ORIGINAL RESEARCH

Assessment of role of maternal serum ferritin as a predictive marker in intrauterine growth restriction

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ABSTRACT

Background: The most frequent problem for both obstetricians and neonatologists is intrauterine growth restriction (IUGR). The present study was conducted to assess the role of maternal serum ferritin as a predictive marker in intrauterine growth restriction.

Materials & Methods:82 antenatal women were selected and parameters such as period of gestation at delivery, mode of delivery, newborns' crown rump length, and birth weightwere measured.Neonates in group I were considered average for gestational age if their birth weight was greater than or equal to the 10th percentile for the corresponding gestational age. Babies in group II were considered tiny for gestational age if their birth weight was less than the 10th percentile for the matching gestational age.Maternal serum samples were taken at 25th week and again at 30-32 weeks in trace free mineral evacuated tubes for assessment of serum ferritin.

Results: The mean age was 23.1years and 22.5years, mean hemoglobin was 10.2gm% and 11.6gm%, the period of gestation at delivery was 38.4 and 37.2, mean birth weight was 2653.1gm and 2174.2gm, mean ferritin level was 15.3ng/ml and 19.2ng/ml in group I and II respectively. The difference was significant (P< 0.05). There were 32 asymmetrically growth-restricted babies and 21 asymmetrically growth-restricted babies with serum ferritin value>20 ng/ml. There were 6 asymmetrically growth-restricted babies and 8 asymmetrically growth-restricted babies with serum ferritin value>20 ng/ml. There were 12 asymmetrically growth-restricted babies and 3 asymmetrically growth-restricted babies with serum ferritin value>20 ng/ml. The difference was significant (P< 0.05).

Conclusion: There was a lack of association between maternal serum ferritin andintrauterine growth restriction.Further research is needed to determine the significance of maternal serum ferritin in differentiating between pregnancies with asymmetric IUGR and symptoms of placental insufficiency and those with simple small for gestational age newborns.

Keywords: Serum ferritin, Intrauterine growth restriction, Women

INTRODUCTION

The most frequent problem for both obstetricians and neonatologists is intrauterine growth restriction (IUGR). The phrase "small for gestational" and "IUGR" Age (SGA) is frequently used in place of according to a population growth chart, small for gestational age is defined as fetal birth weight less than the 10th percentile for gestational age corrected for parity and gender.[1]Worldwide reports have indicated that approximately 24% of all neonates have IUGR on an annual basis. Of these, 40% have asymmetrical IUGR with a low ponderal index, 40% are constitutionally tiny but healthy, and 20% have symmetrical IUGR with a normal ponderal index.[2]There are various causes for fetal growth restriction, which are divided into three categories: maternal (maternal hypertension, diabetes, heart disease, connective tissue diseases), fetal (exposure to teratogens, viral and anoploid infections of the fetus, fetal abnormalities), and placental (placental diseases such as heart attack and placental abruption and placenta previa).[3] Therefore, small fetuses with pathological growth restriction are below 10% by weight. Amniotic fluid volume and Doppler studies can help differentiate between the AGA (Appropriate-for-gestational-age), and SGA (Small-for-gestational age) groups.[4,5]The main intracellular iron storage protein is ferritin, a globular protein complex made up of 24 protein subunits. It is an acute-phase protein, and under stressful conditions like anoxia and infection, its serum concentration rises.Serum ferritin measurements in mothers have also been employed as prognostic markers of increased IUGR risk.[6]The present study was conducted to assess the role of maternal serum ferritin as a predictive marker in intrauterine growth restriction.

MATERIALS & METHODS

The present study consisted of 82 antenatal women. All gave their written consent to participate in the study.

Data such as name, age, etc. was recorded. Parameters such as period of gestation at delivery, mode of delivery, newborns' crown rump length, and birth weightwere measured.For every newborn with fetal growth retardation, the ponderal index was determined. The formula for calculating Rohrer's ponderal index is 100 times the birth weight (in grams) divided by the birth weight cube. Baby measurements were used to split them into two groups. Neonates in group I were considered average for gestational age if their birth weight was greater than or equal to the 10th percentile for the corresponding gestational age. Babies in group II were considered tiny for gestational age if their birth weight was less than the 10th percentile for the matching gestational age.Maternal serum samples were taken at 25th week and again at 30-32 weeks in trace-free mineral evacuated tubes for assessment of serum ferritin by chemiluminescence. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table: I Assessment of parameters

Parameters	Group I	Group II	P value
Mean age (years)	23.1	22.5	0.82
Mean hemoglobin (gm%)	10.2	11.6	0.04
Period ofgestation atdelivery	38.4	37.2	0.91
Mean birthweight (gm)	2653.1	2174.2	0.02
Mean ferritin level (ng/ml)	15.3	19.2	0.01

