## ORIGINAL ARTICLE

# Correlation Between Maternal Anaemia and Birth Weight of Neonates: Experience of A Tertiary Care Hospital

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### Abstract

**Background:** *Maternal anaemia is a common health concern and has frequently been associated with low birth weight (LBW) in newborns. Anaemia during pregnancy can lead to adverse birth outcomes, including prematurity, low birth weight (LBW), and increased risk of neonatal mortality.*

**Objective:** *To determine the correlation between maternal anaemia and neonatal birth weight.*

**Methodology:** *This observational study was conducted in the department of Neonatology, Bangladesh Shishu Hospital & Institute (BSH&I), over a period of six months from January 2023 to June 2023. The sample size consisted of 100 participants, 47 women with maternal anaemia and 53 without anaemia. Newborns were included in the study if they were born to mothers aged between 18 and 40 years, had a gestational age of 37 weeks or more had complete medical records from the third trimester through delivery.*

**Results:** *Low birth weight was observed in 30(63.8%) infants born to anemic mothers and 21(39.6%) infants born to non-anemic mothers. This difference was statistically significant (p<0.01). Positive correlation (r=0.478; p=0.001) between maternal haemoglobin and birth weight was found.*

**Conclusion:** *Infants born to anemic mothers had a significantly higher incidence of low birth weight compared to those born to non-anemic mothers, with a positive correlation observed between maternal hemoglobin levels and neonatal birth weight.*

**Keywords:** *Maternal anaemia, pregnant women, low birth weight.*

### Introduction

Anaemia is a serious global public health problem that particularly affects pregnant women. The global prevalence of anaemia among pregnant women was 36.5%, and it was 29.6% in nonpregnant women.[1] Anaemia is estimated to contribute to more than 115 000 and 591 000 maternal and prenatal deaths globally per year, respectively.[2] As per the WHO, hemoglobin of less than 11g in Pregnancy is considered as anaemia and is divided into 3 levels in terms of severity: mild anaemia (Hb level 9-10.9 gm/dl), moderate anaemia (Hb level 7-8.9 gm/dl) and severe anaemia (Hb level <7 gm/dl).[3] Although anaemia is thought to be a common disorder of pregnancy, it has detrimental effects on fetal outcomes.[4] Birth weight and other neonatal anthropometry are reliable and sensitive indicators of neonatal health.[5] Maternal nutritional deficiency causes disruption of exchanges at fetoplacental unit which leads to micronutrients deficiency in fetus.[6] Hence maternal anaemia is an important determinant of pregnancy outcomes affecting the fetal growth.[7]

Anaemia within pregnancy may lead to adverse birth outcomes including prematurity, low birth weight

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(LBW), and neonatal mortality.[8,9] There are wide variations in maternal anaemia burden between various geographical distributions, and even within the same region so that it is vital to study population factor in specific areas to study maternal anaemia and pregnancy outcomes in different parts of the world, aiming to offer some data to the involved health authorities to put effective strategies trying to prevent anaemia during pregnancy and improve its outcomes.[10,11] So this study was conducted to find out correlation between maternal anaemia and birth weight of the baby.

## Materials and Methods

This observational study was conducted in the department of Neonatology, Bangladesh Shishu Hospital & Institute (BSH&I), over a period of six months from January 2023 to June 2023. The sample size consisted of 100 participants, 47 women with anaemia and 53 without anaemia during third trimester. Newborns were included in the study if their birth weight was documented, gestational age of 37 weeks or more, were born to mothers aged between 18 and 40 years and had at least one measurement of Hb in third trimester. Mothers with twin pregnancies, severe illnesses, hypertension, infections of the reproductive organs, or experiences of domestic violence were excluded from the study to minimize confounding factors. Maternal Hb level at third trimester and birth weight of the baby was documented. Women with hemoglobin levels of d"11 g/dL were categorized as the anemic group, while women with hemoglobin levels >11 g/dL were categorized as the non-anemic group. Anaemia was divided into 3 levels in terms of severity: mild anaemia (Hb level 9-10.9 gm/dl), moderate anaemia (Hb level 7-8.9 gm/dl) and severe anaemia (Hb level <7 gm/dl).[3] Newborns were classified as LBW if their birth weight was below 2500 grams. The findings were documented. Data analysis was performed using SPSS version 25. Numerical variables were expressed as mean ± standard deviation (SD). Categorical variables like parity, residence, gender of newborn, and LBW were presented as frequencies and percentages. A chi-square test was applied to compare the frequency of LBW between the anemic and non-anemic groups. Stratification was done based on maternal age, BMI, gestational age, parity, residence, and gender of the newborn to control for effect modifiers. Correlation between maternal haemoglobin and birth weight of the baby was performed. Results were considered statistically significant if the p-value was <0.05.

