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Effect of maternal anaemia on cord blood haemoglobin

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Abstract
Introduction: Anaemia is the commonest medical disorder in pregnancy affecting 30-50% of pregnant. Of these iron deficiency is responsible for more than 90% of cases. Maternal anaemia has several deleterious effects on the health of mother and fetus. The cord blood shows a linear relationship with maternal hemoglobin and mothers who have anaemia are more likely to deliver anaemic babies. Cause of anaemia in developing countries is multifactorial. Most common causes of anaemia in developing countries are nutritional, hookworm infestations, repeated pregnancy and haemorrhage.
Material and Methods: The study was conducted at Department of Physiology and Department of Obstetrics & Gynaecology, Integral Institute of Medical Sciences & Research, Lucknow. The study included 100 pregnant mothers (as per calculated sample size). After delivery of the baby, blood sample was collected in an EDTA bottle from the umbilical cord at the time of birth of the baby and blood was sent for hemoglobin analysis. Blood was analyzed using fully automated haematoanalyzer named Beckman Coulter. Written informed consent was taken from parents.
Objective: To study the effect of maternal anaemia on cord blood haemoglobin.
Result: There is a linear relationship between maternal and cord haemoglobin.

Keywords: Maternal anaemia, cord blood haemoglobin

Introduction
Anaemia is the commonest medical disorder in pregnancy affecting 30-50% of pregnant. Of these iron deficiency is responsible for more than 90% of cases. The incidence of folate deficiency is around 5% and this is almost always the cause of megaloblastic anaemia in pregnancy, with vitamin B12 deficiency being rare [1]. Maternal anaemia has several deleterious effects on the health of mother and fetus [2]. The cord blood shows a linear relationship with maternal hemoglobin and mothers who have anaemia are more likely to deliver anaemic babies [3]. Umbilical cord blood count at birth shows an increase in haemoglobin (Hb), haematocrit (Hct), mean corpuscular volume (MCV), leucocyte count (LC), reticulocyte count and nucleated RBC with presence of associated immature white blood cells. Cause of anaemia in developing countries is multifactorial. Most common causes of anaemia in developing countries are nutritional, hookworm infestations, repeated pregnancy and haemorrhage.
Maternal anaemia is a major public health problem in developing countries including India. The consequences of maternal anaemia are negative and include poor pregnancy outcome, cardiovascular diseases, cognitive disabilities and decline in the work capacity [2, 3]. The reduction in working capacity is proportional to severity of anaemia and the decline is more in severe anaemia [4]. It is characterized by low haemoglobin concentration. It affects people from low, middle and high income countries. It is a major risk factor for maternal and fetal mortality and morbidity [5, 6].
Anaemia is a condition in which the number of red blood cells and their oxygen carrying capacity is reduced. The most common types of anaemia are iron deficiency anaemia, Thalassemia, Aplastic anaemia, Hemolytic anaemia, Sickle cell anaemia, Pernicious anaemia, Fanconi anaemia. Iron deficiency is the most prevalent cause of anaemia, which is usually due to chronic blood loss caused by excessive menstruation, increased demand for iron, such as fetal growth in pregnancy [7]. Iron deficiency anaemia can lead to perinatal loss, prematurity and low birth weight babies. It also adversely affects the body's immune response.
Anaemia can occur at any age and affect either gender, although it is more prevalent in pregnant women and young children [8]. The major risk groups for iron deficiency include women of childbearing age, pregnant women, and lactating postpartum women. Iron deficiency anaemia results in impaired cognitive and motor development in children and decreased work capacity in adults. The effects are most severe in infancy and early childhood.

Iron-deficiency anaemia affects nearly 1 billion people [9]. In 2013, anaemia due to iron deficiency resulted in about 183,000 deaths – down from 213,000 deaths in 1990 [10]. It is more common in women than men, during pregnancy, and in children and the elderly [11]. Anaemia increases costs of medical care and lowers a person's productivity through a decreased ability to work [6].

Materials and Methods

The study included 100 pregnant mothers (as per calculated sample size). After delivery of the baby, blood sample was collected in an EDTA bottle from the umbilical cord at the time of birth of the baby and blood was sent for hemoglobin analysis. Blood was analyzed using fully automated haematoanalyzer named Beckman Coulter. Newborn birth weight was measured. Written informed consent was taken from parents.

Inclusion Criteria

1. Full term pregnant females (37-41weeks).
2. Women with Singleton pregnancies.
3. Primi or multi parity.
4. Pregnant mothers aged 18-45years.

