Section: Miscellaneous

Original Research Article

IMPACT OF MATERNAL ANAEMIA ON EARLY NEONATAL OUTCOMES: A HOSPITAL-BASED OBSERVATIONAL STUDY

Srushti Suhas Jadhav[1], Mundhe Ram Govindrao[2], Palash Sangai[3], Shweta Rajendra Chougule[4]

[1]*Assistant Professor, Department of Pediatrics, PCMC's PGI and YCMH, Pimpri, Pune-411018, India.*
[2]*Assistant Professor, Department of General Medicine, PCMC PGI and YCM Hospital Pimpri, Pune 411018, India.*
[3]*Senior Resident, Department of Pediatrics, PCMC's PGI and YCMH-411018, India.*
[4]*Academic Coordinator, Dr. D. Y. Patil School of Allied Health Sciences, Pimpri, Pune, Dr. D. Y. Patil Vidyapeeth (Deemed to be University), India.*

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Corresponding Author:
Dr. Srushti Suhas Jadhav,
Assistant Professor, Department of Pediatrics, PCMC's PGI and YCMH, Pimpri, Pune-411018, India.
Email: srushti23695@gmail.com

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ABSTRACT

Background: Maternal anaemia is one of the most common nutritional disorders affecting pregnant women worldwide and remains a major public health concern, particularly in developing countries. It has been associated with several adverse maternal and neonatal outcomes such as low birth weight, preterm delivery, birth asphyxia, and increased neonatal morbidity. Understanding the relationship between maternal haemoglobin levels and neonatal outcomes is essential for improving maternal and neonatal health. **Aim:** To evaluate the impact of maternal anaemia on early neonatal outcomes among deliveries in a tertiary care hospital. **Objectives:** To determine the prevalence and severity of maternal anaemia among pregnant women delivering at the study hospital. To assess early neonatal outcomes such as birth weight, gestational age, Apgar score, and NICU admission in babies born to anaemic mothers. To analyse the association between severity of maternal anaemia and adverse neonatal outcomes.

Materials and Methods: This hospital-based observational study was conducted among 600 pregnant women delivering at a tertiary care hospital. Maternal haemoglobin levels were recorded and mothers were classified as anaemic or non-anaemic according to WHO criteria. Neonatal outcomes including birth weight, gestational age, Apgar score, meconium-stained liquor, and NICU admission were recorded. Data were analysed using descriptive statistics and appropriate statistical tests such as Chi-square test and Student's t-test to determine associations between maternal anaemia and neonatal outcomes.

Results: Maternal anaemia was present in 63.8% of the study population. Neonates born to anaemic mothers had significantly higher incidence of low birth weight (26.9% vs 11.1%), preterm birth (20.6% vs 8.8%), low Apgar score (11.0% vs 4.1%), and NICU admission (17.8% vs 6.5%) compared with neonates born to non-anaemic mothers ($p < 0.05$). The study also demonstrated that increasing severity of maternal anaemia was significantly associated with a higher risk of adverse neonatal outcomes including low birth weight, prematurity, and NICU admission.

Conclusion: Maternal anaemia is highly prevalent and significantly associated with adverse early neonatal outcomes. Early detection, prevention, and effective management of anaemia during pregnancy are essential to improve neonatal health and reduce perinatal morbidity and mortality.

Keywords: Maternal anaemia, Neonatal outcomes, Low birth weight.

INTRODUCTION

Maternal anaemia is one of the most common nutritional and public health problems affecting pregnant women worldwide. It is characterized by a reduced haemoglobin concentration or decreased oxygen-carrying capacity of blood, which leads to inadequate oxygen supply to tissues and organs. During pregnancy, physiological changes such as plasma volume expansion and increased iron requirements make women more susceptible to anaemia. According to the World Health Organization (WHO), anaemia in pregnancy is defined as haemoglobin levels below 11 g/dL, and it remains a major contributor to maternal and perinatal morbidity and mortality globally. The burden is particularly high in developing countries where nutritional deficiencies, infections, and poor socioeconomic conditions contribute to its high prevalence.[1]

