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Original Research Article

Study on relationship between maternal haemoglobin and the early neonatal outcome in term babies

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ABSTRACT

Background: Iron stores of neonates born to anaemic mothers are low, iron content in breast milk in anaemic women is low and because of these factors substantial proportion of infants become anaemic by six months. Thus maternal iron deficiency and anaemia makes the offspring vulnerable for developing iron deficiency anaemia right from infancy. The current study was made attempt to evaluate and establish the relationship between maternal haemoglobin and early neonatal outcome in term babies.
Method: The present cross-sectional observational study conducted in term neonates and their mothers in first stage of labour in the Department of Paediatric and Department of Obstetrics & Gynaecology, GSL Medical College and general hospital, Rajamahendravaram, from 2015 to 2017. Relevant history of mother was recorded and blood sample from the mother was collected in first stage of labour for haemoglobin estimation.
Result: The mean haemoglobin in anaemic mothers was found to be 9.48±0.413 gm/dl and that in non-anaemic mothers was 11.67±0.515gm/dl. Anaemia among mothers has significant effect on birth weight of the newborn babies, on crown heel length of the newborn babies ($P<0.05$) and on head circumference of Newborn babies ($P< 0.05$). It was found that anaemia among mothers has no significant effect on APGAR score at 5 mins and on hospital stay.
Conclusion: Anaemic mothers had newborn with low mean birth weight, low mean head circumference and low crown heel length compared to the those of non anaemic mothers.

Keywords: Anaemia, APGAR score, Birth weight, Maternal haemoglobin, Mother, Neonatal

INTRODUCTION

Anaemia is one of the major public health problems in developing countries. According to WHO estimates, up to 50% of all women living in developing countries are anaemic. However, the population group with the greatest number of individuals affected is pregnant women.[1,2] Nearly 50% of women of reproductive age and 26% of men in age group of 15-59 years are anaemic.[3] Nine out of ten anaemic sufferers are from developing countries. An alarming 600 million people in South East Asia are suffering from iron deficiency anaemia.

In India, prevalence of anaemia is high in all age groups compared to others developing countries. NFHS III survey revealed that India has highest number of cases of anaemia in the world. Studies done by National Nutrition Monitoring Bureau, District Level Household Survey and ICMR have shown that 70% of pregnant women and adolescent girls in the country are anaemic. In girls

anaemia begins in childhood, worsens during adolescence and gets aggravated in pregnancy. [4]

Many studies suggest that, fall in maternal haemoglobin below 11gm/dl is associated with a significant rise in peri natal mortality rate. India contributes 80% of maternal deaths due to anaemia in South East Asia region.

Maternal anaemia has major effects on perinatal mortality, early neonatal outcome. It may lead to preterm delivery, neonatal mortality, low birth weight, placental abruption, compromised head circumference & crown heel length, low APGAR scores, duration of hospital stay etc intern adding up to higher incidence of morbidity rates.

Iron stores of neonates born to anaemic mothers are low, iron content in breast milk in anaemic women is low and because of these factors substantial proportion of infants become anaemic by six months. Thus, maternal iron deficiency and anaemia makes the offspring vulnerable for developing iron deficiency anaemia right from infancy. Poor iron content of complementary food and family food consumed by young child result in further increase in prevalence of anaemia in childhood.[5]

India being a developing country, having relatively high proportion of Below Poverty Line (BPL) population and high rates of illiteracy, this problem needs to be evaluated and assessed regularly to address the underlying factors. The current study was carried out to evaluate and establish the relationship between maternal haemoglobin and early neonatal outcome in term babies.

Objectives of the study determine the relationship between maternal haemoglobin and the early neonatal outcome in term babies.

METHODS

The present cross-sectional observational study conducted in term neonates and their mothers in first stage of labour in the Department of Paediatrics and Department of Obstetrics & Gynaecology, GSL Medical College and general hospital, Rajamahendravaram, from 2015 to 2017.

Based on the results of the correlation of maternal haemoglobin with birth weight, crown heel length, head circumference and Apgar score from the existing literature and with 95% confidence and 80% power minimum sample size comes to 184 (92 for each group).

Inclusion criteria

- Term neonates
- Their mothers in first stage of labour

Exclusion criteria

- Neonates with ABO and Rh incompatibility
- Neonates with congenital anomalies
- Preterm neonates
- Pregnant mothers with systemic illness
- Pregnant mothers with bleeding disorders
- Pregnant mothers with gestational diabetes mellitus, Pre- eclampsiaand antepartum haemorrhage.

Data collection procedure

An informed written consent was obtained from the parents. Relevant history of mother was recorded and blood sample from the mother was collected in first stage of labour for haemoglobin estimation. Then a detailed clinical examination of the newborn was also done.

Mothers with haemoglobin concentration less than 11 g/dl was considered as anaemic. The anaemic and non-anaemic mothers were compared. The relation between maternal haemoglobin, APGAR score and duration of hospital stay of the new-born was then compared. Birth weight, head circumference, crown heel length was also compared.

