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Original Research Article

A Study of Association of Maternal Hemoglobin and Fetal Outcome in Tertiary Care Hospital

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ABSTRACT

Background: Anemia is a common medical disorder in pregnancy and it is associated with poor maternal and perinatal outcomes. **Objective**: to evaluate the association of maternal hemoglobin and fetal outcome. Methods: This is a cross-sectional study undertaken in the inpatient Department of Obstetrics and Gynecology, Bangalore Medical College & Research Institute. There were a total of 690 study subjects. All pregnant women reporting to the inpatient department fulfilling exclusion and inclusion criteria are subjected to detailed history taking. Then they are subjected to lab investigation, a complete blood count. They are followed up till delivery and the birth weight of the neonate is measured immediately after delivery on a precise scale and the APGAR score is calculated. **Results:** Among 690 study subjects, 60.87% (420) had normal hemoglobin, 16.09% (111) had mild anemia, 22.03% (152) had moderate anemia, and 1.01% (7) had severe anemia. Low birth weight was observed more in the severe anemia (28.57%) group, followed by the moderate anemia group (11.84%), mild anemia (10.81%) group, and normal hemoglobin group (10.48%). NICU admissions were more in the severe anemia (28.57%) group, followed by the moderate anemia group (11.84%), normal hemoglobin (10.81%) group, and mild anemia group (10.48%). APGAR score showed moderate depression in 2.62% of neonates of the moderate anemia group and 1.43% of the normal hemoglobin group. Anemia in pregnancy is found to be associated with adverse neonatal outcomes like low-birth-weight babies, low APGAR score, and need for NICU admission, but the association of maternal hemoglobin and the poor neonatal outcome is statistically not significant.

Conclusion: Anemia in pregnancy is found to be associated with adverse neonatal outcomes like low birthweight babies, low APGAR score, and need for NICU admission, but the association of maternal hemoglobin and the poor neonatal outcome is statistically not significant. It is important to diagnose and treat anemia in pregnancy to ensure mother and newborn optimal health.

Keywords: Pregnancy; Anemia; Maternal hemoglobin; Neonatal outcome.

INTRODUCTION

Anemia (defined by WHO as hemoglobin levels of ≤ 11 g/dl) is one among the world's leading causes of disability, and thus one in all the serious global public pathological state which affects both developing and developed countries, particularly in reproductive age groups[1,2]. The FOGSI-

WHO has estimated the prevalence of anemia in developed and developing countries in pregnant women as 14% and 51% respectively and 65-75% in India[3,4].
One of the common medical disorders during pregnancy is anemia. It can lead to various complications for both mother and fetus[5]. Undernourishment leading to anemia in pregnancy restricts fetal growth and it contributes to 8 lakh neonatal deaths, 4 lakh infant deaths, and around 20% of maternal deaths [6-8].
Anemia is very commonly considered a risk factor for poor pregnancy outcomes and can result in prolonged labour, sepsis, Postpartum hemorrhage and also lead to preterm birth, low birth weight, and fetal impairment [9-11].
In medicine, mortality and morbidity are high for those diseases whose cause or cure isn't known or the treatment is incredibly expensive. It is paradoxical but true that the cause of anemia is thought in the majority of cases and treatment with iron is one amongst the cheapest therapies but it's neglected or not diagnosed timely.
The fetus tolerates even advanced degrees of maternal anemia. This is due to the high oxygen affinity of fetal hemoglobin (HbF) and the efficacy of the maternal oxygen transport system, which can deliver adequate amounts of oxygen to the tissues despite low hemoglobin levels.
This study aims to assess the link between maternal hemoglobin concentration at term pregnancy with the fetal outcome, which includes birth weight, Apgar score, and NICU admission.

OBJECTIVE

- To evaluate the association of maternal hemoglobin and fetal outcome.

MATERIALS AND METHODS

All pregnant women reporting to the obstetrics inpatient department of hospitals attached to Bangalore Medical College & Research Institute.

