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Association of Degree of Maternal Anaemia with Neonatal Anthropometry

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Abstract

Anaemia is a common medical problem in pregnancy. Maternal anaemia affects foetal growth and is related to premature births,small for gestational age,stillbirths and neonatal deaths.The objective of the study was to find the association of degree of maternal anaemia with neonatal anthropometric parameters.

The study was done in a teaching hospital. Women admitted with singleton pregnancy more than 24weeks for delivery we're selected and pregnancies with other comorbidities were excluded. Data collected was analyzed. P value <0.05 was considered as significant. It was found that the babies born to women with severe anaemia had significantly lower birth weight, length, head circumference, chest circumference and mid-arm circumference. Since severe maternal anaemia is associated with lower anthropometric parameters, anaemia control measures should start periconceptionally.Every pregnant woman should be screened and treated for anaemia.Health education related to nutrition should be provided to all mothers

Keywords: anaemia, anthropometry, intrauterine growth retardation, neonatal height, weight,

Introduction

Anaemia is a common medical problem in pregnancy. Worldwide prevalence of anaemia in pregnant women is as high as 41.8%.[1] Anaemia is associated with negative impacts on both the mother and the newborn. Maternal anaemia is related to small for gestational age babies.Intrauterine growth retardation and low birth weight inevitably lead to poor growth trajectory in infancy, subsequent iron deficiency anaemia in the child, childhood and adolescence and contribute to low adult height. Maternal anaemia contributes to intergenerational cycle of poor growth in the offspring, who are at risk of developmental difficulties involving cognitive, social, emotional and adaptive functions.

Objective

To study the association of degree of maternal anaemia with neonatal anthropometric parameters

Methods

This was a hospital based descriptive type of observational study conducted in a teaching hospital. Sample size was calculated at 80% study power and alpha error of 0.05 assuming Pearson correlation coefficient of 0.464 between mid-arm circumference and maternal haemoglobin as per Behal et al[2]. Minimum 35 participants were required in the four groups of non-anaemic, mild, moderate and severe anaemia each, to assess correlation. Institutional Ethical committee Clearance was taken prior to the study. Women aged 18-35 year, primigravidae and who gave singleton

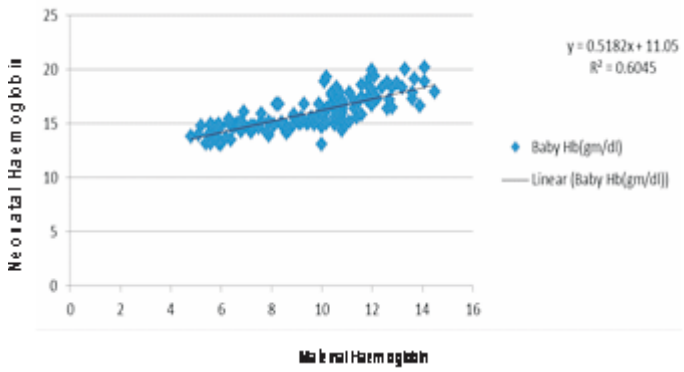
live birth after 24 weeks of gestation were included. Women with antepartum haemorrhage, history of menorrhagia or undergone any major surgery in the past 12 months and mothers of neonates with birth defects were excluded. A written informed consent was taken from all. Detailed history, examination and investigations were done.

Neonatal anthropometry was done which included weight, length, head, chest, abdominal and mid-arm circumferences. Data was recorded and statistical analysis done P value < 0.05 was considered as significant.

Results

Neonatal body weight decreased progressively with increasing severity of maternal anaemia showing a statistically significant correlation (p value=0.001).

Fig.1: Correlation of Maternal Hb and Neonatal Birth Weight.



The mean neonatal length was more in neonates of non-anaemic mothers and as the severity of anaemia increased, more neonates had their length lower than the normal range. However, the mean length was within the normal range values of all the neonates.A highly significant correlation (p value=0.001) was observed between maternal anaemia and neonatal length.

The mean head circumference of newborns born to non-anaemic mothers was significantly higher than the newborns born to anaemic mothers.Also, the mean HC decreased with increasing severity of anaemia which was statistically significant (p value= 0.001). 69.44% of the neonates with low HC were born to severely anaemic mothers. Only 47.22% of all the neonates with low HC were preterm. The mean chest circumference had highly statistically significant (p value=0.001) lower values as the severity of the anaemia increased.57.15% of all the severely anaemic mothers had newborns with CC<31 cms. All the 39 neonates with AC<31 cms were born to mothers with moderate and severe anaemia. A highly significant correlation (p value=0.0018) was seen between degree of maternal anaemia and abdominal circumference of the newborns.

In our study, a positive correlation was seen between increasing severity of maternal anaemia and the mean mid arm circumference (MAC) of the newborns born to the anaemic mothers. All neonates with MAC <9.7 cms were born to mothers with moderate and severe anaemia.

