ORIGINAL ARTICLE

BMI and Elevated Levels of Serum Ferritin and High Sensitivity C-Reactive Protein in Pregnant Women

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ABSTRACT

Objective: To determine the association of (CRP) and Serum ferritin with obesity and variation in its level in obese pregnant women as compared to normal weight.

Methods: This comparative cross-sectional study was conducted at Physiology Department of BMSI Jinnah Postgraduate Medical Centre in Cooperation with the Department of Gynecology and Obstetrics of Jinnah Hospital Karachi. 60 women of age 20 to 40 years in last trimester pregnancy were enrolled in the study with same physical parameters, placed into two equal groups' obese and normal weight. Ferritin and C - reactive protein levels of pregnant women were measured through enzyme linked immunosorbent assay (ELIZA). Results were compared and analyzed statistically.

Results: The ferritin levels and acute phase protein CRP levels of obese subjects significantly higher as contrast to normal weight pregnant Women. Serum ferritin (49.8±0.76 ng /ml) VS 19.8±0.31 ng /ml). C-reactive protein (9.0±0.12 mg/l vs 4.3 ± 0.16 mg/l). The results indicate a positive correlation with BMI.

Conclusion: Elevated levels of CRP and serum ferritin in over-weight gravid women were highest due to inflammation produced by body mass index (BMI).

Key Words: Obesity, Serum Ferritin, C - Reactive Protein, Pregnancy.

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INTRODUCTION:

Ferritin is an iron storing globular protein with molecular weight of 460,000 Daltons[1] During pregnancy serum ferritin levels undergo moderate changes. Serum ferritin values of non pregnant women is 66 ng/ml. The ferritin levels increases up to 97.4 ng/ml during first trimester of pregnancy. The risk of gestational diabetes mellitus increased with increased levels of serum ferritin in mid trimester[2,3]. High levels of haemoglobin, hemotocrit and ferritin an amplified the risk of fetal growth restrictions, pre-term delivery and preeclampsia[4]. Ferritin levels increased in an acute inflammation so it is called an acute phase reactant[5]. Increased Serum ferritin levels occur in iron overload or inflammation[5].

C-reactive protein (CRP) is so named because it can precipitate the C-polysaccharide of streptococcus[6] It is a normal plasma protein, whose concentration rises dramatically in cytokine mediated response to most forms of tissue injury, infection and inflammation. Its physiological role is to bind phosphocholine expressed on the surface of dead or dying cells in order to activate complement system via the C1Q complex, which is due to its pro-inflammatory and pro-coagulant effect.7,8 It was first acute-phase protein to be described and is an exquisitely sensitive systemic marker of inflammation and tissue damage.[9] CRP act as a systemic marker of inflammation and tissue damage[7] Elevated levels of CRP are correlated with several cardiovascular risk factor for example Smoking, hypertension, Diabetes mellitus and Obesity (BMI).[10,11]

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Several studies revealed that in humans the expansion of adipose tissues seen in the obesity result in more blood vessels and more connective tissue fibroblast and especially more macro phages. There is an enhancement in the secretion of some interleukins and inflammatory cytokines in adipose tissue of obese which produce inflammation. Adipose tissue is a reservoir for excess calories which are stored as triglycerides[12]. Excessive deposition of triglycerides in adipose tissue is strongly associated with raised circulating CRP level, as adipose tissue is considered a source of subclinical inflammation[12,13]. Elevated CRP level is also associated with weight gain during late second and early third trimesters of pregnancy Maternal concentrations of CRP have been studied as an aid to diagnosed subclinical infection[14,15].

The present study was designed to find out the association of serum ferritin and C-reactive protein with obesity in gravid woman.