Sample size: 690

Study design: Cross-sectional study

Duration of study: Nov 2019 – May 2021

Methods of collection of data:

Inclusion Criteria:

1. All pregnant women with age group >18years and < 35years.
2. Patients willing to give written informed consent.
3. All pregnant women with gestational age from 37weeks to 40weeks.
4. All pregnant women with pre-pregnancy BMI 18.5 to 24.9.
5. Singleton pregnancy.

Exclusion criteria:

1. Pregnant women not willing to give informed consent.
2. Multiple pregnancies.
3. Hypertensive disorders of pregnancy.
4. Previously diagnosed anemia and history of blood transfusions.
5. Gestational diabetes mellitus.

6. Chronic diseases.
7. Placental disorders.
8. Intrauterine death.
9. Infections.
10. Oligohydramnios/Polyhydramnios.
11. Malignancy.
12. Hemoglobinopathies.
13. Chromosomal/structural anomalies in the neonate
14. Structural anomalies of the uterus.

The procedure of study:

After obtaining approval and clearance from the intuitional ethics committee, the patients fulfilling the inclusion criteria will be enrolled for the study after obtaining informed consent.

All pregnant women reporting to the inpatient department fulfilling exclusion and inclusion criteria are subjected to detailed history taking. Then they are subjected to lab investigation, a complete blood count. They are followed up till delivery and the birth weight of the neonate is measured immediately after delivery on a precise scale and the APGAR score is calculated.

Study participants hemoglobin value is taken as a criterion for deciding the anemia and classifying them according to severity.

Cases are divided into 4 groups
Normal hemoglobin- >11gm/dl
Mild anemia-9.1 to 11 gm/dl
Moderate anemia - 7.1 to 9 gm/dl
Severe anemia - Hemoglobin (Hb) <7gm/dl.

The classification of birth weight was defined according to the criteria of the World Health Organization. Newborns with birth weights less than 2500 grams were classified as low birth weight. APGAR Scores of 7 and above are normal; 4 to 6, moderately depressed; and 3 and below are severely depressed.

Statistical Analysis: The data collected will be analysed statistically using descriptive statistics namely mean, standard deviation, percentage wherever applicable.
Appropriate Parametric and non-parametric tests will be used.

RESULTS

A total of 690 subjects were included in the final analysis. Out of them, 319 (46.23%) were primigravida, and 371 (53.77%) were multigravida.
Majority of them, that is 60.87 %(420) had normal hemoglobin, 16.09 % (111) had mild anemia, 22.03% (152)had moderate anemia, and 1.01%(7) had severe anemia (Table 1).

Table 1: Descriptive analysis of Anemia in the study population (N=690)

Anemia	Frequency	Percentage
Severe	7	1.01%
Moderate	152	22.03%
Mild	111	16.09%
Normal	420	60.87%

In this study, 45.22% of study subjects underwent LSCS, 54.35% had FTND and0.43% had VBAC. Anemia correction was given to 85.71% of severe anemia and 18.42% of moderate anemia cases.
Neonates of study subjects had a maximum neonatal birth weight of 4.25 kg and a minimum of 1.56kg.
Among neonates of study subjects, 9.13% got admitted to NICU in this study. The reason for the majority (42.86%) of NICU admission is being respiratory distress followed by meconium aspiration syndrome (33.33%), low birthweight (11.90%), big baby (9.52%), and floppy baby (2.38%).(Table 2)

Table 2: Descriptive analysis of Reason for NICU admission in the study population (N=42)

Reason for NICU admission	Frequency	Percentage
Low birth weight	5	11.90%
Respiratory distress	18	42.86%
Floppy baby	1	2.38%
Meconium aspiration syndrome	14	33.33%
Big baby	4	9.52%

In the study population, 1.45% of neonates were moderately depressed (APGAR score of 4-6) and 98.55% of neonates had normal APGAR scores.
In this study, low birth weight was observed more in the severe anemia(28.57%) group, followed by the moderate anemia group(11.84%), mild anemia(10.81%) group, and normal hemoglobin group(10.48%). NICU admissions were also more in severe anemia(28.57%) group, followed by the moderate anemia group(11.84%).

