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Association of Maternal Haemoglobin with Perinatal Outcome

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ABSTRACT
Several studies have shown that women with anaemia during pregnancy are more likely to have adverse pregnancy outcomes. Anaemia in the first or second trimester increases the risk of low birth weight and preterm birth. Therefore, this study aimed to investigate the association between maternal heamoglobin and perinatal outcomes. A Retrospective study was conducted in Government Medical college Miraj. During study period of 6 months (February 2023 to July 2023). Total 166 mother and baby pair were included in the study as per inclusion and exclusion criteria. ANC mothers over a period of 6 months were screened and records checked, those who had HB of <11 mg dL^{-1} were included. Relevant data of mother and baby pair (n = 166) was obtained from medical record department. All the information regarding mothers age at the time of delivery, gestational age at birth, neonatal outcome in terms of birth weight, maturity, IUGR were documented. In our study 43% of mothers had severe anemia (<7g dL^{-1}), 33% of mothers had moderate anemia and 22% of mothers had mild anemia. In mothers with severe anemia 50% had babies with birth weight of <2.5 Kg and of mothers with moderate anemia 34% had birth weight of <2.5 Kg. In case of mothers with mild anemia only 14% had birth weight of<2.5 Kg. Out of 137 preterm births in our study 43% were born to mothers with severe anemia, 35% were born to mothers with moderate anemia and only 20% were born to mothers with mild anemia. Our data showed high association of severe anemia with low birth weight and preterm births. In this study there was a statistically significant correlation between maternal hemoglobin with perinatal outcomes. There was a direct correlation between level of maternal hemoglobin and adverse perinatal outcome such as low birth weight and preterm births.

INTRODUCTION

Neonatal birth weight and fetal maturity has been obtaining wide attention as it is a strong predictor of neonatal and perinatal mortality and disability, as well as birth weight percentiles, are used to predict the risk of growth disorders in newborns[1]. The global prevalence of low birth weight (LBW) was 14.6% in 2015[2] and it was estimated that approximately 32.4 million infants that were small for gestational age (SGA) were born in low-income and middleincome countries in 2010[3]. Both LBW and SGA were associated with shortterm and long-term adverse outcomes, such as infection, respiratory depression, jaundice, obesity, insulin resistance and type 2 diabetes[1-5].

Therefore, it is essential to identify the early factors that might influence neonatal birth weight, fetal maturity and alert the need for an intervention. Maternal nutritional status during pregnancy is one of the critical influencing factors of neonatal birth weight[6].

Anemia is a prevalent nutritional deficiency problem affecting pregnant women, with anemia affecting maternal and neonatal health. Relationships between anemia and adverse birth outcomes have been inconsistent, with studies finding an increased risk of low birth weight and preterm delivery.

Maternal anaemia is common medical disorder in developing countries. Anaemia is defined as reduction in circulating haemoglobin mass below the critical value. WHO defines anaemia as haemoglobin concentration of $\leq$11 g dL^{-1}. Centre for Disease Control (CDC) defines anaemia as haemoglobin $\leq$11 mg dL^{-1} in first and third trimester and <10 gm dL^{-1} in second trimester. However, in developing countries like India, the lower limit is accepted as <10 g dL^{-1}, because of prevailing socioeconomic deprivation[7,8]. WHO reports the incidence 0f 35-75% in developing countries and 18% in developed countries. Prevalence of anaemia is 43% in women in developing countries and 12% in developed countries. In India, it is 88%[8]. 20% of maternal deaths are directly or indirectly related to anaemia. It is estimated that 1.200 million people are anaemic worldwide[8]. Common causes of anaemia include malnutrition, poor socioeconomic status, parity, lack of education, worm infestation, lack of regular antenatal care.

Anaemia in pregnancy results in complications such as post-partum haemorrhage, infection, abruption placenta, preeclampsia, increased maternal mortality and morbidity. 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[9]. However, the extent to which maternal haemoglobin affects the perinatal outcome is still uncertain. There is variation in data from different studies on maternal haemoglobin and adverse perinatal outcome. Hence the present study was conducted to assess the relationship between maternal hemoglobin concentration with perinatal outcome (low birth weight, preterm births).