Globally, it is estimated that nearly 40–50% of pregnant women suffer from anaemia, with a higher prevalence reported in South-East Asia and Africa. In India, the prevalence of maternal anaemia remains alarmingly high, with national surveys indicating that more than half of pregnant women are anaemic. The most common cause of anaemia during pregnancy is iron deficiency, though deficiencies of folic acid, vitamin B12, chronic infections, and haemoglobinopathies also contribute to its development. The increased iron requirement during pregnancy is necessary to support maternal erythropoiesis, foetal growth, placental development, and expansion of maternal blood volume. Failure to meet this requirement often results in iron deficiency anaemia.[2]

Maternal anaemia has been associated with several adverse maternal and neonatal outcomes. From the maternal perspective, severe anaemia increases the risk of fatigue, cardiac failure, infections, postpartum haemorrhage, and maternal mortality. However, the impact of maternal anaemia extends beyond maternal health and significantly affects foetal and neonatal outcomes. Reduced haemoglobin levels in the mother lead to impaired oxygen transport across the placenta, resulting in chronic foetal hypoxia and impaired intrauterine growth. This condition predisposes the foetus to complications such as low birth weight, prematurity, intrauterine growth restriction, and birth asphyxia.[3]

Low birth weight (defined as birth weight less than 2500 g) is one of the most commonly reported neonatal complications associated with maternal anaemia. Infants with low birth weight have a higher risk of neonatal morbidity, infections, developmental delay, and infant mortality. Similarly, preterm birth (delivery before 37 completed weeks of gestation) is another important outcome associated with maternal anaemia. Iron deficiency and chronic hypoxia may activate inflammatory pathways and hormonal mechanisms that trigger premature labour. Furthermore, maternal anaemia has also been linked to increased incidence of birth asphyxia, which is defined as the failure to initiate and sustain breathing at birth and is a major cause of neonatal mortality worldwide.[4]

Aim

To evaluate the impact of maternal anaemia on early neonatal outcomes among deliveries in a tertiary care hospital.

Objectives

1. To determine the prevalence and severity of maternal anaemia among pregnant women delivering at the study hospital.
2. To assess early neonatal outcomes such as birth weight, gestational age, Apgar score, and NICU admission in babies born to anaemic mothers.
3. To analyse the association between severity of maternal anaemia and adverse neonatal outcomes.

MATERIALS AND METHODS

Source of Data

The data for the present study were obtained from pregnant women admitted for delivery and their neonates in the Department of Obstetrics and Gynecology and Neonatology of a tertiary care hospital. Maternal demographic details, haemoglobin levels, obstetric history, and neonatal outcome parameters were collected from hospital records and clinical examination.

Study Design

The present study was conducted as a hospital-based observational study designed to evaluate the association between maternal anaemia and early neonatal outcomes.

Study Location

The study was carried out at a tertiary care teaching hospital with well-established obstetric and neonatal intensive care facilities.

Study Duration

The study was conducted over a period of 18 months.

Sample Size

A total of 600 mother–neonate pairs were included in the study. The sample size was considered adequate to evaluate the relationship between maternal anaemia and neonatal outcomes with sufficient statistical power.

Inclusion Criteria

1. Pregnant women admitted for delivery during the study period.
2. Singleton pregnancies.
3. Mothers with documented haemoglobin estimation during pregnancy.
4. Live born neonates delivered at the study hospital.

Exclusion Criteria

1. Mothers with known chronic systemic illnesses such as diabetes mellitus, hypertension, renal disease, or cardiac disorders.
2. Multiple pregnancies (twins or higher order gestation).

3. Congenital anomalies detected in neonates.
4. Mothers who refused to participate in the study.

Procedure and Methodology

All eligible pregnant women admitted for delivery were screened for haemoglobin levels using routine antenatal laboratory investigations. Based on WHO criteria, maternal anaemia was classified into mild, moderate, and severe categories. Relevant maternal demographic details including age, parity, gestational age, socioeconomic status, and antenatal history were recorded.

After delivery, neonatal parameters such as birth weight, gestational age at birth, Apgar score at 1 and 5 minutes, presence of birth asphyxia, meconium-stained liquor, and requirement of neonatal intensive care unit (NICU) admission were documented. Neonates were followed during the early neonatal period to identify complications such as respiratory distress, prematurity-related complications, or sepsis. The collected data were entered into a structured case record form and later transferred to a computerized database for analysis.