DISCUSSION

Anemia is the most prevalent nutritional problem which affects pregnant women. According to Dallman, anemia alters immune status, increases both fetal and maternal stress, and also alters transfer of oxygen from hemoglobin to fetus[12].
In a cohort study by Jaleel et al in 2007, 51 pregnant women, admitted for delivery and having severe anemia were studied and compared with 108 non-anemic women of similar demographic features. Preterm birth was seen in 23.5% cases and 10.2% controls (p = 0.026). Of the severely anemic mothers, 29.6% of babies were low birth weight (p = 0.022) and 27.8% were small for gestational age (p= 0.001), as compared to 14.5% and 8.2% of controls, respectively.
The authors were of the conclusion that severe anemia in mothers carries a significant risk of hemorrhage and infection. It is also associated with preterm birth, LBW, and SGA infants, as well as reduced APGAR score and very high perinatal mortality[13].
In this study, low birth weight was observed more in the severe anemia (28.57%)Group, and NICU admissions were more in severe anemia (28.57%) group. APGAR score showed moderate depression in 2.62% of neonates of the moderate anemia group and 1.43% of the normal hemoglobin group.
Ahmad et al., [14]LoneFWet al.,[15]Bakhtiaret al.,[16]showed1.8,1.8and1.9timeshigher risk of low birth weight babies among anemic mothers. The results of present study correlate with all these studies with regard to maternal anemia and low birth weight. However since the P-value is 0.1016, the association between maternal hemoglobin and neonatal birth weight is statistically not significant. (Table 3)
Since the P-value is 0.2138, the association of maternal hemoglobin and neonatal APGAR score is also statistically not significant. (Table 3)

Table 3: Comparison of Anemia with Neonatal birth weight (kg) in the study population (N=690)

Parameter	Anemia (Mean ± SD)				P-Value
	Severe (N=7)	Moderate (N=152)	Mild (N=111)	Normal (N=420)	
Neonatal birth weight(kg)	2.80 ± 0.48	2.95 ± 0.42	2.85 ± 0.33	2.93 ± 0.38	0.1016
APGAR SCORE Median (IQR)	7.00(7.0 to 8.5)	7.00(7.0 to 8.0)	7.00(7.0 to 8.0)	7.00(7.0 to 8.0)	0.2138

Amongst anemic subjects who have received anemia correction before delivery, 8.82% of neonates required NICU admissions, among anemic subjects who have not received anemia correction before delivery, 10.34% of neonates required NICU admissions, and in subjects with normal hemoglobin, 8.49% of neonates required NICU admissions.
Amongst anemic subjects who have received anemia correction before delivery, 20.59% of neonates were low birth weight, among anemic subjects who have not received anemia correction before delivery, 11.21% of neonates were low birth weight, and in subjects with normal hemoglobin, 10.14% of neonates were low birth weight.
Since the P-value is 0.6265, the association of anemia correction before delivery and neonatal birth weight is statistically not significant. (Table 4)
Since the P-value is 0.3057, the association of anemia correction before delivery and neonatal APGAR score is also statistically not significant. (Table 4)

Table 4: Comparison of Neonatal birth weight (kg) and APGAR score with anemia correction before delivery (N=690).

Parameter	Anemia correction before delivery (Mean ± SD)			P-Value
	Normal (N=424)	Done (N=34)	Not done (N=232)	
Neonatal birth weight(kg)	2.93 ± 0.38	2.91 ± 0.42	2.90 ± 0.39	0.6265
APGAR SCORE Median (IQR)	7.00(7.0 to 8.0)	7.00(7.0 to 8.0)	7.00(7.0 to 8.0)	0.3057

CONCLUSION

Anemia in pregnancy is found to be associated with adverse neonatal outcomes like low birth weight babies, low APGAR score, and need for NICU admission, however, the association of maternal hemoglobin and poor neonatal outcome is statistically not significant.
Joint social and medical efforts are necessary for the overall improvement of the living status of women. Their awareness is to be increased about dietary habits, small family norms, birth intervals, appropriate use of family planning methods, and regular antenatal visits.
Proper antenatal care is the basic requirement for the prevention, early detection, and treatment of anemia. Maternal education needs an emphasis because it increases the awareness of mothers regarding nutrition, contraception, birth spacing, and compliance with medical advice.

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