## Results

Among 100 mothers, 53 had no anaemia while 47 had anaemia . Of those with anaemia , 13% had mild anaemia , 18% had moderate anaemia , and 16% had severe anaemia (Table I).

**Table I**
*Maternal anaemia of the study participant (n=100)*

| Maternal anaemia | Frequency | Percentage |
|---|---|---|
| No anaemia | 53 | 53.0 |
| Mild (Hb level 9-10.9 gm/dl) | 13 | 13.0 |
| Moderate (Hb level 7-8.9 gm/dl) | 18 | 18.0 |
| Severe (Hb level < 7 gm/dl) | 16 | 16.0 |

No significant relationship was found between maternal anaemia and maternal age, occupational status, BMI, residence and parity (p>0.05) (Table II).

**Table II**
*Socio-demographic profile of the mothers (n=100)*

| Maternal parameters | Maternal anaemia | | | | p value |
|---|---|---|---|---|---|
| | Yes (n=47) | | No (n=53) | | |
| | n | % | n | % | |
| Maternal age (years) | | | | | |
| ≥ 20 | 4 | 8.5 | 3 | 5.7 | |
| 21-30 | 31 | 66.0 | 29 | 54.7 | 0.315 |
| >30 | 12 | 25.5 | 21 | 39.6 | |
| Occupational status | | | | | |
| Service | 10 | 21.3 | 18 | 34.0 | 0.159 |
| Housewife | 37 | 78.7 | 35 | 66.0 | |
| BMI (kg/m²) | | | | | |
| 18.5-24.9 | 21 | 44.7 | 26 | 49.1 | 0.662 |
| ≥ 25.0 | 26 | 55.3 | 27 | 50.9 | |
| Residence | | | | | |
| Rural | 25 | 53.2 | 33 | 62.3 | 0.359 |
| Urban | 22 | 46.8 | 20 | 37.7 | |
| Parity | | | | | |
| Primi | 30 | 63.8 | 29 | 54.7 | 0.355 |
| Multi | 17 | 36.2 | 24 | 45.3 | |

There were no significant associations between maternal anaemia status and neonatal gender, gestational age, or APGAR score at 1 minute (p>0.05) (Table III).

**Table III**
*Demographic profile of the neonates (n=100)*

| Neonatal parameters | Maternal anaemia | | | | p value |
| | Yes (n=47) | | No (n=53) | | |
| | n | % | n | % | |
|---|---|---|---|---|---|
| Sex | | | | | |
| Male | 27 | 57.4 | 35 | 66.0 | 0.377 |
| Female | 20 | 42.6 | 18 | 34.0 | |
| Gestational age (weeks) | | | | | |
| 37-41 | 46 | | 52 | | 0.435 |
| >41 | 1 | | 1 | | |
| APGAR score at 1 min | | | | | |
| <7 | 8 | 17.0 | 3 | 5.7 | 0.070 |
| ≥7 | 39 | 83.0 | 50 | 94.3 | |

$\chi^2$ test was done to find out the level of significance

Low birth weight was observed in 30(63.8%) infants born to anemic mothers and 21(39.6%) infants born to non-anemic mothers. This difference was statistically significant (p<0.01) (Table IV).

**Table IV**
*Birth weight of the study participant (n=46)*

| Birth weight (kg) | Maternal anaemia | | | | OR (95% CI) | p value |
| | Yes (n=47) | | No (n=53) | | | |
| | n | % | n | % | | |
|---|---|---|---|---|---|---|
| <2.5 | 30 | 63.8 | 21 | 39.6 | 2.68 | 0.016 |
| ≥2.5 | 17 | 36.2 | 32 | 60.4 | (1.19 to 6.04) | |

