Original article

Effects of maternal anaemia on neonatal outcome – a study done in the specialized urban hospital set up in Bangladesh

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Abstract

Context: Anaemia is a common pregnancy related disorder in Bangladesh that causes various maternal and fetal problems. A prospective study was designed to see the associated maternal factors and fetal outcome in different categories of anaemia and to compare with that of normal pregnancy. ***Methods:*** The study was carried out on 60 Bangladeshi women within 35-40 weeks of gestation. Among them, 20 with normal uncomplicated pregnancies were considered as control group or group A, another 27 having pregnancies with mild anaemia were considered as group B, and 13 having pregnancies with moderate anaemia were considered as group C. Severe anaemic mothers were considered as group D, but not found during the period of collection of data for this study. The mothers were selected as who were suffering from antenatal anaemia i.e. having heamoglobin level <10 gm/dl (mild, if <10 gm/dl; moderate, if <8 gm/dl; and severe, if <6 gm/dl) and control i.e. having heamoglobin level ≥10 gm/dl. The foetal outcome was observed and recorded after delivery. ***Results:*** The mean age of the mother was 23.65±3.83 years, 27.26±4.93 years and 25.85±4.62 years and the mean number of gravidity was 1.65±0.67, 2.15±0.72 and 2.69±1.03 in group A, group B and group C respectively. The difference was statistically highly significant in between A and C ($p<0.001$) and also significant in between A & B and B & C ($p<0.05$). The mean gestational age of the mother was 38.65±0.88 weeks, 37.37±1.01 weeks and 37.15±1.28 weeks in group A, group B and group C respectively and the difference was statistically significant between A & B and A & C ($p<0.001$). The mean birth weight of the neonate was 3.09±0.30 Kg., 2.99±0.16 Kg. and 2.95±0.21 Kg., while the mean APGAR score of the neonate at first minute of birth was 8.90±1.07, 8.11±0.89 and 7.69±0.48 in group A, group B and group C respectively. No significant difference was found in birth weight of the newborn babies in between the groups of the mothers. However, the difference was found significant in between A & B ($p<0.01$) and A & C ($p<0.001$), in case of APGAR score.

Key words: Maternal anaemia, gestational age, neonatal outcome, birth weight, APGAR score.

Introduction

Anaemia is an important risk factor in pregnancy. Anaemia in pregnancy is associated with an increased incidence of both maternal and foetal morbidity and mortality[1]. Reports from India indicate that 16% of all maternal deaths are attributable to anaemia[2]. Maternal mortality due to anaemia in Bangladesh was reported 4% in 1991[3,4]. Maternal anaemia also contributes to an increase in perinatal mortality, low birth weight, and foetal wastage[4]. 87% of women have nutritional anaemia in pregnancy due to iron deficiency[5,6]. In global perspective, iron deficiency is the most common nutrient deficiency in the world, and the most common cause of anaemia in pregnancy linked to reduced iron reserves, which may exist prior to conception[7]. The prevalence of iron deficiency anaemia in pregnancy varies among countries. In Bangladesh, of all pregnant women, about 50% to 59% are anaemic[8]. In general, it is low during the first trimester and increases during the second trimester. About 50% of iron deficiency anaemia occurs after the 25th gestational week[4].

According to the World Health Organization (WHO), a level of haemoglobin below 11 gm/dl during pregnancy is an indicator of anaemia. However, in South Asia, anaemia is diagnosed when the lowest antenatal haemoglobin is <10g/dl. Antenatal anaemia is diagnosed when the lowest haemoglobin level falls below 10g/dl at any time before delivery[9]. In pregnancy, anaemia has a significant effect on placenta. The ability of the

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foetus to grow in the uterus is presumed to be a function of the placental surface area available for the exchange of respiratory gases and nutrients[9,10]. Thus, anaemia has a great impact on health of foetus as well as mother. The present study was aimed-

i) to correlate the status of maternal anaemia with maternal age, parity, gestational age, and
ii) to see the foetal outcome e.g. neonatal weight and APGAR score.

