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Study of correlation of neonatal low birth weight and maternal anemia in first, second and third trimester of pregnancy

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> Abstract --- Background : In Indian antenatal scenario , anemia in pregnant women is one of the commonest pathology routinely encountered. the most common cause of anemia during pregnancy is Iron deficiency anemia. Objective: To identify and analyze the real impact of Anemia during pregnancy individual all three trimesters of pregnancy in Indian pregnant women and its real effect on fetal weight. Materials and Methods: Retrospective evaluation of about 400 pregnant women who came for delivery during the study period February 2022 to May 2022 in Dhiraj hospital, Pipariya was done. The status and level of hemoglobin of these pregnant women during all three trimesters of pregnancy was done by proper detailed record of laboratory investigations and record of neonatal birth weight was done. Results: Among 400 Pregnant patients who had been delivered at Dheeraj Hospital, more than 72 % mothers were anemic in any of the three trimester of pregnancy. The rate of low birth weight baby was higher in these anemic mother than nonanemic mother in any of the three trimester. Conclusions: Considering the relationship between maternal anemia and LBW in the third trimester of pregnancy, anemia in third trimester can be used as a preventable factor for infant LBW.

*Keywords---*low birth weight, anemia in pregnancy, Iron deficiency, birth weight.

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Abbreviations : LBW= Low Birth Weight ; CS = Cesarean Section.

Introduction

Maternal anemia in pregnancy is very common and has numerous deleterious effects on the health of the pregnant mother as well of the fetus. The most common cause of Anemia during pregnancy remains Iron deficiency anemia, however rest causes like other nutritional deficiencies., parasitic infections and Hemoglobinopathies are less common. Iron supplementation to the pregnant women is the routine provision as public health measures, though surprisingly very minute information is there about the benefits of supplemental iron for the mother that impacts the fetus and birth weight and preterm or term delivery. Low birth weight and preterm delivery have been persistently linked to anemia in pregnancy.⁸⁰ During pregnancy level of hemoglobin tends to be on lower side as there is increased demand of iron for the growing fetus and placenta and increased red blood cell mass which is difficult to be compensated without supplementation and by routine poor nutritious diet lacking iron. This iron deficiency anemia in rural parts of India is further aggravated with other factors like childbearing at very early age, repeated pregnancies, short intervals between pregnancies and poor access to antenatal care and poor diet and nutrition access and knowledge especially in lower socioeconomical class. The consequences of iron deficiency anemia during gestation include increased risks of preterm delivery, lower birth weight and even perinatal mortality.¹¹ Reduced level of hemoglobin favor changes in placental angiogensis and which in turn causing decreased availability of oxygen to the fetus which results in intrauterine growth restriction and low birth weight. The purpose of this study is to evaluate effect of different trimester hemoglobin level or anemia on low birth weight neonate so that more caution or intensity of management of anemia can be weighed upon in particular trimesters.

Aim and Objective

Our study aimed to identify the real impact of maternal anemia in particular trimester on birth weight of the newborn. The aim of this observational study is to assess in which trimester of pregnancy, Iron deficiency anemia carries a greater risk of low birth weight (LBW) infants and preterm birth so that greater caution can be made in particular trimester or in earlier trimesters for the corrective measures of management.

Material and Method

The study was conducted in Obstetrics & Gynec department of Dheeraj Hospital, Smt. B. K. Shah Medical Institute & Reasearch Center ,Sumandeep Vidhyapeeth, Piparia, Vadodara ,Gujarat, India a tertiary care hospital in a rural area from February 2022 to May 2022. About 400 pregnant women who came for delivery during the study period were included in the study. This one is a retrospective study in which mothers eligible and not falling in any of the exclusion criteria only were included in this study after consent when they arrived for delivery . Hemoglobin in first, second and third , all the three trimesters was noted from their antenatal record. Any treatment given was noted and subsequent hemoglobin was recorded. After delivery Birth weight of the babies of these mothers were noted and correlated.

Inclusion Criteria

- Singleton pregnancy.
- Hemoglobin level done in all the three trimester,

Exclusion Criteria

- Hydrops fetalis
- Any Congenital anomaly in fetus
- Pregnancy with diabetes mellitus, Hypertension, Hemoglobinopathies or TORCH
- Still birth

In our study Measurement of Hemoglobin taken into consideration was done by cyanmethemoglobin method (Analyzer–Coulter) only. At least once measurement of the hemoglobin must be done in all the three trimesters. Rest of the management was as per the standards practiced in antenatal care. Birth weight of the newborn was recorded in kilograms using a digital scale.

Results

In this RCTs we had included 400 mothers .72% of the mothers were anemic in any of the three trimesters to start with. Higher percentage of anemia was seen in the first trimester and was lowest in the third trimester. 18% of the mothers remained anemic throughout all the trimesters. 28% of the mothers were non-anemic throughout.

 Table 1

 Anemia During Pregnancy and Mean Hb in three trimesters (Total 400 Mothers)

Mean Haemoglobin	10.2 gm/dl
Mean Birth weight	2.48 kg
Mothers with Anemia in 1st Trimester	272 (68%)
Anemic mother's Mean Hb in 1st	9.3
Trimester	
Mothers with Anemia in 2nd Trimester	248 (62%)
Anemic mother's Mean Hb in	9.9
2ndTrimester	
Mothers with Anemia in 3rd Trimester	72 (18%)
Anemic mother's Mean Hb in 3rd	8
Trimester	
Mothers with Severe Anemia < 7gm/dl	22
Nonanemic mothers in all the three	112 (28%)
trimesters	

From these results it can be postulated that mean Hb in the nonanemia group remained high in all the three trimesters compared to the anaemia group. It was further observed that trimester to trimester drop was seen only in few of the nonanemic mothers who might be refractory to the treatment given or treatment was not sufficient enough to raise the haemoglobin, while in the anaemic mothers a general trend of gradual increase in Hb in all the trimesters seen.