Statistical analysis

Analysis was done after classifying the mothers into anaemic and non-anaemic groups to find out the statistical significance of association between maternal haemoglobin with birth weight, crown heel length, head circumference and early neonatal outcome variables using chi-square test and unpaired t- test. A p-value less than 0.05 were considered as significant.

RESULTS

The mean age was 22.74±3.210 years and 23.04±3.328 years among anaemic and non anaemic respectively (Table 1).

The mean haemoglobin in anaemic mothers was found to be 9.48±0.413 gm/dl and that in non-anaemic mothers was 11.67±0.515gm/dl (Table 1).

Table 1: Basic characteristics.

Characteristics	Anaemic mother	Non-anaemic mother
Age	22.74±3.2	23.04±3.3
Haemoglobin level	9.48±0.41	11.67±0.51

Among anaemic mothers, 25% of new born were low birth weight, where it was 10.9% among neonates of non anaemic mothers and was found significant (P< 0.05).

Observed that 69.7% low birth weight babies were born to anaemic mothers whereas 30.3% of those born to non anaemic mothers.

Anaemia among mothers has significant effect on birth weight of the newbornes (Table 2).

Table 2: Comparison of birth weight of newborn in anaemic and non-anaemic mothers.

Birth Weight (kgs)		Anaemic mothers		Non anaemic mothers		p-value
		N	%	n	%	
	<2.5	23	25	10	10.9	P
	>2.5	69	75	82	89.1	<0.05

Table 3: Comparison of crown heel length of new-borns in anaemic and non-anaemic mothers.

Crown-Heel length (CHL)		Anaemic mothers		Non anaemic mothers		P - value
		n	%	n	%	
	≥45cm	52	56.5	78	84.8	P
	≤44cm	40	43.5	14	15.2	<0.05

Among anaemic mothers, 43.5% neonates were born with crown heel length <45 cm, whereas it was 15.2% among neonates of non-anaemic. It showed a statistically significant association with a P value <0.05 (P value <0.05 was considered statistically significant).

Among those babies having less crown hip length (<44cm), 74% were born to anaemic mothers, whereas 26% of them born to non-anaemic mothers.

Anaemia among mothers has significant effect on crown heel length of the newborn babies (P< 0.05).

Out of the 92 anaemic mothers 40(43.5%) were found to have babies with smaller crown heel length whereas it was only 14 (15.2%) among non- anaemic mothers (Table 3).

Table 4: Comparison of head circumference of new-born in anaemic and non-anaemic mothers.

Head Circumference (HC)		Anaemic mothers		Non anaemic mothers		P - value
		n	%	n	%	
	>34 cms	39	42.4	67	72.8	P <0.05
	≤34 cms	53	57.6	25	27.2	

Among anaemic mothers, 57.6% neonates are born with head circumference ≤34cms, whereas it is 27.2% among neonates of non-anaemic. It showed a statistically significant association (P-value <0.05).

Within neonates born with less head circumference (n=78), those born to anaemic mothers are high (68%) compared to that of non-anaemic mothers (32%).

Anaemia among mothers has significant effect on head circumference of Newborn babies (P< 0.05)

Out of the 92 anaemic mothers 53(57.6%) were found to have babies with smaller head circumference and it was 25(27.2%) among babies of non-anaemic mothers (Table 4).

Table 5 : Comparison of APGAR score and duration of hospital stay between anaemic and non-anaemic mother.

	Anaemic mother	Non-anaemic mother
APGAR score	9.88±0.510	9.98±0.209
Duration of hospital stay	4.11±2.703	4.58±4.122

The mean APGAR score, at 5mins, of newborn babies of anaemic mothers was 9.88±0.510, and it was 9.98±0.209 among those of non-anaemic mothers. It was found that anaemia among mothers has no significant affect on APGAR score at 5 mins (Table 5).

The mean duration of hospital stay of newborn babies of anaemic mothers was 4.11±2.703 days and it was 4.58±4.122 days among those of non-anaemic mothers. It was found that anaemia among mothers has no significant role on hospital stay (Table 5).

DISCUSSION

The study included 182 pregnant women out of which 92 were anaemic (Hb< 11 gm/dl) and 92 were non anaemic (Hb> 11 gm/dl).

The mean age of the study participants is 22.74 years and 23.04 years among anaemic and non anaemic mothers respectively. Average haemoglobin levels among anaemic and non anaemic mothers were 9.48±0.413 gm/dl and 11.67±0.515 gm/dl respectively. The mean haemoglobin levels among study population were little low compared to a study carried on maternal anaemia in various trimesters 6.

Effect of maternal haemoglobin levels on birth weight

Among anaemic mothers, 25% of newborn were low birth weight, where it was 10.9% among neonates of non anaemic mothers. Observed that 69.7% low birth weight babies were born to anaemic mothers whereas 30.3% of those born to non anaemic mothers. Anaemia among

mothers has significant affect on birth weight of the new born babies.