Methods

A prospective study was carried out in the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital and Maternal and Child Health Training Institute (widely known as Azimpur Maternity), Dhaka, from August 2005 to June 2006 on 60 Bangladeshi women, of which 20 having normal uncomplicated pregnancies were considered as control group or group A, another 27 with mild anaemia were considered as group B and 13 with moderate anaemia were considered as group C, where the patients were not anaemic previously. Severe anaemic mother were considered as group D, but was not found during the period of collection of placenta for this study. The mothers were selected as who were suffering from antenatal anaemia i.e. having heamoglobin level <10 gm/dl (mild, if <10 gm/dl; moderate, if <8 gm/dl; and severe, if <6 gm/dl) and control i.e. having heamoglobin level ≥10 gm/dl[11]. Data of perinatal outcome were collected from the delivery notes (either normal vaginal delivery or Caesarean section), conducted in the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital and Maternal and Child Health Training Institute, Dhaka. Selection of the control and the study group was done on the basis of diagnosis by a registered physician or from the hospital record.

Common inclusion criteria

1. Pregnant women between 35 and 40 weeks of gestation having clinical anaemia.

Common exclusion criteria

The following cases were excluded from this study:

1. A known case of diabetes mellitus prior to pregnancy
2. Gestational diabetes mellitus (GDM)
3. Rh-negative mother
4. Preeclamptic toxaemia (PET)
5. Antepartum haemorrhage (APH)
6. Eclampsia
7. A positive case for HBsAg
8. A positive case for VDRL

Statistical processing of data

The collected data were processed and statistical analyses were done by ANOVA (multiple comparison). All the statistical analyses were done by using the SPSS 11.0 version.

Table I: Haemoglobin level in different groups

Groups	No. of subjects (n)	Blood Haemoglobin Level (gm/dl)
A	20	10.50 (12-10)
B_1	27	9.20 (8-9.2)
B_2	13	7.20 (6.5-7.8)

Group A: Control
Group B_1: Case (mild anaemic)
Group B_2: Case (moderate anaemic)
Figures in parentheses indicate range.

Results

The table-I shows that the mean haemoglobin level in control group was 10.5 gm/dl. Mean haemoglobin level in mild and moderate groups was as 9.2 gm/dl and 7.2 gm/dl respectively.

The table-II shows that the mean±SD age of the mothers were 23.65±3.83, 27.26±4.93 and 25.85±4.62 years in groups A, B and C respectively. Mean difference in age between group A & B was statistically significant ($p<0.01$). Besides, the mean±SD number of gravidity was in 1.65±0.67, 2.15±0.72 and 2.69±1.03 in A, B and C respectively. The difference was statistically highly significant in between A and C ($p<0.001$) and also significant in between A & B and B & C ($p<0.05$). Moreover, the mean±SD gestational age of the mother was 38.65±0.88, 37.37±1.01 and 37.15±1.28 weeks in group A, group B and group C respectively and the difference was statistically significant between A & B and A & C ($p<0.001$).

The table-III shows that the mean±SD birth weight of the neonate was 3.09±0.30, 2.99±0.16 and 2.95±0.21 Kg. in group A, group B and group C respectively. The mean difference in birth weight between groups A, B, and C was not significant. Besides, the mean±SD APGAR score of the neonate at first minute of birth was 8.90±1.07, 8.11±0.89 and 7.69±0.48 in group A, group B and group C respectively and the difference was significant between A & B ($p<0.01$) and A & C ($p<0.001$).