Table 1: Relation of Maternal Hb and Neonatal Anthropometry

Parameters	Non anaemic	Mild	Mod	Severe
Mean Neonatal weight in Kg	2926.62 ±384.04	2576.68 ±353.96	2381.35 ±351.56	2001.38 ±402.93
Mean Neonatal Length in cms	50.82 ±1.81	48.05 ±2.11	47.61 ±2.43	45.98 ±1.43
Mean Head Circumference in cms	34.06 ± 0.46	33.56 ±0.59	33.45 ±0.75	32.9 5±0.78
Mean Chest Circumference in cms	32.10 ±0.44	31.69 ±0.78	31.55 ±0.85	30.64 ±0.21
Mean Abd. Circumference in cms	32.07 ± 0.52	31.72 ± 0.73	31.57 ± 0.75	30.99 ± 0.94
Mean Mid-arm Circumference in cms	8.75 ±0.38	8.66 ±0.33	8.48 ±0.41	7.97 ±0.38

Discussion

In our study, all anthropometric parameters were lower as compared to non-anaemic mothers.

Others[3,4,5,6] too observed that anaemia in pregnancy had a recognizable association with low birth weight.The strongest effect on birth weight independent of gestational age was seen only with severe maternal anaemia[7,8,9,10]. Rahmati et al [11] stated that haemoglobin below 11g/dl increases the risk of LBW in the first trimester and that this relationship was observed more in developing countries.

Insults occurring in the early phase of pregnancy tend to affect cell hyperplasia and Type 1 IUGR. It is irreversible. Insult occurring 27th week onwards affect cell hypertrophy, resulting in Type 2 IUGR and is reversible[12].Maximum weight gain, fat and glycogen deposition of foetus occurs in the third trimester. Iron and other micronutrient accretion rates are the highest in the same trimester as well. This physiology explains the association of third trimester maternal Hb and low birth weight in newborns of anaemic mothers.

Kaur[13] and Gaur et al [3] also found that the length of babies born to anaemic mothers was lower as compared to babies born to non-anaemic mothers.Foetal, maternal, placental and environmental factors influence foetal growth[3]. Placental weight is closely associated with the surface area of peripheral villi which, in turn, is a determinant of nutrient transport from the mother to the foetus. In anaemic mothers, defective placental function with subsequent low oxygenation leads to inadequate foetal growth. Neonatal length is also more affected if the anaemia is from early gestation.

The Ponderal index (PI),a parameter used to diagnose impaired foetal growth is defined as (weight in grams)*100/ (length in cm^3). An adequate PI indicates that a baby is proportional or symmetric IUGR (type 1) and a low PI indicates that a baby is disproportional or asymmetric IUGR (type 2). PI is normal in normal weight and normal length as well as with low weight and less length(Symmetrical IUGR). PI can decrease in cases with lower weight and normal length or in cases with severely low weight and lesser length. Even with normal PI, weight and length could have been affected and IUGR could be present.

Subsequently, neonatal weight and length carry individual importance[12].

Behal et al [2] and Kaur [13] deduced from their study that head circumference of a newborn born to an anaemic mother showed a decrease especially in moderate and severe anaemia group,however, Nair M. et al [6] did not find any significant correlation of maternal iron deficiency anaemia and head circumference of neonates.

Maternal anaemia leads to alterations in foetal biometry including the head circumference. The biparietal diameter is the standard one against which other parameters are compared at a given gestational age[14]. Though prematurity was associated with severe anaemia, we observed that even term babies of anaemic mothers had lower mean HC. Gaur et al [3] and Behal et al [2] too found that maternal anaemia had highly significant ($p<0.01$) effects on chest circumference of the newborns with lowest mean in newborns of severely anaemic women. showed that the chest circumference of a newborn born to an anaemic mother showed a decrease especially in moderate and severe anaemia group.

As in our findings,Yasmin L. Alsaadi et al [15] also found the mean abdominal circumference of the foetus in non-anaemic pregnant women to be significantly higher than that in anaemic pregnant women.Morphological changes in placenta leading to inadequate nutrient transport and chronic hypoxia, stress-induced cortisol secretion, oxidative stress, enhanced risk of infection and

inflammation are potentially responsible for the risk of decreased liver size and lower values of abdominal circumference in maternal anaemia.Most of the energy of the foetus is diverted to maintain the growth of the vital organs such as brain and heart at the expense of liver, muscles and fat[16].

It was observed that the mid-arm circumference of a newborn born to an anaemic mother showed a decrease especially in moderate and severe anaemia group[2,,3].Due to chronic hypoxia,there was decreased muscle mass and thinned skin due to decreased fat. Hence a decrease in mid-arm circumference also was seen in these neonates.

Conclusion

Maternal anaemia is associated with reduced placental weight which adversely affects foetal growth and leads to lower anthropometric parameters as compared to non-anaemic mothers. Improving the nutritional status of pregnant women could have a positive impact on improving the iron status of the mothers and also their newborns. Anaemia control measures should start periconceptionally so that women enter the state of pregnancy with adequate iron reserves.Health education related to nutrition should be provided to all mothers.

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