Exclusion Criteria

1. Multiple Pregnancies (e.g.TWIN)
2. Newborns with congenital malformations.
3. Newborns born to mother complicating with antepartum hemorrhage, eclampsia.
4. Chronic diseases e.g- diabetes mellitus, heart disease, kidney disease, lung disease and hypertension.
5. Birth asphyxia.
6. HIV infection.
7. Those who have not given consent.

Statistical Analysis

The data was analyzed using Statistical Package for Social Science software (21.0) IBM. Statistical tests unpaired t test and Chi-Square test were applied. P value<0.05 was taken as significant.

Observations & Results

The present Study included 100 female pregnant Subjects, attending OPD's of the IIMS&R, Integral University, Lucknow, Uttar Pradesh

Category	Haemoglobin level (Hb)g/dl	Hemoglobin level of Mothers (Mean ±SD)	No. of mothers	cord blood Hb (Mean ±SD)	P value

Results show that out of 100 subjects, 54(54%) were anaemic and 46(46%) were non anaemic. In this present study, out of 100 pregnant females, 28(28%) mothers had mild anaemia (haemoglobin between 10-10.9g/dl), 22 (22%) had moderate anaemia (haemoglobin between 9.9-7g/dl) and only 4 (4%) had severe anaemia and 46 (46%) mothers had normal haemoglobin level (>11g/dl).

Cord blood Hb level of anaemic group in different grades of anaemia and non-anaemic mothers. In mildly anaemic mothers mean cord blood Hb level was 16.0±0.69, moderately anaemic mothers had mean Hb level as 15.4±1.15, in severely anaemic mothers mean cord blood Hb level was 12.98±0.69 and that of non anaemic group mothers was 17.07±0.76. The difference was statistically non-significant at p=0.0001.The Cord blood haemoglobin value reduces as the haemoglobin level of the mother reduces, but the reduction is not statistically significant.

Table 1: Cord Blood Hb levels in mothers with anaemia

Category	Hb level (gm/dl)	Maternal Hb (Mean ± SD)	No of Cases	Cord blood Hb (Mean ± SD)	P value
Mild	10-10.9	10.55 ±0.24	28	16.0 ± 0.69	0.0001
Moderate	9.9-7	9.2 ±0.72	22	15.4± 1.15	0.0001
Severe	6.9-4	6.45± 0.34	4	12.98± 0.69	0.0003
Normal	>11	12.02± 0.70	46	17.07±0.76	0.0001

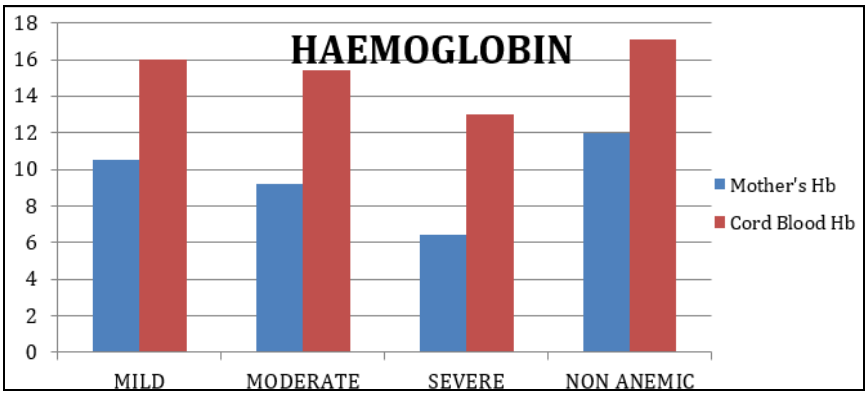

Fig 1: Correlation between Maternal and Cord blood Hb levels in different grades of anaemic and non-anaemic mothers.

Conclusion and Summary

Infants are not iron deficient at birth due to active transport of iron across placenta even when maternal iron stores are low. There is not much significant effect on cord blood haemoglobin and newborn birth weight if the mother is only mild to moderately anemic. Maternal anaemia should be very severe enough to affect the fetal health. Severe anaemia is associated with poor fetal outcome. All women should be given advice regarding diet in pregnancy with details of foods rich in iron along with factors that may promote or inhibit the absorption of iron. This should be backed up with written information. Dietary changes alone are not sufficient to correct an existing iron deficiency in pregnancy and iron supplements are necessary [12, 13]. Foods rich in vitamin C (e.g., fruits, vegetables and juice) are recommended beyond six months to increase iron absorption.

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