MEDICAL CHANNEL

Original Article

COMPARISON OF SERUM FERRITIN LEVELS BETWEEN OBESE AND NON – OBESE PREGNANT WOMEN IN THIRD TRIMESTER OF PREGNANCY

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ABSTRACT

Objective: To find out association of serum ferritin with obesity and variation in its level in obese pregnant women as compared to non-obese pregnant women.
Study Design: Comparative observational study.
Place & Duration of Study: This Comparative observational study was carried out in the Department of Physiology Basic Medical Science Institute (BMSI), Jinnah Post Graduate Medical Centre (JPMC) Karachi with the collaboration of Gynaecology and Obstetrics Department of JPMC Karachi during the period from October 2008 to May 2009.
Methods: Sixty pregnant women (30 normal weight and 30 obese) in third trimester of pregnancy with comparable age, sex, height and gestational age were recruited for present study. Subjects were randomly selected from Gynaecology OPD of JPMC Karachi. Data analysis including paired "t" test and correlation analysis were carried out. P value upto 0.05 was considered significant.
Results: The mean serum ferritin levels were significantly higher ($P<0.001$) in obese pregnant women as compared with control group (49.8 ± 0.76 ng /ml VS 19.8 ± 0.31 ng/ml). It showed statistically significant positive correlation with body mass index (BMI). While haemoglobin levels not showed marked difference (statistically non-significant)
Conclusion: Serum ferritin levels in obese pregnant women were higher due to inflammation produced by pre-pregnant body mass index (BMI) not due to iron stores.

Keywords: Obesity, Serum ferritin, Pregnancy, Adipose tissue, Inflammation.

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INTRODUCTION

Ferritin is an iron containing spherical protein of 24 repeating sub units with molecular weight of approximately 460,000 Daltons, with an iron core of ferric oxide phosphate. when fully saturated ferritin may contain over 20% iron by

weight[1]. Ferritin readily takes up excess iron entering the cytoplasm and rapidly yield it up again when required for synthesis of hemoglobin and iron containing cell constituents[2]. During pregnancy serum ferritin levels undergo moderate changes. Serum ferritin value of non pregnant women is 66 ng/ml. During first trimester the serum ferritin level increases upto 97.4 ng/ml. Elevated serum ferritin concentration in mid pregnancy is associated with an increased risk of gestational diabetes mellitus[3,4]. High levels of hemoglobin, hematocrit and ferritin are also associated with an increased risk of fetal growth restriction, pre-term delivery and preeclampsia[5]. It is thought that iron demands are low during the first trimester. However, in the second trimester it decreases upto 22.2 ng/ml and in the third trimester it reaches the lowest value of 14.7 ng/ml[6].

Serum ferritin is an acute phase reactant rising with inflammatory process from infection through chronic disease. Increase in serum ferritin levels occur in iron overload or inflammation[7]. There is an enhancement in the secretion of some interleukins and inflammatory cytokines in adipose tissues of obese individuals which produce inflammation[8]. While adipose tissue of obese persons is infiltrated by macrophages, which may be a major source of locally produced pro-inflammatory cytokines, namely Leptin, TNF α, IL6 and resistin[9]. TNF and interleukin I α (IL - 1 α) and other pro-inflammatory cytokines transitionally induce ferritin synthesis, suggesting that pathway is related to inflammation[10,11].

METHODOLOGY

This Comparative observational study was carried out in the Department of Physiology, Basic Medical Science Institute, Jinnah Post Graduate Medical Centre Karachi, during the period of October 2008 to May 2009. Sixty pregnant women of age range 20 – 40 years and of gestational age third trimester were recruited from the Department of Gynecology and Obstetric, JPMC Karachi. Subjects were divided into two groups according to presence or absence of obesity: group A, normal weight pregnant women and group B, obese pregnant women. For comparative analysis, group A was selected as control (normal weight pregnant women), having same age range, height, weight, BMI and gestational age. Women who gave history of conditions like malignancy disorders, acute or chronic liver disease or other acute inflammatory conditions were excluded from the study. Also patients of diabetes mellitus and cardiovascular disease were excluded from the study.

