



A CROSS SECTIONAL STUDY AMONG BODY MASS INDEX AND SERUM FERRITIN LEVEL IN A TERTIARY CARE HOSPITAL, KOLKATA.

Biochemistry

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ABSTRACT

Introduction: The rising prevalence of overweight and obesity in India has resulted in an increased prevalence of obesity-related comorbidities. Obesity predisposes affected people to subclinical inflammation. Adipose tissue is an active endocrine organ that increases the released of inflammatory mediators in obesity. Serum ferritin is well known acute phase reactant and also marker of acute and chronic inflammation. In this study we tried to evaluate whether obesity correlate with change in serum ferritin level or not in Indian population.

Materials and Methods: This cross sectional observational study was conducted in department of biochemistry of NRS Medical College and Hospital from January 2021 to October 2021. 105 otherwise healthy participants were selected for this study, among them 60 are female and 45 are male. The participants were assessed for BMI and serum ferritin.

Result: Correlation test was performed between BMI and serum ferritin of both group (male and female). Statistically significant positive correlation was found between serum ferritin and BMI among the female participants (P Value-0.018, r-0.304). Correlation is significant at the 0.05 level (2-tailed).

Conclusion: In this study BMI was positively correlated with serum ferritin among female participants. Adipose tissue may play a vital role in the production of acute phase reactants like ferritin.

KEYWORDS

INTRODUCTION:

Obesity is globally fast growing public health problem. In India 8–38% of the rural population and 13–50% of the urban population are obese¹. This is more common in women and being thought as most serious threat to human health². The WHO guidelines for south-east Asian region defined body mass index (BMI) between 23–24.9 kg/m² is termed overweight, whereas the term “obesity” is employed, once BMI exceeds 25 kg/m². Obesity was considered by the American Medical Association (AMA), as a “disease” in 2013.⁴

Overweight and obese are prone to develop serious complications like ischemic heart disease, diabetes, obstructive sleep apnea, corpulmonale and other diseases⁵. Obesity predisposes affected people to subclinical inflammation. Many studies have concluded that overweight and obese people are in a state of an ongoing subclinical inflammation that may secondarily cause iron deficiency, malignancy, so forth^{6,9}. Adipose tissue is an active endocrine organ that increases the released of inflammatory mediators in obesity. Several proinflammatory mediators are also secreted by the adipose tissue, including adiponectin, resistin, leptin, interleukin 6 (IL6), tumour necrosis factor (TNF α) and c-reactive protein (CRP)¹⁰.

Ferritin is a 24-subunit 24-subunit macromolecule that's composed of 2 subunits, termed H and L. Ferritin plays an important role for storage of intracellular iron, and has been the subjective of extensive recent reviews¹¹⁻¹⁴. Serum ferritin is well known acute phase reactant and also marker of acute and chronic inflammation, which non-specifically elevated in a wide range of inflammatory conditions, including chronic kidney disease¹⁵, rheumatoid arthritis and other autoimmune disorders.¹⁶, acute infection, and malignancy.

Several previous studies, with contradictory findings, have detected an association between ferritin and obesity with few reports concluding that high ferritin levels were related with increased obesity¹⁷⁻¹⁹. However, others reported either similar²⁰⁻²¹, or even lower²² ferritin concentration in obese versus normal weight adults.

However, very few study had been carried out in India up till now which establishes relationship between obesity and serum ferritin. Keeping this in view, this proposed study aimed to elucidate whether obesity correlate with change in serum ferritin level or not in Indian population.

MATERIAL AND METHODS:

This cross sectional observational study was conducted in department

of biochemistry of NRS Medical College and Hospital from January 2021 to October 2021. This study was approved by institutional ethics committee. Patients with previous normal iron status in the age group of 18-70 years were included in this study. Patient suffering from acute or chronic infection, , thromboembolism, inflammatory disorders, SLE, RA, taking alcohol, drugs affecting iron status or ferritin (iron supplements, steroids, antirheumatics, etc.) and pregnancy were excluded from study. 105 otherwise healthy participants were selected for this study, among them 60 are female and 45 are male. Informed written consent was obtained from every participant individually. A preformed questionnaire and consent form had been prepared and was used for relevant history: medication. The participants were assessed for (i) BMI, (ii) serum ferritin. Approximately 5 ml Blood was collected in vial without anticoagulants at fasting state with a standard aseptic procedure after obtaining informed consent. Blood was centrifuged to separate serum. BMI was calculated based on the measured weight and height of the participants (BMI = body mass (kg) / [height (m)]²), who were classified into following categories: normal below 23 kg/m², overweight as those with BMI between 23.0– 24.9 kg/m² and obesity as those having BMI >25.0 kg/m². Clear serum was separated and stored in microcentrifuge tube at -20°C until assayed. Serum Ferritin (ng/dl) determined by Chemiluminescence method inadvia-centure XP autoanalyzer. SPSS 19 for window was used to estimate means, SD and correlation study.