Objectives: To assess the percentage of anemia in ANC mothers and classify them as per the severity of anemia. To assess the perinatal outcome in these mothers. To assess the relationship between maternal hemoglobin concentration with perinatal outcome.

MATERIALS AND METHODS

Research study design: Retrospective study.

Research study centre: Government Medical college Miraj.

Population source: Mother and Baby data from Hospital medical records section.

Study period: Six months (February 2023 to July 2023).

Sample size: Data of (n = 166) mother and baby pair as per inclusion and exclusion criteria.

Inclusion criteria: Mothers with anaemia during pregnancy having haemoglobin of <11g dL^{-1}. (According to the World Health Organization, anaemia in pregnancy is defined as a haemoglobin (Hb) level <11 g dL^{-1}).

Exclusion criteria: Risk factors which can cause adverse perinatal outcomes (low birth weight, preterm births) such as mothers with Systemic illnesses like Diabetes mellitus and Hypertension. Pregnant Women on any drugs affecting neonatal growth. Antenatal Infection with Toxoplasmosis, Rubella, Cytomegalovirus, Herpes Virus. Mothers with addictions like Smoking and alcoholism. Babies with any Diagnosed Congenital anomalies/disorders.

Methodology: ANC mothers over a period of 6 months were screened and records checked, those who had HB of <11 mg dL^{-1} were included. Relevant data of mother and baby pair (n = 166) was obtained from medical record department. All the information regarding mothers age at the time of delivery, gestational age at birth, neonatal outcome in terms of birth weight, maturity, IUGR were documented. Mothers with HB <11 mg dL^{-1} were included and were graded as per mild, moderate and severe anaemia. Those mothers who had adverse perinatal outcome (low birth weight, preterm births) were evaluated for any association with grade of anaemia. Babies were assessed for adverse perinatal outcome, those babies as per exclusion criteria were excluded from the study and

adverse perinatal outcomes in the form of low birth weight, preterm births were analysed for any association with the maternal hemoglobin levels and severity of anemia. Other sociodemographic features were also analysed with the adverse perinatal outcome (low birth weight, preterm births) for any association. Statistical analysis was done by using SPSS-22. Statistical significance was evaluated using Chi-square test and Pearson correlation, Z-test. The $p<0.05$ was considered statistically significant.

OBSERVATION AND RESULTS

In mothers with severe anemia 50% had babies with birth weight of <2.5 Kg and of mothers with moderate anemia 34% had birth weight of <2.5 Kg. In case of mothers with mild anemia only 14% had birth weight of<2.5 Kg.

Out of 137 preterm births in our study 43% were born to mothers with severe anemia, 35% were born to mothers with moderate anemia and only 20% were born to mothers with mild anemia (Table 1). Our data showed high association of severe anemia with low birth weight and preterm births. In present study, Majority of mother 115 (69.3%) belong to age group 19-25 years., followed by 41 (24.7%) in 26-30 years. And 10 (6.0%) belong to age group 31-35 years. In our study (72) 43.4% of mothers had severe anemia (<7g dL^{-1}), 56 (33.7%) of mothers had moderate anemia and 38 (22.9%) of mothers had mild anemia.

In present study, Majority of patients 137 (82.5%) belong to <37 weeks of gestation and 29 (17.5%) belong to >37 weeks of gestation. In present study, Majority of patients 110 (66.3%) belong to <2.5 kg and 56 (33.7%) belong to >2.5 kg of birth weight.

In mothers with severe anemia 50% had babies with birth weight of <2.5 Kg and of mothers with moderate anemia 34% had birth weight of <2.5 Kg. In case of mothers with mild anemia only 14% had birth weight of<2.5 Kg. There was a statistically significant corelation between maternal anemia (Severe anemia) with low birth weight(<2.5 kg).

Out of 137 preterm (<37 weeks) births in our study 43% were born to mothers with severe anemia, 35% were born to mothers with moderate anemia and only 20% were born to mothers with mild anemia. There was a statistically significant ($p = 0.001$) correlation between maternal hemoglobin (Severe anemia) with preterm births (Gestational age <37 weeks of gestation) (Table 2-6).