5 ml of venous blood was drawn with the help of disposable syringe under all aseptic measures and transferred to a gel centrifuge tube. After clotting, blood was centrifuged to obtain serum. After that serum obtained was transferred to clean and dry plastic cups which were properly covered and stored at -50°C till analyzed. Before analyzing serum was thawed and allowed to attain room temperature. Weight and height of all subjects were measured in kilograms and centimeters respectively, using weighing machine with high scale (MIC health scale machine, Made in China). For body mass index calculations, height in centimeters was converted

TABLE # I
COMPARISON OF BIO-PHYSICAL PARAMETERS BETWEEN GROUP A AND GROUP B

Parameter	Normal weight pregnant women (n-30)	Obese pregnant women (n=30)	P-Value
Age	22.6 ± 0.29	22.6 ± 0.26	0.405
Gestational Age	31.2 ± 0.18	31.2 ± 0.18	1.00
Height (m)	1.5 ± 0.01	1.5 ± 0.2	0.62
Weight (Kg)	57.9 ± 0.40	75.1 ± 0.44	0.001
BMI (Kg/m^2)	24.2 ± 0.11	31.4 ± 0.15	0.001

TABLE # II
COMPARISON OF BIOCHEMICAL VARIABLES BETWEEN GROUP A AND GROUP B

Parameter	Group A Normal weight pregnant Women (n=30) Mean ± SEM	Group B Obese pregnant women Without GDM (n=30) Mean ± SEM	P Value
Serum ferritin (ng/ml)	19.8 ± 0.31	49.8 ± 0.76**	0.001
Hb(g/dl)	11.2 ± 0.12	11.1 ± 0.11	0.222

Significantly high as compared to group A ($P < 0.001$)

TABLE # III
CORRELATION COEFFICIENT OF SERUM FERRITIN VERSUS BMI & Hb

Parameters	Group A Normal weight Pregnant women (n=30)	Group B Obese pregnant Women Without GDM (n=30)
Serum ferritin VS BMI	r=-0.317	r=0.75**
Serum ferritin VS Hb	r=0.79**	r=0.53**

*P<0.05, **P<0.01, ***P<0.001

to meters. Body mass index was calculated by applying following formula:

$$\text{Body mass index} = \frac{\text{Weight in kilogram}}{(\text{Height in meter})^2}$$

Serum ferritin was estimated by ELISA (enzyme linked immunosorbant assay) method (Biosource, USA) using QM Lab (Germany) analyzer.

Data analysis including paired t-test and correlation analysis were carried out by SPSS version 10.0 for windows. Paired sample t-test was used to analyse the numeric variables like age and serum ferritin level. Pearson's correlation co-efficient (r) values were calculated to find out the correlation of serum ferritin with BMI and haemoglobin.

RESULTS

The results of our study showed proportional increase in the level of serum ferritin with increase in weight and BMI. The mean values of weight and BMI were statistically highly significant (P<0.001) in obese pregnant women as compared to non-obese pregnant women, whereas age, height and gestational age mean values were non significant (Table I). However, mean serum ferritin level was statistically highly significant (P<0.001) in obese pregnant women as compared to control group while haemoglobin levels were statistically non-significant (Table II). The serum ferritin levels showed statistically significant (P<0.001) positive correlation with BMI in obese pregnant women only (Table III).

Thus, high serum ferritin level in obese pregnant women highlight the need of proper management during pregnancy from early days, especially focusing on weight control, as increased serum ferritin level may be an indicator of other fateful complication like increased iron load.

DISCUSSION

Ferritin is found in liver cells, spleen and bone marrow. It is also found in the heart, pancreas and kidney. Human Serum contains a small but significant quantity of ferritin. The higher serum ferritin concentration has been found in obese pregnant women as compared to control[9]. Under these circumstances the current study was undertaken to compare and confirm the report of increase in serum ferritin levels in obese pregnant women and to investigate that the higher serum ferritin levels were due to iron over load or inflammation. To proceed, we had chosen two groups one healthy normal weight pregnant women, second obese pregnant women. The results of our study show that in obese women in the third trimester of pregnancy, the levels of serum ferritin were significantly elevated when compared to women with normal weight. This finding is in agreement with the study reported by Yesilbursa et al.[10] Knuiman et al[11] reported that there was no positive association between serum ferritin and body mass index. On the contrary, study conducted by Chen et al[12] showed that serum ferritin levels were higher in obese pregnant women as compared to controls and that highest levels of serum ferritin were significantly associated with higher pre-pregnant body mass index. The results of our study are in agreement with this study and also with the study of Fernendez et al[13]. In our study we found a positive correlation of serum ferritin with hemoglobin levels in both obese and non-obese pregnant women

CONCLUSION

The results of our study shows that serum ferritin levels were significantly higher in obese pregnant women, and increased iron stores were due to inflammation produced by higher body mass index (BMI).

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