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Effect of severe maternal anaemia on neonatal outcome

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Abstract
Introduction: Anaemia in pregnancy is one of the most common public health issues in developing countries, affecting approximately 60% of pregnant woman worldwide. Severe anemia in pregnant women is associated with an elevated risk of maternal and perinatal mortality. The present study aimed at determining the impact of severe anaemia during pregnancy on neonatal outcomes in a tertiary care hospital.
Methods: This was a cross sectional study conducted at tertiary care teaching hospital over a period of six months. A simple random sampling technique was used. All women admitted for delivery and having a haemoglobin level less than 7 gm % were included in the study. Control subjects were selected from the every second woman admitted for delivery and having matching criteria age, parity, and period of gestation and whose haemoglobin level is more than 11 gm %.Neonatal outcomes were analysed.
Results: A total of 188 participants (94 study and 94 control) were included in the study. All the participants were categorized into two groups based on haemoglobin levels. It is evident that the incidence of low birth weight babies were more (42.55%) in the severely anemic group and very minimal in controls. complications in study group and control group. Preterm birth was observed commonly in study participants and accounted for 18.09%. In our study second common complication was ENND (7.4%).
Conclusion: Low birth weight and pre term birth was found to be high in our study participants as compared to controls. Severe anemia in pregnancy may have adverse effects for the newborn and should be treated or prevented early in pregnancy.

Keywords: Severe anaemia, Low birth weight, pre term birth

Introduction
Anaemia is defined by WHO as "haemoglobin level less than 10gm Spercentage in pregnancy. It is divided into three degree *viz* mild degree (9-10.9 gm %), moderate degree (7.0- 8.9 gm %) and severe degree (less than 7.0 gm %) [1] Most of the pregnant women presenting to the antenatal clinics have iron deficiency anaemia. Along with physiological causes, social causes are also responsible for anaemia during pregnancy like early age at marriage, teenage pregnancy, ill spacing between two pregnancies and poor supplementation of iron, malnutrition, endemic diseases like malaria and worm infestations [2].
Globally the prevalence of anaemia is 51% and is as high as 87.5% amongst pregnant women in India. Anaemia, the most preventable cause that can improve perinatal health [3]. Although adolescent pregnancies have often been reported to be associated with adverse pregnancy outcomes such as preterm birth, low birth weight, small for gestational age infant and higher rates of neonatal and post-neonatal mortality, the impact of anemia on adverse pregnancy outcomes in adolescent pregnant is controversial. Some studies found significant associations whereas others didn't between the low Hb concentration and adverse obstetric and neonatal outcomes [4, 5].
Severe anemia is of particular concern because it poses a significant health and mortality risk. Pregnant women and young children (6-24 month of age) are the 2 groups at highest risk. Severe anemia in pregnant women is associated with an elevated risk of maternal and perinatal mortality [6].
The present study aimed at determining the impact of severe anaemia during pregnancy on neonatal outcomes in a tertiary care hospital.

Materials and Methods
This was across sectional study conducted in the department of obstetrics and gynecology, Mc

Gann teaching district hospital, Shimoga over a period six months. A simple random sampling technique was used. All women admitted for delivery and having a haemoglobin level less than 7 gm % were included in the study. Control subjects were selected from the every second woman admitted for delivery and having matching criteria age, parity, and period of gestation and whose haemoglobin level is more than 11 gm %.

The study excluded women who reported that they will relocate/move after delivery, pregnant women who had history of blood transfusion (within the previous 2 weeks), antenatal cases with other associated diseases, cases of bad obstetric history for any other reason and those who did not give consent. Women were informed about the study aims and follow up schedule and those agreeing to participate gave a signed consent. The information collected was, social demographic characteristics, economic characteristics and reproductive health history. After delivery, detailed neonatal examination and neonatal complications were noted. Neonatal outcomes were low birth weight (which was measured within the 24 hours after birth using digital infant scale), gestational age at birth (full weeks were calculated to describe the gestational age), small for gestational age infant (weight less than the tenth percentile for gestational age), APGAR score (5 minute <7) and NICU admission (before discharge from the hospital for any reason).

Results

A total of 188 pregnant women were included in the study. All the participants were categorized into two groups based on haemoglobin levels. Group I comprised of pregnant women whose haemoglobin levels less than 7 gms % and group II comprised of pregnant women whose haemoglobin levels were more than 11 gms %.

In our study, majority of study subjects belonged to the age group of 20-30 years in both study and control group which accounted for 83% and 84% respectively. The minimum age in the entire study group was 18 years and the maximum age was 36 years. All study participants were belonged to lower socioeconomic group (100%). In control group, 77 (81.91%) belonged to lower socioeconomic group and remaining were from middle socioeconomic group 17 (18.09%). Majority of participants in study group were from rural area which accounted for 64 (68.1%). In control group, majority of participants were from urban which accounted 74 (75.5%). In study group, preponderance of illiteracy was reported and accounted for 60.64% followed by primary and secondary education 23.04% and 14.90% respectively. Unbooked participants were found to be higher in study group (84%). In study group, 34.1% participants were primigravidae. In study population, 8.5% patients had hemoglobin level below 4 gms % (Table 1).