METHODS:

This comparative cross-sectional study was carried out in the Physiology Department of BMSI, JMPC Karachi. Patients were selected for the study with the collaboration of gynae/obs: Department JPMC, Karachi. Total 60 subjects of age 20 to 40 years in last trimester of pregnancy were divided into two equal groups A. normal weight pregnant women. B. Obese gravid women. 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. The serum is then 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 to meters. Body mass index of the subjects was calculated by applying formula: BMI=Body weight in Kg/Height in meter^2.

Serum ferritin was estimated by ELISA (enzyme linked immunosorbant assay) method Biosource, USA) using QM Lab (Germany) analyzer. (Serum C-reactive protein was estimated by ELISA (enzyme linked immunossorbant assay) using kit-kat No. BC-1119 manufactured by biocheck, Inc USA.

Data analysis including paired-t-test and co-relation analysis were carried out by SPSS version 10.0 for windows paired simple t-test was used to analyze the numeric variables like age, and inflammatory markers. Pearson's co-relation co-efficient (r) were calculated to create the linear co-relation between serum ferritin, c-reactive protein and BMI.

RESULTS:

The present study manifest that increased serum ferritin and CRP levels proportionally increased with weight and Body Mass Index. The mean values of weight and BMI were statistically highly significant ($P<0.001$) in over weight gravid women as contrast normal weight gravid women.

Where as age, height and gestational age mean values were non significant (Table.I). However, mean serum ferritin and CRP level were statistically highly significant ($P<0.001$) in obese as compared to non-obese pregnant women (Table.II) Serum ferritin and C-reactive level showed statically significant ($P<0.001$) positive co-relation with BMI in obese pregnant women only (Table III).

DISCUSSION:

Koening et al[16], Mendall. et al[17], and tracy et al[18] reported a positive association between BMI and CRP concentration in middle age person. The findings of present study demonstrate the higher levels of serum ferritin and c-reactive protein in obese as compared to normal weight pregnant women.

A higher prevalence of substandard systemic inflammation was observed in over weight gravid women compared with normal weight pregnant women.

Visser et al[19] observed that higher body

Table: I Comparison of Biophysical Parameters between two groups A and B

PARAMETERS	GROUP A Normal weight pregnant woman (n=30)	GROUP B 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 6.2	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 B

PARAMETERS	GROUP A Normal weight pregnant woman (n=30)	GROUP B Obese pregnant women (n=30)	P.VALUE
Serum Ferritin ng/ml	19.8 0.31	49.8 0.76 **	0.001
Serum C-Reactive protein mg/lit	4.3 0.16	9.0 0.12	0.001
Hb (gm/dl)	11.2 0.12	11.1 0.11	0.222

Table-III: Correlation Coefficient of Serum Ferritin and Serum C-Reactive Protein Versus BMI

PARAMETERS Serum ferritin vs BMI	GROUP A Normal weight pregnant woman (n=30)	GROUP B Obese pregnant women (n=30)
Serum C-Reactive protein vs BMI	0.39**	0.42**
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

mass index is associated with higher C - reactive protein concentration that could not be explained by inflammatory disease of other factor known to increase C - reactive protein concentration. The Data of above study suggest that state of substandard systemic inflammation is present in over weight and obese persons. Our finding are similar to this study.

Ferritin present normally in spleen, bone marrow and liver cells. Small significant quantity of ferritin present in human serum. The higher serum ferritin concentration has been found in obese pregnant women as compared to control[19].

Our results are in similar with the findings of Bastard et al[20]. Amirkhii et al[21] who reported increased Serum ferritin level, in obese as contrast

to with normal weight.

In our study we observed that the highest level of serum ferritin was significantly correlated with BMI. These findings are in agreement with the study of Fernendez et al[22].

In our study we correlate serum ferritin with C-Reactive protein and found highly significant co-relation of serum ferritin with CRP these finding are in agreement with the study of William et al[23].

CONCLUSION:

Higher BMI is associated with higher serum ferritin and serum c-reactive protein level, that could not be explained by inflammatory disease or other factors or disease known to increase serum ferritin and c-reactive protein concentration.

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