Table 1: Age wise distribution of mothers

Age of mother	Frequency	Percentage
19-25	115	69.3
26-30	41	24.7
31-35	10	
Total	166	100.0

Table 2: Distribution of mothers as per degree of anaemia

Degree of anaemia	Frequency	Percentage
Severe (<7)	72	43.4
Moderate (7-9.9)	56	33.7
Mild (10-10.9)	38	22.9
Total	166	100.0

Table 3: Distribution of babies as per gestational

Gestational age	Frequency	Percentage
<37	137	82.5
>37	29	17.5
Total	166	100.0

Table 4: Distribution of babies as per birth weight

Birth weight	Frequency	Percentage
<2.5	110	66.3
>2.5	56	33.7
Total	166	100.0

DISCUSSIONS

In present study, Majority of mother 115 (69.3%) belong to age group 19-25 years., followed by 41 (24.7%) in 26-30 years. and 10 (6.0%) belong to age group 31-35 years. In another study conducted by Anjanappa *et al.*[10] also found that, out of 69 anaemic mothers, 42 (60.86%) belonged to 21-25 years. Seven women were ≤20 years (10.14%) and five were >30 years (7.24%). Also study conducted by Kaul *et al.*[11] found that among the 574 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. Similar results were observed in present study.

In our study 43% of mothers had severe anemia (<7g dL^{-1}), 33% of mothers had moderate anemia and 22% of mothers had mild anemia. Whereas other studies conducted by Anjanappa *et al.*[10] and Kaul *et al.*[11] found that majority of women belong to mild anemia in contrast to our study.

The high percentage of mothers with severe anemia in our study is may be due to less sample size, early detection and presentation of severe anemia and as no blinding was done, Thus the selection of mothers might be biased.

In mothers with severe anemia 50% had babies with birth weight of <2.5 Kg and of mothers with moderate anemia 34% had birth weight of <2.5 Kg. In case of mothers with mild anemia only 14% had birth weight of<2.5 Kg. There was a statistically significant correlation between maternal anemia (Severe anemia) with low birth weight(<2.5 kg).

Anjanappa *et al.*[10] found that 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

Table 5: Correlation between maternal haemoglobin and birth weight

	Birth weight		
	<2.5	>2.5	Total
Degree of anaemia severe (<7)	56	16	72
Count % within birth weight	50.91	28.57	43.37
Moderate (7-9.9)	38	18	56
Count % within birth weight	34.55	32.14	33.73
Mild (10-10.9)	16	22	38
Count % within birth weight	14.55	39.29	22.89
Count % within birth weight	110	56	166
Total	66.27	33.73	100.00

Table 6: Correlation between maternal haemoglobin and gestational age

	Gestational age		
	<37	>37	Total
Degree of anaemia severe (<7)	60	12	72
Count % within gestational age	43.80	41.38	43.37
Moderate (7-9.9)	49	7	56
Count % within gestational age	35.77	24.14	33.73
Mild (10-10.9)	28	10	38
Count % within gestational age	20.44	34.48	22.89
Count % within gestational age	137	29	166
Total	82.53	17.47	100.00

difference was statistically significant (p<0.0001). Kidanto *et al.*[12] 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. Owais *et al.*[13] observed significantly higher number of low birth weight in anemic group as compared to non-anemic group.

Several studies reported the association between Hb reduction and birth outcomes[14,15]. However, the definition of gestational age for maternal Hb measurements was not precise in all studies, which was considered a confounding factor affecting the association between maternal Hb and birth outcomes[16]. Whereas, out of 137 preterm (<37 weeks) births in our study 43% were born to mothers with severe anemia, 35% were born to mothers with moderate anemia and only 20% were born to mothers with mild anemia. There was a statistically significant (p = 0.001) correlation between maternal hemoglobin (Severe anemia) with preterm births (Gestational age <37 weeks of gestation)

CONCLUSION

Anaemia in pregnancy is one of the causes of poor perinatal outcome. Maternal Anaemia is associated with the high risk of low birth weight and preterm birth and overall increases perinatal mortality and morbidity. In this study there was a statistically significant correlation between maternal hemoglobin with perinatal outcomes. There was a direct correlation between level of maternal hemoglobin and adverse perinatal outcome such as low birth weight and preterm births. So, it needs to be emphasized that correction of iron deficiency still remains one of the most important steps towards better obstetrical care and perinatal outcome in developing country. 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.

Limitation:

- It was retrospective study
- Babies were not followed up after discharge so long term consequnces of maternal anemia could not be studied

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