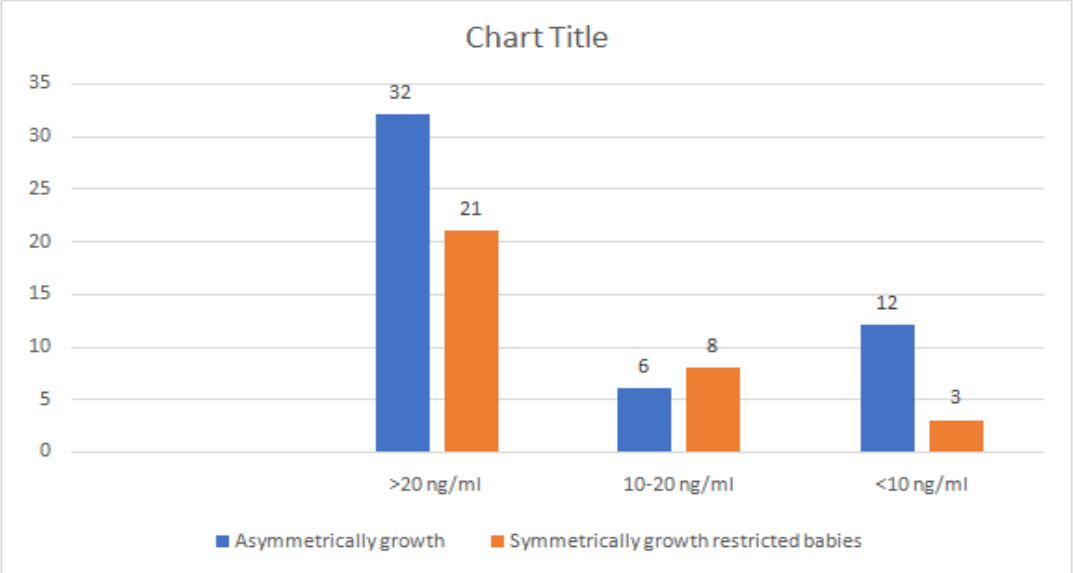
Table: I shows that the mean age was 23.1yearsand 22.5years, mean hemoglobin was 10.2gm% and 11.6gm%, the period of gestation at delivery was 38.4 and 37.2, mean birth weight was 2653.1gm and 2174.2gm, mean ferritin level was 15.3ng/mland 19.2ng/ml in group I and II respectively. The difference was significant (P< 0.05).

Table: II Distribution according to different range of mean serum ferritin value

Serum ferritin value	Asymmetrically growth Restricted babies	Symmetrically growth restricted babies	P value
>20 ng/ml	32	21	0.05
10-20 ng/ml	6	8	0.94
<10 ng/ml	12	3	0.01

Table: II, graph I shows that there were 32 asymmetrically growthrestricted babies and 21 asymmetrically growthrestricted babies with serum ferritin value>20 ng/ml. There were 6 asymmetrically growthrestricted babies and 8 asymmetrically growthrestricted babies with serum ferritin value>20 ng/ml.There were 12 asymmetrically growthrestricted babies and 3 asymmetrically growthrestricted babies with serum ferritin value>20 ng/ml.The difference was significant (P< 0.05).

Graph: I Distribution according to different range of mean serum ferritin value



DISCUSSION

In fetuses with growth restriction, mortality around birth is 6-10 times more common and 35% of stillbirths occur in preterm fetuses.[7] Also, the rate of asphyxia reaches 50%, however, the prevention of these events can be achieved by recognizing cases of growth restriction and optimal care.[8]The concentration of ferritin in the mother's blood depends on the amount of extraction by the fetus.[9] Pregnant women with fetuses with IUGR have higher blood ferritin levels due to decreased placental intake of iron and ferritin. Some authors believe that fetal IUGR reduces placental perfusion, small placental abruption, and other placental damage, so that damage to the placental parenchyma, which issignificantly rich in ferritin, leads to an increase in maternal serum ferritin and reduces the intake of ferritin by the placenta and the fetus.[10,11]The present study was conducted to assess the role of maternal serum ferritin as a predictive marker in intrauterine growth restriction.We found that the mean age was 23.1years and 22.5years, mean hemoglobin was 10.2gm% and 11.6gm%, the period of gestation at delivery was 38.4 and 37.2, mean birth weight was 2653.1gm and 2174.2gm, mean ferritin level was 15.3ng/ml and 19.2ng/ml in group I and II respectively. Bindal et al[12] enrolled a total of 326 antenatal women in the study. Maternal serum samples were evacuated for serum ferritin. The mean ferritin value of women with average for gestational age neonates was 15.49 ng/ml and women with growth-restricted neonates was 19.71 ng/ml. The women with mean serum ferritin above 20 ng/ml, were 6.26 times more likely to have asymmetrically growth restricted baby and 4.47 times more likely to have a symmetrically growth-restricted baby when compared to women with serum ferritin value less than 20 ng/ml.We found that there were 32 asymmetrically growth-restricted babies and 21 asymmetrically growth-restricted babies with serum ferritin value>20 ng/ml. There were 6 asymmetrically growth-restricted babies and 8 asymmetrically growth-restricted babies with serum ferritin value>20 ng/ml. There were 12 asymmetrically growth-restricted babies and 3 asymmetrically growth-restricted babies with serum ferritin value>20 ng/ml. Salem et al[13] in their study blood samples were drawn, at 30-32 gestational weeks, from 450 women who were then followed up resulting in 32 term pregnancies with asymmetric IUGR. The control group included the first recruited 32 women delivering adequate for gestational age neonates at term. Serum ferritin was then measured in the stored serum samples. Ultrasound scanning was performed at 30-32 weeks then at 37 weeks. Umbilical and middle cerebral artery Doppler scans were added at 37 weeks. Serum ferritin, at 30-32 weeks, was higher in women delivering IUGR babies (19.3±6.83 vs 14±5.18, p18.2 ng/mL had a sensitivity of 59.4% and a specificity of 90.6%. The area under curve showed an accuracy of 76.8%. Women with ferritin >18.2 ng/ml were 10.23 times more likely to get asymmetrically growth-restricted neonates. Uberos et al[14] concluded that ferritin levels >13 ng/ml had 4.5 times more risk of resulting in IUGR at 38 weeks of gestation. Hubel et al showed no significant difference in ferritin between AGA and IUGR cases, but their study only included 10 asymmetric IUGR cases. The limitation of the study is the small sample size.

CONCLUSION

Authors found that there was a lack of association between maternal serum ferritin andintrauterine growth restriction.Further research is needed to determine the significance of maternal serum ferritin in differentiating between pregnancies with asymmetric IUGR and symptoms of placental insufficiency and those with simple small for gestational age newborns.

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