Study on effect of various maternal factors with neonatal birth weight, also shown significant association between maternal haemoglobin and birth weight.[7]

Studied maternal anemia in various trimesters and its effect on the newborn weight in Mysore, Karnataka and it was found that the mean birth weight of babies born to anaemic mothers was marginally lower compared to that of babies born to non anaemic mothers.[8] Studied the effect of maternal anaemia on birth weight in Egypt. It was found that the number of low birth weight infants (64%) was statistically significant (p<0.001) in the anemic group of mothers than the non anemic group (10%).[9]

Found that the anthropometric measurements of newborn of anaemic and non-anaemic mother group showed a statistically significant difference as we compared with present study it was similar.[10]

Concluded in their research that anaemia during pregnancy had significant negative effect on neonatal birth weight.[10] Their multivariate analysis in Owasis population that risk of LBW babies in anaemic population was 1.9 times higher than non-anaemic mother.[11]

Hospital based Study on Maternal Indicators and obstetric outcome in the north Indian population had shown similar had also established the significant effect of maternal anaemia on birth weight.[12]

Maternal and perinatal outcome in varying degrees of anemia and it was found birth weight of neonate was significantly associated with maternal anaemia.[13]

Effect of maternal haemoglobin levels on Crown Heel Length

Among anaemic mothers, 43.5% neonates were born with crown heel length <45 cm, whereas it was 15.2% among neonates of non-anaemic. Observed that 74.1% low crown heel length babies were born to anaemic mothers whereas 25.9% of those born to non-anaemic mothers and it was observed that anaemia among mothers has significant affect on crown heel length of the newborn babies.

Studied on effects of anaemia on crown heel length also concluded that maternal anaemia had significant effect on crown heel length of new born.[14]

A study conducted determine the effect of maternal anaemia on anthropometric profile of neonates and it was found crown heel length of neonates of severely anaemic mothers were severely compromised (p< 0.05).[15]

Concluded in their research that anaemia during pregnancy had significant negative effect on neonatal anthropometric measurements (length, weight and head circumference).[10]

Updated gestational age specific crown-heel length of Chinese newborns also showed the significant effect of maternal anaemia.[16]

Carried out a study on maternal and perinatal outcome in varying degrees of anemia and it was found crown heel length of neonates was significantly associated with maternal anaemia.[13]

Effect of maternal haemoglobin levels on Head Circumference

Among anaemic mothers, 57.6% neonates were born with head circumference≤34cm, whereas it was 27.2% among neonates of non-anaemic. Observed that 67.9% low head circumference babies were born to anaemic mothers whereas 36.8% of those born to non-anaemic mothers and it was observed that anaemia among mothers has significant affect on crown heel length of the new born babies.

A study to determine the effect of maternal anaemia on anthropometric profile of neonates and it was found mean birth weight, head circumference and the crown heel length of neonates of severely anaemic mothers were severely compromised (p< 0.0005).[15] Concluded in their research that anaemia during pregnancy had significant negative effect on neonatal anthropometric measurements (length, weight and head circumference).[10] Updated gestational age specific crown-heel length of Chinese newborns also showed the significant effect of maternal anaemia.[16] Carried out a study on maternal and perinatal outcome in varying degrees of anemia and it was found crown heel length of neonates was significantly associated with maternal anaemia.[13]

Effect of maternal haemoglobin levels on APGAR scores

All the neonates of anaemic and non-anaemic mothers were assessed for APGAR scores at 1min and 5 minutes. Mean APGAR score at 1 minute among neonates of anaemic mothers was 7.85±0.512 and it was 9.88±0.510 at 5 mins. among neonates of anaemic and non-anaemic mothers respectively.

Among 92 neonates of anaemic mothers, 6 babies were evaluated to have APGAR score ≤7 at 1 min and 2 neonates among 92 of non-anaemic mothers were evaluated to have APGAR score ≤7 at 1minute. The effect of maternal anaemia was insignificant on APGAR score at 1 minute. Similarly, among 92 neonates of anaemic mothers, 3 babies were evaluated to have APGAR score ≤8 at 5 minutes and 1 neonate among 92 of non-anaemic mothers were evaluated to have APGAR score ≤8 at 5 minutes. The effect of maternal

haemoglobin on APGAR scofre at 5 minutes was statistically insignificant.

Anuja B. studied the relationship between maternal haemoglobin and maternal and perinatal outcome in Nagpur and it was found that the neonates of anemic women had 1.8 times more risk of low APGAR score at 1 minute.[17] A study was carried out in Bolivia by Elise M. Laflamme to compare the maternal haemoglobin concentration and pregnancy outcome and it was found that maternal anemia was associated with lower infant Apgar scores at 1min after birth (P=0.006).[18]

Effect of maternal haemoglobin levels duration of hospital stay

Duration of hospital stay among neonates of anaemic and non-anaemic mothers was evaluated. Mean duration of hospital stay among neonates of anaemic mothers was 4.11±2.703 days and it was 4.58±4.122 days among non-anaemic mothers respectively. This may be due to the reason that this study included cases of both normal vaginal delivery and caesarean section. This study had shown insignificant association between maternal haemoglobin status and duration of hospital stay.

CONCLUSION

Anaemic mothers had newborn with low mean birth weight, low mean head circumference and low crown heel length compared to the those of non-anaemic mothers.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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