Sample Processing

Maternal haemoglobin levels were measured using automated haematology analysers as part of routine antenatal investigations. Birth weight of neonates was measured within the first hour of life using calibrated digital weighing scales. Gestational age was determined based on last menstrual period and confirmed by early obstetric ultrasonography whenever available.

Statistical Methods

The collected data were entered into Microsoft Excel and analysed using statistical software such as SPSS version 25.0. Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to summarize the data. The association between maternal anaemia and neonatal outcomes was assessed using Chi-square test or Fisher's exact test for categorical variables and independent t-test or ANOVA for continuous variables. A p-value of less than 0.05 was considered statistically significant.

Data Collection

Data were collected prospectively using a pre-designed structured proforma. Maternal clinical details, laboratory findings, and neonatal outcomes were recorded at the time of delivery and during the early neonatal period. Confidentiality of participants was maintained throughout the study, and ethical approval was obtained from the Institutional Ethics Committee prior to commencement of the study.

RESULTS

Table 1: Impact of Maternal Anaemia on Early Neonatal Outcomes among Deliveries in a Tertiary Care Hospital (N = 600)

Early neonatal outcome	Anaemic mothers (n = 383) n (%) / Mean ± SD	Non-anaemic mothers (n = 217) n (%) / Mean ± SD	Test of significance	95% CI	p-value
Low birth weight (<2500 g)	103 (26.9)	24 (11.1)	$\chi^2 = 20.44$	OR 2.95 (1.82 to 4.76)	<0.001
Preterm birth (<37 weeks)	79 (20.6)	19 (8.8)	$\chi^2 = 14.10$	OR 2.71 (1.58 to 4.63)	<0.001
Apgar score <7 at 5 min	42 (11.0)	9 (4.1)	$\chi^2 = 8.25$	OR 2.84 (1.36 to 5.94)	0.004
NICU admission	68 (17.8)	14 (6.5)	$\chi^2 = 14.69$	OR 3.12 (1.71 to 5.70)	<0.001
Meconium-stained liquor	86 (22.5)	24 (11.1)	$\chi^2 = 12.96$	OR 2.33 (1.43 to 3.80)	<0.001
Birth weight (kg)	2.53 ± 0.47	2.96 ± 0.39	t = 11.94	Mean difference −0.43 (−0.50 to −0.36)	<0.001
Gestational age (weeks)	37.18 ± 1.94	38.46 ± 1.28	t = 9.62	Mean difference −1.28 (−1.54 to −1.02)	<0.001
Apgar score at 1 min	6.91 ± 1.19	7.61 ± 0.82	t = 8.41	Mean difference −0.70 (−0.86 to −0.54)	<0.001
Apgar score at 5 min	8.16 ± 0.92	8.73 ± 0.51	t = 9.44	Mean difference −0.57 (−0.69 to −0.45)	<0.001

Table 1 shows the comparison of early neonatal outcomes between babies born to anaemic mothers (n = 383) and non-anaemic mothers (n = 217). The findings demonstrate that adverse neonatal outcomes were significantly more common among anaemic mothers. Low birth weight (<2500 g) was observed in 103 (26.9%) neonates born to anaemic mothers compared to 24 (11.1%) among non-anaemic mothers, and this difference was statistically significant ($\chi^2 = 20.44$, OR = 2.95, 95% CI: 1.82–4.76, $p < 0.001$). Similarly, preterm birth occurred in 79 (20.6%) babies of anaemic mothers compared with 19 (8.8%) babies of non-anaemic mothers, showing a significant association ($\chi^2 = 14.10$, OR = 2.71, 95% CI: 1.58–4.63, $p < 0.001$).

Low Apgar score (<7 at 5 minutes) was also more frequent in neonates of anaemic mothers (42; 11.0%) compared to non-anaemic mothers (9; 4.1%), which was statistically significant ($\chi^2 = 8.25$, OR = 2.84, 95% CI: 1.36–5.94, $p = 0.004$). NICU admission was required for 68 (17.8%) neonates born to anaemic mothers compared with 14 (6.5%) neonates of non-anaemic mothers ($\chi^2 = 14.69$, OR = 3.12, 95% CI: 1.71–5.70, $p < 0.001$). Meconium-stained liquor was also more commonly observed in anaemic mothers (86; 22.5%) than in non-anaemic mothers (24;

11.1%) and was statistically significant (χ^2 = 12.96, OR = 2.33, 95% CI: 1.43–3.80, p < 0.001).

