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Original Research Article

Correlation of serum magnesium levels with body mass index in post-menopausal women: an observational study

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ABSTRACT

Background: Obesity and overweight status based on body mass index among post-menopausal women is common finding. Micro-nutrient deficiencies like magnesium have also been summarised in the post-menopausal syndrome. With this background we planned this study to correlate serum magnesium levels with body mass index in post-menopausal women.
Methods: A prospective observational study was conducted on the post-menopausal women attending the department of medicine in a tertiary care hospital of Maharashtra. We recruited 60 cases that fitted our eligibility criteria taken from the duration of 4 months in our institute. Data was collected using pre-designed and pre-tested questionnaire which had demographic variables, anthropometric measurements like height, weight, body mass index etc and serum magnesium levels of the patients. Serum magnesium levels were tested in blood using commercial kit for quantative measurement (Xylidyl Blue method) using automated analyser. Body mass index was calculated using the standard formula and classified based on the WHO guidelines.
Results: The mean serum magnesium levels among obese/overweight post-menopausal women was 1.43±0.23 and among non-obese/overweight post-menopausal women it was 2.59±0.31($p<0.001$). We found a high inverse correlation between serum magnesium levels with body mass index in the present study. ($r=-0.83$, $p<0.001$)
Conclusions: The serum magnesium levels were significantly lower among the obese/overweight subjects when compared to normal subjects in the present study. There was significant high negative correlation between the serum magnesium levels and body mass index in the present study.

Keywords: Serum magnesium, Body mass index, Menopause

INTRODUCTION

Menopause is s state of variability in reproductive hormones and thus is responsible for some typical symptoms like hot flushes and mood disturbances.[1,2] Due to the physiological transition and advancement of age some of the variations in post-menopausal women are higher cardiovascular risk, lipoprotein changes, coagulation changes, skeletal system changes, cognitive changes, decreased libido and risk of cancer among women.[1,3,4] Obesity and overweight status based on body mass index among post-menopausal women is common finding. Micro-nutrient deficiencies like magnesium have also been summarized in the post-menopausal syndrome.[2] There are reports suggested the link of serum magnesium levels and estrogen levels in post-menopausal women.[5-8] So, we conducted this study with a goal of correlating serum magnesium levels with body mass index in post-menopausal women.

METHODS

A prospective observational study was conducted on the post-menopausal women attending the department of

medicine in a Panjabrao Deshmukh Memorial Medical College, Amravati, Maharashtra. We recruited 60 cases that fitted our eligibility criteria taken from the duration of 4 months (September 2020 to December 2020) in our institute. Ethical committee clearance and other necessary permissions were taken. Written and informed consent was taken before the start of the study. Cases that more than 45 years of age and have attained their last menstrual period at least one year prior to the study were included in the present study. Those patients who were already of magnesium replacement therapy, hormonal replacement therapy and ant drugs like anti-cancer treatment, diuretics etc were excluded from the study. Those patients were chronically bed ridden and having chronic kidney disease and liver diseases were also excluded. Data was collected suing pre-designed and pre-tested questionnaire which had demographic variables, anthropometric measurements like height, weight, body mass index etc and serum magnesium levels of the patients. A study conducted by Yadav et al inferred that the correlation between serum magnesium and body mass index was 0.90.[5] Using this with 95% power and 3% absolute error, we found the minimum sample size to be 44. For our convenience, we included 60 cases in the present study. Sampling was done using convenience sampling technique. Serum magnesium levels were tested in blood using commercial kit for quantitative measurement (Xylidyl Blue method) using automated analyser. Body mass index was calculated using the standard formula and classified based on the WHO guidelines.[9]

Statistical analysis

The data was collected, compiled, and analyzed using EPI info (version 7.2). The qualitative variables were expressed in terms of percentages. The quantitative variables were expressed in terms of mean and standard deviations. The difference between the means was analysed using student t test. Pearson's correlation coefficient was used for correlation of quantative variables. All analysis was 2 tailed and the significance level was set at 0.05.

RESULTS

We have included 60 cases in the present study.

The mean age of the study subjects was 57.43±9.45 years and 13.33% of the cases had family of obesity.

Among the 60 subjects, 8.33% were obese, 15% were overweight and 76.67% were normal body mass index.

The mean serum magnesium levels among obese/overweight post-menopausal women was 1.43±0.23 and among non-obese/overweight post-menopausal women it was 2.59±0.31 and this difference was statistically significant.

We found a high inverse correlation between serum magnesium levels with body mass index in the present study. (r=-0.83, p<0.001)

Table 1: Demographic particulars of the present study.

Demographic particulars	Frequency	Percentage
Age group		
45 to 50	5	8.33
50 to 60	9	15.00
60 to 65	25	41.67
>65	21	35.00
Family history of obesity (Present)	8	13.33

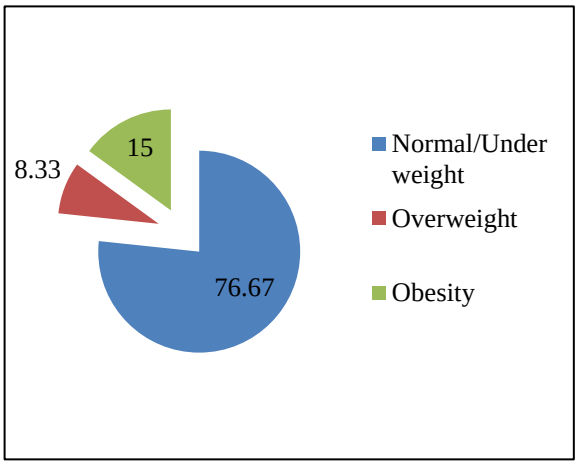

Figure 1: Distribution of the sample based on the body mass index.