Table 1: Socio demographic data of study participants and control group

Variables	Group I (n=94)	Group II (n=94)
Age in years		
<20	9(9.6%)	9(9.57%)
20-30	78(83%)	79(84.04%)
31-40	7(7.4%)	6(6.3%)
Socio economic status		
Lower	94(100%)	77(81.91%)
Middle	0(0%)	17(18.09%)
Residence		
Urban	30(31.9%)	74(75.5%)
Rural	64(68.1%)	24(24.5%)
Literacy		
Illiterate	57(60.64%)	53(56.39%)
Primary	23(23.04%)	25(25.60%)
Secondary	14(14.90%)	9(9.5%)
Graduate and above	1(1.07%)	7(7.44%)
Registration		
Booked	15(16%)	76(80.85%)
Unbooked	79(84%)	18(19.15%)
Obstetric score		
Primi	32(34%	71(75.53%)
Multi	62(66%)	23(24.47%)
Hemoglobin (g %)		
4	8(8.5%)	NA
4-7	86(91.5%)	NA

Table 2 shows the symptoms distribution in study and control group. Facial edema (4.3%) and loss of appetite (4.3%) was found to be the common symptoms in group I subjects. Whereas in control group, facial edema and loss of appetite was accounted for 0% and 1.1% respectively. Cough (1.1%), burning micturation (1.1%) and gastritis (1.1%) was reported in both groups.

Table 2: Symptoms distribution in two groups of patients studied

Symptoms	Group I	Group II
Loss of appetite	4(4.3%)	0(0%)
Bleed PV	2(2.1%)	0(0%)
Cough	2(2.1%)	2(2.1%)
Adeno Ca CX	1(1.1%)	0(0%)
Anasarca	1(1.1%)	0(0%)
Burning micturition	1(1.1%)	1(1.1%)

Epistaxis	1(1.1%)	0(0%)
Facial edema	4(4.3%)	1(1.1%)
Fever	1(1.1%)	0(0%)
Gastritis	1(1.1%)	1(1.1%)
Leak	1(1.1%)	0(0%)
Loss of wt	1(1.1%)	0(0%)
Pancytopenia	1(1.1%)	0(0%)
Passing of worms	1(1.1%)	0(0%)
Weakness	1(1.1%)	0(0%)

Table 3 explains the distribution of birth weight in study and control group. It is evident from the table that the incidence of low birth weight babies were more (42.55%) in the severely anemic group and very minimal in controls.

Table 3: Birth weight distribution in the study groups

Birth weight (Kg)	Group I	Group II
< 2.5	40(42.55%)	4(4.94%)
2.5 - 3	34(36.17%)	81(86.17%)
> 3	2(2.12%)	9(9.57%)

Table. 4 depicts complications in study group and control group. Preterm birth was observed commonly in study participants and accounted for 18.09%. But in control group pre term birth was observed in 5 participants and accounted for 5.32%. In our study second common complication was ENND (7.4%). Whereas in control group, it was 2.1%.

Table 4: Neonatal complications and fetal outcome in study and control group

Complications	Group I	Group II
Preterm birth	17 (18.09%)	5(5.32%)
IUGR	5(5.32%)	1(1.1%)
Still birth	1(1.1%)	1(1.1%)
Sepsis	1(1.1%)	0(0%)
ENND	7(7.4%)	2(2.1%)
IUFD	9(9.6%)	0(0%)
Twin 1 end	1(1.1%)	0(0%)
Apgar		
<7	82(87.2%)	98(100%)
>7	12(12.8%)	0(0%)

Discussion

Studies on maternal anaemia and adverse reproductive outcomes have produced inconsistent findings. This is largely mitigated by the fact that maternal anaemia has been analysed as an aggregated exposure such as 'any anaemia during pregnancy'. It is likely that anaemia diagnosed early in pregnancy may exert stronger associations on pregnancy outcomes than anaemia diagnosed later in gestation [7].

Our study confirms that anaemia is pervasive among pregnant women especially in developing countries. In particular, women with severe anaemia have worse fetal (stillbirth) and neonatal outcomes. Demographic variables such as educational level, maternal age, parity, residence (urban/rural) and access to hospital delivery may also be perplex in our study, as they were also associated with severe anaemia. This is in comparision to the study conducted by Parks *et al.* [8].

If education level is a marker for socio-economic status, then anaemia is likely more prevalent among women with a lower socio-economic standing. Associated diseases such as tuberculosis, HIV, and malnutrition are also known to be more predominant in anaemic group, thus anaemia may be a marker for other co-morbidities in pregnancy. Therefore the diagnosis of anaemia in a pregnant woman may prompt evaluation and testing for other issues which, if untreated, could drastically alter the outcomes of the pregnancy for both the mother and the baby [8].

In our study, Pre term birth was found to be the common complication in severe anaemia. Preterm birth remains one of the greatest causes of perinatal mortality and morbidity worldwide [7]. Preterm birth may occur through multiple pathways, with maternal infection, hypoxia and oxidative stress being the three major postulated biological mechanisms [9]. The prospective cohort study from China, found anaemia in early pregnancy to be associated with increased risk for preterm PROM, whereas anaemia in late pregnancy was associated with reduced risk for spontaneous preterm labour [7].

In our study, second common complication observed was IUGR. As per the study conducted by Rohini *et al*., the incidence of IUGR and LBW as 6.7%, and 28.3% respectively with no statistically significant association with anemia (Hb 8-10.9 gm%) [10]. Another study also opined that moderate to severe, but not mild; maternal anemia appears to have an association with SGA outcomes, but the findings have to viewed with caution due to the great heterogeneity of the studies [11]. Iron deficiency anaemia during pregnancy has been explored as a risk factor for stillbirth although the evidence is limited and conflicting [12]. A few studies from low-to-middle income countries have shown an association of maternal anaemia with stillbirth and perinatal death [13]. But others from high-income countries have not reported a significant association [14].

Conclusion: Low birth weight and pre term birth was found to be high in our study participants as compared to controls. Severe anemia in pregnancy may have adverse effects for the newborn and should be treated or prevented early in pregnancy.

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