When continuous variables were analysed, babies born to anaemic mothers had significantly lower mean birth weight (2.53 ± 0.47 kg) compared to babies of non-anaemic mothers (2.96 ± 0.39 kg), with a mean difference of −0.43 kg (t = 11.94, p < 0.001). Gestational age was also lower in anaemic mothers (37.18 ± 1.94 weeks) compared to non-anaemic mothers (38.46 ± 1.28 weeks), with a mean difference of −1.28 weeks (t = 9.62, p < 0.001). In addition, Apgar scores at both 1 minute and 5 minutes were significantly lower among babies born to anaemic mothers (p < 0.001).

Table 2: Prevalence and Severity of Maternal Anaemia among Pregnant Women Delivering at the Study Hospital (N = 600)

Parameter	Category / Mean ± SD	n (%) / Mean ± SD	Test of significance	95% CI	p-value
Maternal anaemia status	Present	383 (63.8)	χ^2 = 18.99	60.0 to 67.7	<0.001
	Absent	217 (36.2)		32.3 to 40.0	
Severity of anaemia	Mild	179 (29.8)	χ^2 = 74.63	26.2 to 33.5	<0.001
	Moderate	147 (24.5)		21.1 to 27.9	
	Severe	57 (9.5)		7.2 to 11.8	
Maternal haemoglobin (g/dL)	Overall	10.38 ± 1.67	t = 5.58	10.25 to 10.51	<0.001
	Among anaemic mothers	9.24 ± 1.08	t = 167.28	9.13 to 9.35	<0.001
	Among non-anaemic mothers	12.38 ± 0.74	t = 246.21	12.28 to 12.48	<0.001

Classification used: Mild = Hb 10.0–10.9 g/dL; Moderate = 7.0–9.9 g/dL; Severe = <7.0 g/dL.

Table 2 illustrates the prevalence and severity of maternal anaemia among the study participants. Out of the total 600 pregnant women included in the study, 383 (63.8%) were found to be anaemic, while 217 (36.2%) had normal haemoglobin levels. The prevalence of maternal anaemia in the study population was statistically significant (χ^2 = 18.99, 95% CI: 60.0–67.7, p < 0.001).

Among the anaemic women, mild anaemia was the most common category, affecting 179 (29.8%) women. Moderate anaemia was observed in 147 (24.5%) women, while severe anaemia was present in 57 (9.5%) women. The distribution of severity of anaemia was statistically significant (χ^2 = 74.63, p < 0.001), indicating that a considerable proportion of pregnant women in the study population were affected by different degrees of anaemia.

The overall mean maternal haemoglobin level in the study population was 10.38 ± 1.67 g/dL (95% CI: 10.25–10.51, p < 0.001). Among anaemic mothers, the mean haemoglobin level was 9.24 ± 1.08 g/dL, whereas among non-anaemic mothers it was 12.38 ± 0.74 g/dL, and this difference was statistically significant.

Table 3: Early Neonatal Outcomes in Babies Born to Anaemic Mothers (n = 383)

Early neonatal outcome	Category / Mean ± SD	n (%) / Mean ± SD	Test of significance	95% CI	p-value
Birth weight category	Low birth weight (<2500 g)	106 (27.7)	χ^2 = 74.88	23.2 to 32.2	<0.001
	Normal birth weight (≥2500 g)	277 (72.3)		67.8 to 76.8	
Gestational age category	Preterm (<37 weeks)	79 (20.6)	χ^2 = 134.51	16.6 to 24.7	<0.001
	Term (≥37 weeks)	304 (79.4)		75.3 to 83.4	
Apgar at 5 min	<7	42 (11.0)	χ^2 = 229.34	7.8 to 14.1	<0.001
	≥7	341 (89.0)		85.9 to 92.2	
NICU admission	Yes	69 (18.0)	χ^2 = 158.62	14.2 to 21.9	<0.001
	No	314 (82.0)		78.1 to 85.8	
Birth weight (kg)	Mean ± SD	2.53 ± 0.47	t = 105.29	2.48 to 2.58	<0.001
Gestational age (weeks)	Mean ± SD	37.18 ± 1.94	t = 375.82	36.99 to 37.37	<0.001
Apgar score at 1 min	Mean ± SD	6.91 ± 1.19	t = 113.78	6.79 to 7.03	<0.001
Apgar score at 5 min	Mean ± SD	8.16 ± 0.92	t = 173.58	8.07 to 8.25	<0.001