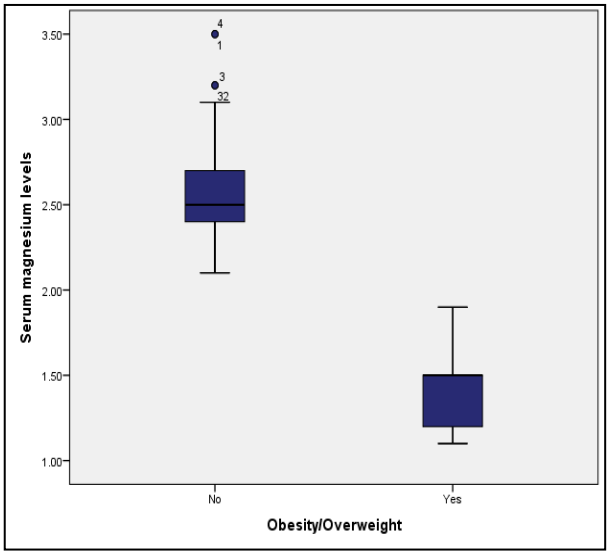

Figure 2: Serum magnesium levels based on the obesity status of the present sample (p<0.001).

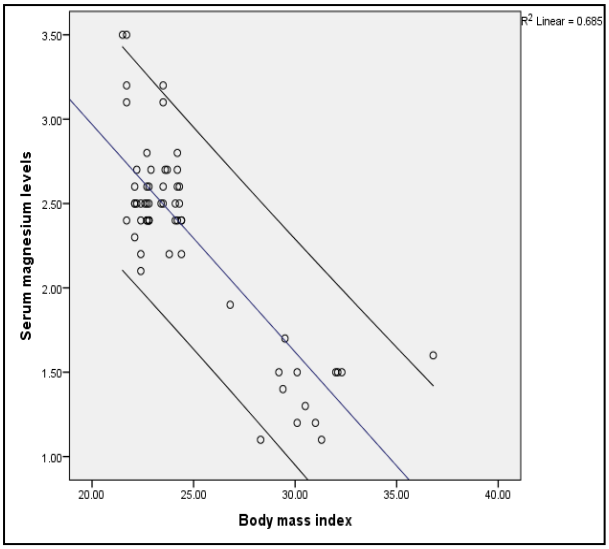

Figure 3: Scatter diagram of serum magnesium levels with body mass index in the present sample (r=-0.83, p<0.001).

DISCUSSION

Post-menopausal women experience a variety of symptoms and signs which seriously affect their quality of life.[2] Obesity or overweight and nutritional deficiencies are two of sides of malnutrition among these women. Studies have suggested that there is relation between magnesium deficiency and obesity status among this group of women.[5-8,10] We conducted this study to explore the correlation of body mass index with serum magnesium levels.

The prevalence of obesity and overweight among the post-menopausal women in our study was 23.33%. Some studies conducted by Gravena et al (74.4%), Chen et al (51.5%) and Karunakaran et al (50%) were higher than our study.[11-13] A study conducted by Sinha et al inferred that the prevalence of overweight and obesity were observed to be high among those aged 45-50 years (30.63%, 4.26%) and 50-56 years (32.36%; 18.91%) in their study.[14] Another study conducted by Singh et al reported that the prevalence of overweight and obesity among post-menopausal women was 32.73% and 30.65% respectively.[15] Due to smaller sample size our study had lower proportions when compared to other studies.

The mean serum magnesium levels among obese/overweight post-menopausal women was 1.43±0.23 and among non-obese/overweight post-menopausal women it was 2.59±0.31 and this difference was statistically significant. Similar results were reported by Yadav et al in their study (Serum Mg levels among obese=1.40 mg/dl; non obese=2.50 mg/dl; p<0.001). Serum magnesium status has been correlated with obesity and overweight status among children in some studies and found that there was a significant association between the two.[6]

Obesity is a state as a result unhealthy practice which is often high in calories but poor in essential nutrients. Hence, these subjects will be magnesium deficient.[7] National health and nutrition examination survey highlights that magnesium deficiency is prevalent among the obese subjects.[8,10] We found an inverse relationship between the serum magnesium levels with body mass index in our study. (r=-0.83; p value<0.001). A study by Yadav et al reported that they had high negative correlation between the serum magnesium levels and body mass index in their study (r=-0.92; p<0.001).[5] Similar inverse relationship have been inferred by studies by Shamani et al, Jiang et al, He et al, Castellanos-Gutierrez et al, Lu et al and Galan et al but the study population was different from our study.[6,8,17-20]

Our study had some limitations. Firstly, small sample size, larger multi centeric studies have is conducted to understand the exact correlation of magnesium deficiency with obesity. Second it was a single center study and was hospital based. Community based studies will give a better picture of the association. Nonetheless, this is one of the pioneer studies conducted in the post-menopausal women group and will surely add up the evidence of the association.

CONCLUSION

One fourth of the post-menopausal women in the present study were overweight or obese. The serum magnesium levels were significantly lower among the obese/overweight subjects when compared to normal subjects in the present study. There was significant high negative correlation between the serum magnesium levels and body mass index in the present study. Future studies on association of magnesium levels and changes in body mass index are warranted. Randomized controlled trials on replacing the magnesium in obese and overweight women will address the high levels evidence of this association.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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