Table II: Comparison of maternal age, gravidity and gestational age in between different study groups

Group (n)	Age (in years) Mean±SD	Gravidity (number) Mean±SD	Gestational age (in weeks) Mean±SD
A (20)	23.65±3.83 (19.0-32.0)	1.65±0.67 (1.0-3.0)	38.65±0.88 (37.0-40.0)
B_1 (27)	27.26±4.93 (19.0-35.0)	2.15±0.72 (1.0-4.0)	37.37±1.01 (36.0-39.0)
B_2 (13)	25.85±4.62 (21.0-35.0)	2.69±1.03 (1.0-5.0)	37.15±1.28 (35.0-40.0)
P value			
A vs B_1	<0.01**	<0.05*	<0.001***
A vs B_2	>0.10ns	<0.001***	<0.001***
B_1 vs B_2	>0.10ns	<0.05*	>0.50ns

*Figures in parentheses indicate range. Statistical analysis done by ANOVA (multiple comparison), ns = not significant, */**/*** = significant*

Table III: Comparison of neonatal birth weight and APGAR score in between different study groups

Group (n)	Birth weight (Kg) Mean±SD	APGAR score Mean±SD
A (20)	3.09±0.30 (2.5-3.5)	8.90±1.07 (7.0-10.0)
B_1 (27)	2.99±0.16 (2.5-3.3)	8.11±0.89 (7.0-10.0)
B_2 (13)	2.95±0.21 (2.5-3.2)	7.69±0.48 (7.0-8.0)
P value		
A vs B_1	>0.10ns	<0.01**
A vs B_2	>0.10ns	<0.001***
B_1 vs B_2	>0.50ns	>0.10ns

*Figures in parentheses indicate range. Statistical analysis done by ANOVA (multiple comparison), ns = not significant, **/*** = significant.*

Discussion

A fall in the haemoglobin concentration is a late consequence in iron deficiency anaemia[10]. Maternal age and gravidity influence the iron status in pre-conception period. According to the present study, increased number of gravidity is a contributing factor for anaemia in pregnancy. Lao and Wong (1997)[12] observed that anaemic mothers were significantly younger, but their number of gravidity had no significant difference. The latter observation has a contradiction with the present study. However, our observation is similar to the findings of Singla et al. (1978)[13].

Correlating anaemia and gestational age, Thangaleeta and Vijayalaksmi (1994)[7] stated that the risk of preterm delivery increase with the intensity of anaemia. Lao and Wong (1997)[12] found that the gestational age in anaemic group was less than the control group, which is similar to the findings of the present study. However, Singla et al. (1978)[13] found no significant difference in gestational age in between anaemic and control unlike the present study.

Proper fetal growth depends on adequate exchange across the placenta[6,9]. Teasdale (1980)[14] described that two stages are clearly distinct in the development of the human placenta. The first stage of growth, which terminates at approximately 36 weeks of gestation, is characterized by a progressive increase in parenchymal component. The second stage, which extends from 36 weeks to term, is called the maturation stage, as because it is characterized by substantial fetal growth without any increase in placental functional tissues. Any interruption e.g. anaemia, ischaemia, in placental growth or placental circulation may compromise the growth and well being of the foetus[15]. Breymann (2002)[1] observed that in hypoxic condition like anaemia, foetal birth weight is reduced due to blood flow and oxygen supply. Levy et al. (2005)[16] showed that higher rates of preterm deliveries (<37 weeks gestation) and low birth weight (<2500 gm) were found among mother with anaemia compared to the non-anaemic group. Similar was the findings of Singla et al. (1978)[13]. Hence, the result of the present study is contradictory with the findings of Breymann[1], Singla et al.[13] and Levy et al[16]. However, Lao and Wong (1997)[12] found no significant difference in foetal birth weight in between anaemic and control groups, which is similar to the observation of the present study.

Reshetnikova et al. (1995)[17] found no significant difference in APGAR score in between the study groups. This is contradictory to the present study. Thangaleeta and Vijayalaksmi (1994)[7] found APGAR score was higher in control group (>8) as compared to anaemic group. The present study also shows a higher APGAR score in control as compared to mild and moderate anaemic groups. This signifies the status of well being of the foetus in anaemic and normal condition of the mother.