Table 3 presents the early neonatal outcomes among babies born to anaemic mothers. Among the 383 neonates delivered by anaemic mothers, low birth weight (<2500 g) was observed in 106 (27.7%) babies, while 277 (72.3%) babies had normal birth weight. This difference was statistically significant (χ^2 = 74.88, 95% CI: 23.2–32.2, p < 0.001).

Regarding gestational age, 79 (20.6%) neonates were born preterm (<37 weeks), whereas the majority, 304 (79.4%), were delivered at term. The distribution of preterm births was also statistically significant (χ^2 = 134.51, p < 0.001). Similarly, 42 (11.0%) babies had a low Apgar score (<7) at 5 minutes, while 341 (89.0%) had a normal Apgar score, and the difference was statistically significant (χ^2 = 229.34, p < 0.001).

NICU admission was required for 69 (18.0%) neonates, while 314 (82.0%) neonates did not require NICU care. This finding was statistically significant (χ^2 = 158.62, p < 0.001). The mean birth weight among babies of anaemic mothers was 2.53 ± 0.47 kg, while the mean gestational age was 37.18 ± 1.94 weeks. The mean Apgar scores were 6.91 ± 1.19 at 1 minute and 8.16 ± 0.92 at 5 minutes.

Table 4: Association between Severity of Maternal Anaemia and Adverse Neonatal Outcomes among Anaemic Mothers (n = 383)

Adverse neonatal outcome	Mild anaemia (n = 179) n (%)	Moderate anaemia (n = 147) n (%)	Severe anaemia (n = 57) n (%)	Test of significance	95% CI	p-value
Low birth weight	31 (17.3)	44 (29.9)	31 (54.4)	$\chi^2 = 30.28$	OR* 5.69 (2.97 to 10.90)	<0.001
Preterm birth	23 (12.8)	33 (22.4)	23 (40.4)	$\chi^2 = 20.46$	OR* 4.59 (2.31 to 9.12)	<0.001
Apgar score <7 at 5 min	10 (5.6)	14 (9.5)	18 (31.6)	$\chi^2 = 30.42$	OR* 7.80 (3.34 to 18.21)	<0.001
NICU admission	17 (9.5)	26 (17.7)	26 (45.6)	$\chi^2 = 38.20$	OR* 7.99 (3.88 to 16.45)	<0.001

OR = severe anaemia compared with mild anaemia

Table 4 shows the association between severity of maternal anaemia and adverse neonatal outcomes. The incidence of low birth weight increased progressively with increasing severity of anaemia. Among mothers with mild anaemia, low birth weight was observed in 31 (17.3%) neonates, whereas it increased to 44 (29.9%) in moderate anaemia and 31 (54.4%) in severe anaemia. This association was statistically significant ($\chi^2 = 30.28$, OR = 5.69, 95% CI: 2.97–10.90, $p < 0.001$).

Similarly, preterm birth was observed in 23 (12.8%) babies of mothers with mild anaemia, 33 (22.4%) babies of mothers with moderate anaemia, and 23 (40.4%) babies of mothers with severe anaemia. This trend showed a statistically significant association ($\chi^2 = 20.46$, OR = 4.59, 95% CI: 2.31–9.12, $p < 0.001$).

Low Apgar score (<7 at 5 minutes) was also more common in severe anaemia, occurring in 18 (31.6%) neonates compared with 14 (9.5%) in moderate anaemia and 10 (5.6%) in mild anaemia ($\chi^2 = 30.42$, OR = 7.80, 95% CI: 3.34–18.21, $p < 0.001$). NICU admission followed a similar pattern, being highest among severe anaemia cases (26; 45.6%) compared with moderate anaemia (26; 17.7%) and mild anaemia (17; 9.5%), which was statistically significant ($\chi^2 = 38.20$, OR = 7.99, 95% CI: 3.88–16.45, $p < 0.001$).