NEONATE	STATUS OF ANEMIA IN MOTHER				
Birth Weight (KG)	NON ANEMIC	ANEMIC IN 1ST TRIMESTER	ANEMIC IN 2ND TRIMESTER	ANEMIC IN 3RD TRIMESTER	
1.75-1.99 (130 neonates)	-	3 %	11%	86%	
2.5-2.0 (148 neonates)	12%	36%	40%	12%	
2.51- 2.99(82 neonates)	54%	30%	14%	2%	
More than of equal to 3.0 (Total 40 neonates)	87% (35)	7.5% (3)	5%(2)	-	

Table 2 The relation of maternal anemia with birth weight of newborns

Maximum (88%) babies having birth weight below 2499 grams were born to mother who have maternal anemia. Among babies weighing in between 2.5 kg to 2 kg, 12% were of nonanemic mother and among the anemic mother, these 12% were of 3rd trimester, 340% of 2nd trimester and 36% of 1st trimester. All babies having birth weight between 1750 to 1999 grams were born to mother who have maternal anemia , among these 86% were of 3rd trimester,11% of 2nd trimester and 3% of 1st trimester. 54% babies with birth weight between 2500 to 3000 grams were born to mothers who didn't have maternal anemia among these neonates only 2% were of 3rd trimester, 14% of 2nd trimester and 30% of 1st trimester. Maximum (87.5%) babies with birth weight more than 3kg were born to nonanemic mother. This table represents number of mother who were anemic in different trimesters and their respective baby birth weight. The nonanemia mothers in all trimesters and their 3rd trimester had baby weight below 2.50 kg. All nonanaemic mother had delivered baby with weight more than 2.51 kg.

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Table 3
The difference in LBW babies between anemic and non anemic groups in various
trimesters

LOW BIRTH NEONATE	WEIGHT	ANAEMIA	NONANEMIA	DIFFERENCE
1 st TRIMESTER		12 %	6 %	6%
2 ND TRIMESTER		15 %	7 %	8 %
3 RD TRIMESTER		98 %	39 %	59 %
TOTAL		17%	5%	12%

There is significant difference of low birth weight neonate in anemic and non anemic mothers as well the difference is more pronounced especially in third trimester. Thus these results revealed that anemic mother especially in the third trimester is a significant risk factor for low birth weight. In the present study, the positive association between maternal anemia especially in the third trimester and low birth weight baby was verified.

Discussion

In this study it is revealed that there is a need to strictly keep watch on maternal hemoglobin in third trimester mainly to prevent low birth weight baby and its associated complication. Maternal hemoglobin level or maternal anemia plays a pivotal effect on fetal growth and maternal anemia is a significant risk factor for low birth weight fetus. ⁶ In a study by K Jagdish Kumar et al⁷ During pregnancy more than 50% were anemic at some point of time as well 39% of the mothers were anemic throughout. Mean birth weight of babies born to anemic mothers. This difference was statistically significant. There was 6.5% increase in the incidence of low birth weight babies and 11.5% increase in preterm deliveries in mothers who were anemic in their third trimester.⁷

In a study by Hamalainen H et al² The frequency of anemia was 2.6%, with 0.3% occurring in the <u>first trimester</u>. After controlling for confounding factors, anaemia detected in the first trimester was associated with low-birth-weight infants whereas the mid- and third-trimester anaemia groups showed no significantly different outcomes when compared with the non-anaemic women. First trimester anemia was not significantly associated with small birth weight for gestational age². There is correlation of Low birth weight baby and anemia in pregnant mother. In a study by *Sruthy Gnanasekaran* et al⁶, about 85% of low birth weight babies were born to mothers with severe maternal anemia which is statistically significant. None of the mothers who didn't have maternal anemia had low birth weight babies.⁶

In a study, by Singla PN et al it was concluded that all indices of fetal growth showed linear relationships with maternal hemoglobin. Maternal anemia was associated with growth retarding effect more on fetal birth weight and mid-arm circumference than on any other anthropometric indices.¹⁰ In a study by Nair M et al, it was revealed that mothers with anemia at any time during pregnancy was found to have 4.3 times higher risk of giving birth to low birth weight babies compared to non-anemic mothers.¹² Anemia in pregnancy has a recognizable association with fetal outcome. Increased incidence of low birth weight babies is seen if the mother is anemic in her third trimester only. Increased incidence of preterm deliveries is seen if the mother is anemic in her second and third trimesters. Supplementing iron earlier and maintaining optimal Hb (10-12 g/dl) throughout gestation has better overall outcome regarding premature deliveries and low birth weight babies. Thus in our study results it was revealed that the incidence of low birth weight babies was significantly more in mothers who were anemic in the third trimester than in second or first trimester, thus it can be postulated that there is need of intensive treatment and need of keen and regular watch on blood hemoglobin level improvement in anemic mother in first and second trimester so that level of hemoglobin can be improved upto third trimester and thus significant impact on birth weight of baby resulting in lbw baby can be reduced significantly.

Conclusion

Thus from this study it can be postulated that third trimester anemia in pregnancy is a significant risk factor for low birth weight baby. With proper management of maternal anemia and implementation of the diet modification and iron supplementation in second and first trimester , maternal hemoglobin in third trimester can be much improved and thus the chances of low birth weight baby can be reduced significantly . Thus need of higher center referral of the newborn as well all complications related to low birth weight can be significantly reduced. Thus it can be recommended that medical professionals should keep a keen watch on maternal hemoglobin level and should consider intense treatment to raised hemoglobin in first and second trimester to improve hemoglobin level in third trimester.

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