

Effect of Antenatal Anaemia of the Mother on the Volume of the Placenta

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ABSTRACT

In pregnancy, anaemia has a tremendous effect on the placenta. Maternal anaemia increases the volume of the placenta. Foetal hypoxaemia usually develops as a consequence of maternal anaemia, due to lower haemoglobin concentration, and stimulates placental growth.

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, Bangladesh, from August 2005 to June 2006 on 60 Bangladeshi women who were within 35-40 weeks of gestation. Among them, 20 had normal uncomplicated pregnancies (considered as control group or group A) and another 27 had pregnancies with mild anaemia (considered as group B₁) and 13 had pregnancies with moderate anaemia (considered as group B₂). Severe anaemic (considered as group B₃) mother was 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 haemoglobin 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 haemoglobin level ≥10 gm/dl. The placentae of the mothers were collected after delivery and their volume were measured by water displacement method and recorded.

The present study showed that mean volume of placenta in group A, group B₁ and group B₂ were 444.00±38.37, 472.59±17.34 and 485.38±24.62 ml respectively. The difference between group A & B₁, and A & B₂ were found statistically significant.

The volume of the placenta was found to increase with ascending grade of antenatal anaemia of mothers in comparison to that of normal pregnancy.

Key Words: Antenatal Anaemia, Maternal Anaemia, Volume of Placenta

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 mortality¹. According to the World Health Organization (WHO), a level of haemoglobin below 11 gm/dl during pregnancy is an indication of anaemia. However, in South Asia, usually anaemia is recognized, if haemoglobin concentration is <10g/dl of blood. Antenatal anaemia is diagnosed, when haemoglobin level falls below 10g/dl at any time

before delivery². In pregnancy, anaemia has a tremendous effect on placenta. Placental volume has been taken as an indicator of placental function³. Maternal anaemia causes the development of a big placenta⁴. An increase in placental volume in case of maternal anaemia has frequently been interpreted as evidence of compensatory hypertrophy for reduced oxygen supply. It is possible in the way that foetal hypoxaemia develops due to lower haemoglobin concentration in placental circulation, usually stimulates placental growth^{5,6}. Babies born with a disproportionately large placenta are at greater risk

for hypertension in later life⁷. Sarneen et al 1983 observed that the structural and functional changes in placenta induced by anaemia in mother are likely to have adverse effects on delicate systems of developing foetus⁸. Hence, it bears a great importance to study the extent of changes in volume of the placenta in different categories of anaemic mothers. The present study was aimed to correlate the difference between volume of the placenta of different grades of anaemic and that of normal pregnant women in Bangladesh.

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, Bangladesh, from August 2005 to June 2006 on 60 Bangladeshi women, of which 20 having normal uncomplicated pregnancies (considered as control group or group A) and another 27 from pregnancies with mild anaemia (considered as group B₁) and 13 from pregnancies with moderate anaemia (considered as group B₂), where the patients were not anaemic previously. Severe anaemic (considered as group B₃) mother was not found during the period of collection of placenta for this study. Pregnant women were selected between 35-40 weeks of gestation. Selection of the control and the study group was done on the basis of diagnosis by a registered physician or from the hospital record. The mothers were selected as who were suffering from antenatal anaemia i.e. having haemoglobin 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 haemoglobin level ≥10 gm/dl⁹. Each of the placentae was collected in a labeled plastic bag within 6 hours of delivery (either normal vaginal delivery or Caesarean section), conducted in the Dhaka Medical College Hospital and Azimpur Maternity, Dhaka. The placentae were brought to the Department of Anatomy, Dhaka Medical College, Dhaka, for further study.

Measurement of the volume of the placenta:

The volume of the Placenta was measured by water displacement method, according to Brown et

al. (1986)¹⁰. The placenta was immersed in water filled bucket. The volume of water poured out of the bucket was measured in a graduated cylinder, marked in millimeter (ml).

Common exclusion criteria:

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

Exclusion criteria were followed meticulously as per hospital records and investigations.