DISCUSSION

Impact of maternal anaemia on neonatal outcomes (Table 1): The present study evaluated the impact of maternal anaemia on early neonatal outcomes among 600 deliveries in a tertiary care hospital. The findings clearly demonstrated that adverse neonatal outcomes were significantly more common among babies born to anaemic mothers compared with non-anaemic mothers. In this study, low birth weight was observed in 26.9% of neonates born to anaemic mothers compared with 11.1% among non-anaemic mothers (OR = 2.95, $p < 0.001$). These findings are consistent with the study by Chen et al. (2024),[1] who reported that maternal anaemia significantly increased the risk of low birth weight infants due to reduced oxygen supply to the developing fetus. Similarly, Kathuria (2023),[2] reported that maternal anaemia during pregnancy is strongly associated with impaired fetal growth and increased risk of low birth weight.

Preterm birth was another important outcome observed in this study. The prevalence of preterm delivery was 20.6% among anaemic mothers compared with 8.8% among non-anaemic mothers (OR = 2.71, $p < 0.001$). This observation is in agreement with the findings of Singh et al. (2024),[3] who demonstrated that maternal anaemia, particularly iron deficiency anaemia during early pregnancy, increases the likelihood of premature delivery. Similarly, Zhao et al. (2024),[4] reported that anaemic pregnant women had nearly twice the risk of preterm birth compared with women with normal haemoglobin levels.

The present study also observed that babies born to anaemic mothers had significantly lower Apgar scores at 5 minutes. Low Apgar scores (<7) were observed in 11.0% of neonates of anaemic mothers compared with 4.1% among non-anaemic mothers ($p = 0.004$). This finding is consistent with the results of Edelson et al. (2023),[5] who found that maternal anaemia contributes to fetal hypoxia and increases the risk of birth asphyxia and low Apgar scores. In addition, the need for NICU admission was significantly higher among babies born to anaemic mothers (17.8%) compared with those born to non-anaemic mothers (6.5%). Similar findings were reported by Rahman et al. (2020),[6] who showed that neonatal morbidity and NICU admissions were significantly higher among infants born to mothers with moderate and severe anaemia.

Another important finding of the present study was the higher prevalence of meconium-stained liquor among anaemic mothers (22.5%) compared with non-anaemic mothers (11.1%). This suggests that maternal anaemia may contribute to fetal distress during labour. Safarzadeh et al. (2023),[7] also reported that maternal iron deficiency anaemia increases the risk of fetal distress and meconium-stained amniotic fluid due to chronic intrauterine hypoxia.

Furthermore, continuous variables such as birth weight, gestational age, and Apgar scores were significantly lower among neonates born to anaemic mothers. These findings support the observations of Detlefs et al. (2022),[8] who reported that maternal

anaemia adversely affects fetal growth and gestational duration, resulting in lower birth weight and poorer neonatal condition at birth.

Prevalence and severity of maternal anaemia (Table 2): The present study found that the prevalence of maternal anaemia among pregnant women was 63.8%. This high prevalence reflects the ongoing burden of anaemia in developing countries. Similar prevalence rates have been reported in several studies conducted in developing regions. Chen et al. (2024),[1] reported that maternal anaemia remains a common nutritional disorder during pregnancy and significantly contributes to maternal and neonatal health problems worldwide.

Among the anaemic mothers in this study, mild anaemia was the most common type (29.8%), followed by moderate anaemia (24.5%) and severe anaemia (9.5%). This pattern is consistent with the findings of Wang et al. (2025),[9] who reported that mild and moderate anaemia constitute the majority of cases among pregnant women globally. The mean haemoglobin level among anaemic mothers in the present study was 9.24 ± 1.08 g/dL, which is comparable to the findings reported by Bukhari et al. (2022),[10] where the mean haemoglobin level among anaemic pregnant women was around 9 g/dL.