$\chi^2$ test was done to find out the level of significance

Positive correlation (r=0.478; p=0.001) between maternal haemoglobin and birth weight was found (Fig.-1).
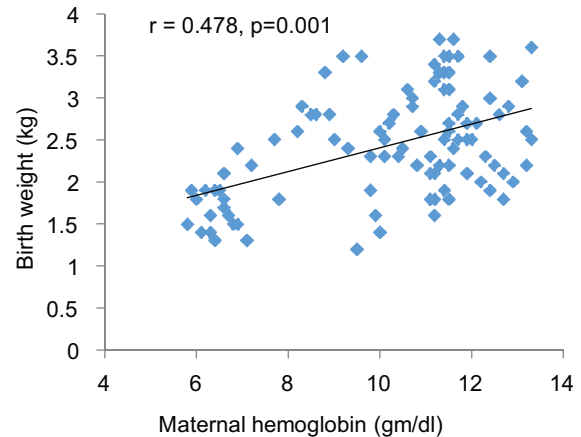


r = 0.478, p=0.001

**Fig.-1** *Scatter diagram showing positive correlation (r=0.478; p=0.001) between maternal haemoglobin and birth weight*

### Discussion

In this study anaemia was found in 47% pregnant mother of those with anaemia , 13% had mild anaemia , 18% had moderate anaemia , and 16% had severe anaemia . Jasim et al[12] reported 15.16% mild anaemia , 19.18% moderate anaemia and 40.73% severe anaemia . Singh et al[13] reported that the prevalence of maternal anaemia was 53.4% among the study population, of which 11.2% were mildly anemic, 19.5% were moderately anemic, and 22.75 were severely anemic.  Bukhari et al[14] found maternal anaemia prevalence of 39%, with 21% being moderately anemic and 18% being mild anemic.

The current study found no significant relationship between maternal anaemia and maternal age, occupational status, BMI, residence, or parity (p>0.05). Similarly, Singh et al[13] reported no significant association between maternal anaemia and parity. However, this contrasts with the findings of Khan et al[15] who reported that high parity was significantly associated with maternal anaemia . In the study by Dudhe et al.[16], most participants were homemakers, with some being laborers a finding consistent with that of Kefiyalew et al[17] who also studied anaemia among pregnant women. Jasim et al[12] showed that parity, BMI, and mode of delivery were not significantly associated with maternal anaemia .[12]

The present study showed no significant associations between maternal anaemia status and neonatal gender, or APGAR score at 1 minute (p>0.05). Similarly, Singh et al[13] reported that maternal

anaemia did not significantly affect the gestational age (p=0.40) or APGAR score at 1 minute (p = 0.61). In contrast, the study by Bakhtiar et al[18] found that maternal anaemia during pregnancy was associated with lower birth weight and a reduced APGAR score at one minute.

In this study, low birth weight was observed in 63.8% infants born to anemic mothers and 39.6% infants born to non-anemic mothers, a difference that was statistically significant (p<0.01). Similarly, Singh et al[13] reported that babies born to non-anemic mothers had significantly higher birth weights compared to those born to anemic mothers (p<0.0001). Jasim et al[12] also found a significant association between maternal anaemia and low birth weight. Malik et al[19] reported a significant difference in the frequency of low birth weight between anemic and non-anemic mothers [68.0% vs. 40.0% (p=0.005)]. The odds ratio (OR) for low birth weight in the anemic group was 3.188 indicating that the likelihood of low birth weight was approximately three times higher in anemic mothers. Similarly, studies by Habib et al[20] and Deriba et al[21] reported a higher frequency of low birth weight in anemic mothers compared to non-anemic mothers: 68.3% vs. 42.8% (p<0.001) and 34.6% vs. 10.8% (p=0.001) respectively. Figueiredo et al[22] also found that women with maternal anaemia had a higher risk of delivering infants with birth weights under 3000 gm compared to those without anaemia (crude RR = 1.36; 95% CI: 1.06-1.76).

The present study showed a positive correlation between maternal hemoglobin levels and birth weight (r=0.478; p=0.001). Similarly, the study by Dudhe et al[16] supported the positive association between maternal hemoglobin and neonatal birth weight. Moghaddam et al[23] also found that higher maternal hemoglobin levels were associated with higher birth weight values. Additionally, it was observed that babies born to anemic mothers had lower birth weights compared to those born to non-anemic mothers. Akhter et al[24] further confirmed this relationship, reporting a significant correlation between maternal hemoglobin and birth weight (r=0.35; p<0.001).

## Conclusion

This study demonstrates a significant association between maternal anaemia and low birth weight in neonates. Infants born to anemic mothers had a notably higher incidence of low birth weight compared to those born to non-anemic mothers, with a positive correlation observed between maternal hemoglobin levels and neonatal birth weight. These findings underscore the importance of early screening, timely diagnosis, and effective management of maternal anaemia during pregnancy to improve neonatal outcomes.

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