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.

Result

The present study shows that mean volume of placenta in group A, group B₁ and group B₂ were 444.00±38.37, 472.59±17.34 and 485.38±24.62 ml respectively. The difference between group A & B₁, and A & B₂ were found statistically significant (Table-I, Fig.1).

Table I: Volume of the placenta in different study groups

Group (n)	Volume of placenta (in ml) Mean±SD	P value
A (20)	444.00±38.37 (370-500)	A vs B ₁ <0.001***
B ₁ (27)	472.59±17.34 (430-505)	A vs B ₂ <0.001***
B ₂ (13)	485.38±24.62 (460-550)	B ₁ vs B ₂ >0.10ns

Group A : Control, Group B₁ : Mildly anaemic, Group B₂ : Moderately anaemic

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

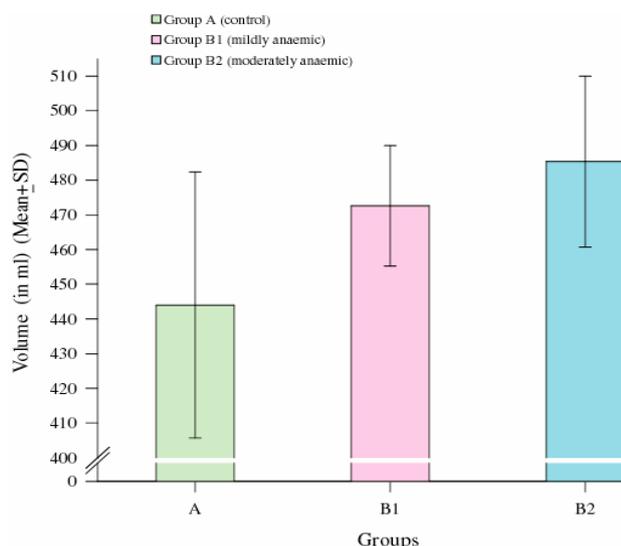


Fig 1: Comparison of volume of placenta in normal and anaemic pregnancy

Discussion

Teasdale (1980)¹¹ studied with 17 placentae collected in between mid-gestation and term in normal pregnancy and observed 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 components. The second stage, which extends from around 36 weeks to term, is called the maturation stage, as because it is characterized by substantial foetal growth but without any increase in placental functional tissues. Aherne and Dunnill (1966)¹² showed that the total placental volume was gradually increased along with the gestational age ranged from 170 ml at 28 weeks to 723 ml at term. They also observed that there was considerable scatter throughout the trimester. Beischer et al. (1970)¹³, Agboola (1973)¹⁴ observed that the maternal anaemia was associated with placental hypertrophy. Kalra et al. (1983)⁸ were performed a histometric study of placenta in anaemic pregnancy. They observed that all anaemic groups revealed statistically significant in increase in the number of hypovascular villi. Huang et al. (2000)¹⁵ worked

with a stereological study of anaemic and nonanaemic placenta and found that the total volume of the intervillous space, branch villi significantly increased in the anaemic group. The findings of the present study are similar to the findings of Beischer et al.¹³, Agboola¹⁴, Kalra et al.⁸ and Huang et al.¹⁵. Placental hypertrophy associated with maternal anaemia, which is probably a compensatory physiological response to ensure adequate oxygen supply to the fetus. Thus, the placental development influenced by anaemia and subsequent hypoxia, causes abnormal trophoblast invasion and release of hypoxia inducible factor (HIF) in anaemia¹. Singla et al. (1978)¹⁶ showed that placental volume in anaemic mothers were significantly less than those in the mothers without anaemia. However, this is contradictory with the findings of the present study and may be due to variation in procedure.

Conclusion

The present study shows that the volume of the placenta was found to increase with different grade of antenatal anaemia of mothers in comparison to that of normal pregnancy in Bangladesh. Maternal anaemia is very common in developing countries like Bangladesh. Further studies with larger sample and high technical back up are recommended especially to find out the molecular basis of such causation.

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