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References

1. Breymann C. Iron deficiency and anaemia in pregnancy: modern aspects of diagnosis and therapy. *Blood Cells, Molecules, and Diseases* 2002; **29(3)**: 506-16. http://dx.doi.org/10.1006/bcmd.2002.0601. http://dx.doi.org/10.1006/bcmd.2002.0599. http://dx.doi.org/10.1006/bcmd.2002.0597. PMid:12547241.
2. Prema K, Neela Kumari S, Ramalakshmi BA. Anaemia and adverse obstetric outcome. *Nutr Rep Int* 1981; **23**: 637-43.
3. Seshadri S. Nutritional anaemia in South Asia. In: Gillespie S. ed. *Malnutrition in South Asia*: *a regional profile*. UNICEF Regional Office for South Asia, Kathmandu; 1997: Publication No. 5, p. 75.
4. Hyder SM, Persson LA, Chowdhury M, Lönnerdal BO, Ekström EC. Anaemia and iron deficiency during pregnancy in rural Bangladesh. *Public Health Nutr* 2004; **7(8)**: 1065-70. http://dx.doi.org/10.1079/PHN2004645. PMid:15548345.
5. Medappa N. ed. Iron absorption and its implications on strategies to control iron deficiency anaemia. *ICMR Bull* 2000; **30(2)**: 1-7.
6. Gambling L, Mcardle HJ. The effect of nutrient deficiency on fetal development, pregnancy outcome and adult metabolism. *Arch Tierz* 2003; **46 (SI 2)**: 130-41.
7. Thangaleeta T, Vijayalaksmi P. Impact of anaemia in pregnancy. *Ind J Nutr Diet* 1994; **31(9)**: 251-6.
8. Helen Keller International, Bangladesh. Anaemia is a severe public health problem in pre-school children and pregnant women in rural Bangladesh. *Nutritional Surveillance Project Bull* 2002; **10**: 1-4.
9. Rao KB. Safe motherhood. In: Ratnam SS, Rao KB, Arulkumaran S. eds. *Obstetrics and Gynaecology for Postgraduation.* 2nd ed. Chennai: Orient Longman Ltd; 1999: p. 2-3.
10. McLintock C, Repke JT, Bucklin B. Hematologic disease in pregnancy. In: Powrie R, Greene M, Camann W. eds. *de Swiet's Medical disorders in obstetric practice.* 5th ed. USA: Blackwell; 2010: p. 48-81. http://dx.doi.org/10.1002/9781444323016.ch2.
11. Amin MR, Reza S. *Laboratory manual for practical physiology and biochemistry.* 1st ed. Dhaka: Medicogist; 2005: p. 396-406.
12. Lao TT, Wong WM. Placental ratio — its relationship with mild maternal anaemia. *Placenta* 1997; **18(7)**: 593-6. http://dx.doi.org/10.1016/0143-4004(77)90015-7.
13. Singla PN, Chand S, Khanna S, Agarwal KN. Effect of maternal anaemia on the placenta and the new born infant. *Acta Paediatr Scand* 1978; **67(5)**: 645-8. http://dx.doi.org/10.1111/j.1651-2227.1978.tb17816.x.
14. Teasdale F. Gestational changes in the functional structure of the human placenta in relation to fetal growth: a morphometric study. Am J Obstet Gynecol 1980; 137(5): 560-8. PMid:7386550.
15. Zamudio S, Baumann MU, Illsley NP. Effects of chronic hypoxia in vivo on the expression of human placental glucose transporters. *Placenta* 2006; **27(1)**: 49-55. http://dx.doi.org/10.1016/j.placenta.2004.12.010. PMid:16310037.
16. Levy A, Fraser D, Katz M, Mazor M, Sheiner E. Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. *Eur J Obstet Gynecol Reprod Biol* 2005; **122(2)**: 182-6. http://dx.doi.org/10.1016/j.ejogrb.2005.02.015.
17. Reshetnikova OS, Burton GJ, Teleshova OV. Placental histomorphometry and morphometric diffusing capacity of the villous membrane in pregnancies complicated by maternal iron-deficiency anemia. *Am J Obstet Gynecol* 1995; **173(3)**: 724-7. http://dx.doi.org/10.1016/0002-9378(95)90330-5.