RESULT –

In our study population 60 were female and 45 were male. BMI and serum ferritin of female participant were 26.2 $\pm$ 4.74 and 89.4 $\pm$ 57.4 (table 1). BMI and serum ferritin of male participant were 23.1 $\pm$ 3.9 and 122.3 $\pm$ 87.4 (table 2)

Table 1 -Distribution of BMI and Serum Ferritin among female participant

	Mean	Minimum	Maximum	Standard deviation
BMI	26.2	35.60	17.80	4.74
Serum ferritin	89.4	3.00	253.00	57.4

Table 2 -Distribution of BMI and Serum Ferritin among male participant

	Mean	Minimum	Maximum	Standard deviation
BMI	23.	35.60	17.80	4.74
Serum ferritin	122.3	16	519.00	87.4

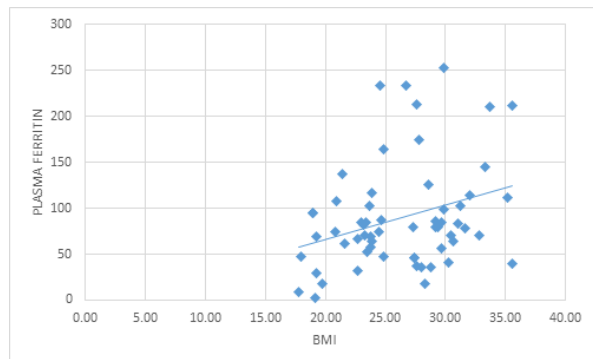
Correlation test was performed between BMI and serum ferritin of

both group (male and female). Statistically significant positive correlation was found between serum ferritin and BMI among the female participants (P Value-0.018, r-0.304). Correlation is significant at the 0.05 level (2-tailed). (table 3 and picture 1)

Table 3-Pearson's correlation of BMI with ferritin (female participant)

Variable	Correlation Coefficient	P value
ferritin	0.304	0.018 (<0.05)

Picture-1 (serum ferritin & BMI)

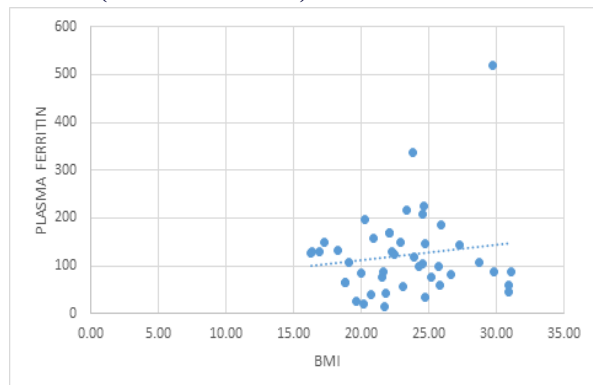


But no significant correlation were found between serum ferritin and BMI among the male participants (P Value-0.34, r-0.145). (Table 4 and picture 2)

Table-4 Pearson's correlation of BMI with ferritin (male participant)

Variable	Correlation Coefficient	P value
ferritin	0.145	0.34

Picture-2 (serum ferritin & BMI)



DISCUSSION

we conducted cross sectional study to evaluate association between obesity (BMI was used as an indicator) and serum ferritin. We observed statistical significant positive correlation between serum ferritin and BMI among female participants, (P Value-0.018, r-0.304) but no significant correlation was found between serum ferritin and BMI among male participants. (P Value-0.34, r-0.145).

Obesity is one among the largest health challenges of the 21st century. Various studies conducted on obese metabolic syndrome patients versus obese non-metabolic syndrome patients, reported higher levels and direct correlation of ferritin with BMI between the groups, advocating some level of inflammation responsible for high levels of ferritin²³⁻²⁴. Results of a South Korean cross-sectional study revealed substantial Positive correlations between serum ferritin and total body fat in men and women. They additionally reported a rise in ferritin with an increase in trunk fat mass in both genders²⁵. Another study, based on different fat distribution, showed that ferritin was positively correlated with total body fat and trunk fat mass and inversely correlated with leg fat mass in both genders²⁶. Another study, conducted among young females, reported a statistically significant inverse correlation between body fat percentage and ferritin.²⁷ A study by Eftekhari et al.²⁸ has shown serum ferritin levels were reduced in obesity.

The mechanism for the positive correlation of obesity with ferritin isn't

absolutely understood. There's a growing proof supports that obesity-related inflammatory method will increase ferritin level²⁹⁻³⁰ with depleted iron stores³¹⁻³². Serum ferritin is an acute phase reactant like C-reactive protein, which will increase in response to inflammatory processes in obese people, together with adipokines discharged by adipocytes^{33, 22}. Inflammatory cytokines are activated in response to obesity, and consequently, hepcidin, an iron regulatory protein, is discharged as a defence mechanism resulting in attenuated iron level and increased ferritin level³⁴. These findings are corroborating with our present study.

CONCLUSION:

In this study BMI was positively correlated with serum ferritin among female participants. Adipose tissue may play a vital role in the production of acute phase reactants like ferritin.

Limitation:

Our study has some limitations. The first is the use of a cross-sectional design, we cannot detected causal relationships that may be acquired from a longitudinal design. A second limitation is with the relatively small sample size that may limit the generalizability of our findings. Another limitation is the only BMI is used as an indicator of obesity/overweight. In addition, this study did not measure other biomarkers of inflammation, which if measured may substantiate any existing relationships. However, the current findings may serve as a platform for future longitudinal studies.

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