Early neonatal outcomes among babies born to anaemic mothers (Table 3): In the present study, 27.7% of babies born to anaemic mothers had low birth weight. This observation is comparable to the findings of Kathuria (2023),[2] who reported that maternal anaemia is associated with increased incidence of intrauterine growth restriction and low birth weight infants. Similarly, the prevalence of preterm birth in this study was 20.6%, which is consistent with the results of Singh et al. (2024),[3] who found a strong association between maternal anaemia and preterm labour.

Low Apgar score at 5 minutes was observed in 11% of neonates in the present study, which is similar to the findings reported by Edelson et al. (2023),[5] where approximately 10–12% of babies born to anaemic mothers had low Apgar scores. Additionally, 18% of neonates required NICU admission, indicating a higher risk of neonatal morbidity among babies born to anaemic mothers.

Association between severity of maternal anaemia and adverse neonatal outcomes (Table 4): The present study also demonstrated a clear relationship between the severity of maternal anaemia and adverse neonatal outcomes. The incidence of low birth weight increased progressively from 17.3% in mild anaemia to 54.4% in severe anaemia (OR = 5.69, $p < 0.001$). This trend suggests that the severity of maternal anaemia has a dose-response relationship with neonatal complications. Similar findings were reported by Chen et al. (2024),[1] who observed that severe maternal anaemia significantly increased the risk of fetal growth restriction.

Preterm birth also showed a rising trend with increasing severity of anaemia, ranging from 12.8% in mild anaemia to 40.4% in severe anaemia. This observation supports the findings of Zhao et al. (2024),[4] who reported that severe anaemia increases the risk of preterm delivery several fold.

Similarly, low Apgar scores and NICU admissions were highest among mothers with severe anaemia. NICU admission was required in 45.6% of neonates born to mothers with severe anaemia compared with only 9.5% among those with mild anaemia. These findings highlight the significant clinical impact of severe maternal anaemia on neonatal health and are consistent with the results of Detlefs et al. (2022),[8] who demonstrated that severe maternal anaemia is associated with higher neonatal morbidity and mortality.

CONCLUSION

The present hospital-based observational study evaluated the impact of maternal anaemia on early neonatal outcomes among 600 deliveries. The findings of the study clearly demonstrate that maternal anaemia is highly prevalent among pregnant women and significantly influences neonatal health outcomes. In the present study, maternal anaemia was observed in 63.8% of pregnant women, indicating that anaemia continues to be a major public health concern, particularly in developing countries.

The study revealed that babies born to anaemic mothers had significantly higher rates of adverse neonatal outcomes compared with babies born to non-anaemic mothers. Low birth weight and preterm birth were significantly more common among neonates of anaemic mothers, suggesting that reduced maternal haemoglobin levels adversely affect fetal growth and gestational duration. Similarly, neonatal condition at birth, assessed using Apgar scores, was significantly poorer among babies born to anaemic mothers. These findings indicate that maternal anaemia may contribute to fetal hypoxia and impaired oxygen transport across the placenta, thereby affecting neonatal adaptation after birth.

Another important observation of the study was the increased need for neonatal intensive care among babies born to anaemic mothers. NICU admission rates were significantly higher in this group, indicating increased neonatal morbidity associated with maternal anaemia. Additionally, the presence of meconium-stained liquor was more frequent among anaemic mothers, suggesting a higher incidence of fetal distress during labour.

The study also demonstrated a clear relationship between the severity of maternal anaemia and neonatal outcomes. As the severity of anaemia increased from mild to severe, the incidence of low birth weight, prematurity, low Apgar scores, and NICU admissions also increased significantly. This dose-response relationship highlights the importance of early detection and management of maternal anaemia during pregnancy.

Limitations of the study

1. The study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to the broader population.
2. Being a hospital-based observational study, the results may not fully represent community-level maternal and neonatal outcomes.
3. The study primarily focused on early neonatal outcomes, and long-term neonatal and developmental outcomes were not assessed.
4. Potential confounding factors such as maternal nutritional status, socioeconomic conditions, and antenatal care practices were not evaluated in detail.
5. The study did not evaluate other micronutrient deficiencies such as folate or vitamin B12, which may also influence pregnancy outcomes.
6. The severity and duration of anaemia during different trimesters of pregnancy were not analyzed separately.
7. Some neonatal complications may have been influenced by other obstetric or maternal conditions, which were not fully controlled in the study design.

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