%) participants in the moderate anaemia group required ICU admission, 30 (33.3%) participants in the severe anaemia group required ICU admission (Table 2).

Table 2: Intranatal characteristics of the participants.

Variables	Category	Frequency (%)	
		Moderate anaemia	Severe anaemia
Type of delivery	Normal	97 (62.3)	60 (66.7)
	CS	58 (37.4)	28 (31.1)
	Vacuum delivery	0 (0)	2 (2.2)
Iron sucrose requirement	Yes	107 (69)	30 (33.3)
	No	48 (31)	60 (66.7)
Blood transfusion requirement	Yes	49 (31.6)	81 (90)
	No	106 (68.4)	9 (10)
Packed cell transfusion	Yes	49 (31.6)	81 (90)
	No	106 (68.4)	9 (10)
Whole blood transfusion	Yes	5 (3.2)	40 (44.4)
	No	150 (96.8)	50 (55.6)
Meconium-stained liquor	Present	29 (18.7)	17 (18.9)
	Absent	126 (81.3)	73 (81.1)
Foetal distress	Present	31 (20)	23 (25.6)
	Absent	124 (80)	67 (74.4)
ICU requirement of mothers	Yes	3 (1.7)	30 (33.3)
	No	152 (98.3)	60 (66.7)

Post-natal outcomes

A total 11 (7.1%) participants delivered a still born/IUD baby in the moderate anaemia group, 6 (6.7%) participants in the severe anaemia group delivered a still born/IUD baby. Thirty-eight (24.5%) participants delivered a pre-term baby in the moderate anaemia group, 26 (29.2%) participants in the severe anaemia group delivered a pre-term baby. 61 (39.4%) participants delivered a pre-term baby in the moderate anaemia group, 41 (45.6%) participants in the severe anaemia group delivered a pre-term baby. While 5 (4.2%) newborns had an APGAR score <7 at 1 minute after delivery, in the moderate anaemia group, 4 (3.4%) newborn in the severe anaemia group had an APGAR score <7. 10 (6.9%%) newborns had an APGAR score <7 at 5 minute after delivery in the moderate anaemia group, 2 (2.4%) newborn in the severe anaemia group had an APGAR score <7. A higher proportion of the newborns (n=23, 14.8%) in the severe anaemia group required ICU admission compared to the moderate anaemia group (n=10, 11.1%). A total number of

22 (9.0%) neonatal death was observed after excluding the IUD and still birth. Out of these, 13 (8.4%) were in the moderate anaemia group and 9 (10%) were in the severe anaemia group (Table 3).

Table 3: Post-natal characteristics of the participants.

Variables	Category	Frequency (%)	
		Moderate anaemia	Severe anaemia
Fetal condition at birth	Still born/IUD	11 (7.1)	6 (6.7)
	Alive	144 (92.9)	84 (93.3)
Fetal maturity	Yes	38 (24.5)	26 (29.2)
	No	117 (75.5)	64 (70.8)
Birth weight	Low (<2.5 kg)	61 (39.4)	41 (45.6)
	Normal (>=2.5kg)	84 (60.6)	49 (54.4)
Apgar (1 minute)	Apgar <7	13 (9.0)	4 (4.8)
	Apgar >=7	131 (91.0)	80 (95.2)
Apgar (5 minutes)	Apgar <7	10 (6.9)	2 (2.4)
	Apgar >=7	134 (93.1)	82 (97.6)
ICU admission for newborns	Present	23 (14.8)	10 (11.1)
	Absent	132 (85.2)	80 (88.9)
Neonatal death	Present	13 (8.4)	9 (10.0)
	Absent	142 (91.6)	81 (90.0)

DISCUSSION

Our hospital-based observational study examined the feto-maternal outcomes in laboring women with moderate and severe anemia. We found significant differences in maternal and fetal morbidity and mortality between the two groups.

Compared to moderate anemia, severe anemia was associated with a higher incidence of assisted deliveries, blood transfusions, and ICU admissions. These findings align with previous studies, which have reported similar trends.[13-15]

Our study also found that severe anemia was linked to a higher requirement for iron sucrose and whole blood transfusions. This is consistent with previous research, which has highlighted the need for more aggressive treatment in severe anemia cases.[16,17]

Regarding fetal outcomes, our study did not find significant differences in stillbirth rates, fetal maturity, birth weight, APGAR scores, meconium-stained liquor, and neonatal deaths between the two groups. However, recent literature suggests that severe anemia may be associated with a higher risk of adverse fetal outcomes.[18-20]

This study has some limitations. The lack of significant differences in some fetal outcomes may be attributed to the relatively small sample sizes, low event rates, and variations in study design and population characteristics. Further research with larger sample sizes and diverse populations is needed to fully understand the relationship between anemia severity and fetal outcomes.

Despite these few limitations, our study highlights the importance of early detection and management of anemia during pregnancy to reduce the risk of complications during labor and improve maternal and fetal outcomes.

CONCLUSION

In conclusion, this study investigated the impact of maternal anaemia on pregnancy outcomes in a cohort of Indian women. The findings suggest that severe anaemia is associated with adverse outcomes, including increased need for blood transfusions, ICU admissions, and neonatal complications. However, the study did not find significant differences in maternal morbidity, birth weight, or gestational age at delivery between moderate and severe anaemia groups. These results contribute to the ongoing debate about the effects of maternal anaemia on pregnancy outcomes, highlighting the need for further research to inform evidence-based guidelines for anaemia management in pregnancy. Ultimately, addressing anaemia in pregnancy is crucial to improve maternal and fetal health, particularly in resource-limited settings.

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Ethical approval: The study was approved by the Institutional Ethics Committee of Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapura, Karnataka, India

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