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MAGNESIUM – A FORGOTTEN CATION IN WOMEN

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ABSTRACT

***Background**: Magnesium is an important and vital element in maintaining the body functions. It needs to be supplemented adequately. Deficiency of magnesium can lead to various derangements in the metabolic processes of the human body. Decline in magnesium levels after menopause should be monitored and corrected in order to avoid the complications in the remaining years of healthy life.* ***Objectives**: To estimate the levels of Serum Magnesium in the women who have attained menopause for at least a period of one year.* ***Study Design**: A Case-Control Clinical Investigational Study.* ***Setting**: Central Clinical Laboratory of MIMER Medical College, Talegaon Dabhade, Pune and Department of Biochemistry, MIMER Medical College, Talegaon Dabhade, Pune.* ***Data Sources and Analysis**: Serum Magnesium levels of 60 women [30 – control and 30 – cases] were estimated and analysed.* ***Results**: The women in the case group reflected low serum magnesium levels due to decreased levels of the hormone, oestrogen after the age of menopause. However, to the contrary, women in the control group had adequate amount of magnesium to maintain the metabolic functions. Mean age of the case group was* 67.1 ± 10.2 *years and of the control group was* 30.4 ± 6.01 *years. Serum Magnesium levels of the case group was* 1.95 ± 0.376 *mg/dL and of the control group was* 2.23 ± 0.364 *mg/dL.* ***Conclusion**: Magnesium, being an essential cation, is required for various functions. Its requirement must be adequately met and deficiencies should be given prompt attention. Women are more commonly affected than men and need to be assessed for serum magnesium levels. Menopause brings about a wide array of changes in equilibrium and is a period that requires utmost attention. Sufficient intake and supplementation of magnesium thus becomes an inevitable part of treatment in associated risks and illnesses.*

KEYWORDS: Serum Magnesium, Post-Menopausal women, Dietary Magnesium.

INTRODUCTION

Menopause, the time when ovarian function ceases in a female, can be defined as the absence of menstrual periods (amenorrhoea) for 12 months. It is a normal part of life and cannot be regarded as a disease or a condition.[1] Thus approximately 30% of a woman's life is spent in the postmenopausal period. The average age for menopause is globally is 47.5 years[2] and about 46.2 years in India.[3] It is often accompanied by essential mineral deficiencies causing or intensifying serious clinical symptoms.[4] The cessation of ovarian function leads to a subsequent decline in synthesis of the hormone, oestrogen, which leads to a wide array of metabolic dysfunctions such as diabetes mellitus type II[5], cardiovascular diseases like coronary artery disease[6], gout, hepatitis C, gum diseases, urinary tract infections, autoimmune diseases, etc.[7] Another widely prevalent disorder among females past the age of menopause is osteoporosis, characterized by decreased bone strength that predisposes to an increased risk of fractures.[8]

Therefore, post-menopausal women must be advised on lifestyle modifications that reduce the risk of diseases that appear after menopause and also to avoid the risk factors like smoking. Also, proper supplementation of deficits in diet should be made.[9]

Magnesium, an intracellular cation, is an essential electrolyte for living organisms and is the fourth most abundant mineral in the human body.[10] It is required for the proper functioning of neuromuscular transmission, bone and teeth formation[11] cardiac excitability, muscle contraction, as a co-factor in cellular energy production reactions, protein synthesis, DNA synthesis and maintenance of electrolyte composition in body fluids.[12] Magnesium has a normal serum concentration of 0.7 – 1 mmoL/L or 1.7 – 2.4 mg/dL. The Recommended Dietary

Allowance of magnesium is about 340 mg per day.[13], which could be met through the various magnesium rich foods such as dark green vegetables, legumes, cereals, wheat bread, fish, dry apricots and nuts.[14]

Hypomagnesaemia is the decreased serum magnesium concentration, less than 1.8 mg/dL. It arises due to inadequate dietary intake or malabsorption or increased excretion with use of drugs such as furosemide.[15] Abnormalities of magnesium levels can result in disturbances in nearly every organ system and can cause potentially fatal complications.[16] Some of the common disorders associated with hypomagnesemia are hyper excitability, tremors, fasciculations, tetany, cardiac arrhythmias, insulin resistance, ventricular tachycardia, atherosclerosis, hypertension, osteoporosis and asthma.[17] Therefore, a suitable and prompt monitoring and correction of magnesium levels will lead to a significant decline in the risk and complications of the above mentioned diseases.

MATERIALS AND METHOD

A total of sixty female subjects were selected from the Out Patient Department (OPD) of the department of Obstetrics and Gynaecology, MIMER Medical College and Dr. Bhausaheb Sardesai Talegaon Rural Hospital after obtaining an approval from the Institutional Ethics Committee. Thirty cases were included in this study who had attained menopause for atleast a period of one year. Thirty controls were taken from healthy pre-menopausal women aged between 20 and 40 years with regular menstruation.

The present study included the women who were willing to participate in the study, irrespective of undergoing calcium and magnesium supplementation.

Critically ill women, women with known osteoporotic features, bone disorders, under medication that affects bone metabolism, obese women, on hormone replacement therapy, steroid treatment, etc. were excluded from the study.

A case-control clinical investigational study was conducted amongst the post-menopausal and pre-menopausal women respectively.

After obtaining an informed consent from the participant, about 2 ml of venous blood was collected under all aseptic precautions in a plain bulb. Serum, free from haemolysis, was obtained and analysed for estimation of Magnesium level by the use of Magnesium Colorimetric Assay Kit which employs the Xylidyl Blue Method.[18] A fully automated Biochemical Analyser XL-640 was used.

RESULTS

This study was conducted in the women of pre- and post-menopausal age group. Each group consisted of 30 individuals, selected according to the criteria for inclusion and exclusion of the study. The mean age of women in the Case group is about 67.16 ± 10.24 years and of women in the Control group is about 30.4 ± 6.01 years.

The serum magnesium levels were estimated and recorded. These were further categorized according to the age groups and is represented in the given chart. [Table 1].

Table 1: Distribution according to age and serum Magnesium levels.

CATEGORY	AGE GROUP (years)	MEAN SERUM MAGNESIUM LEVEL (mg/dL)
CASE GROUP	40 – 60	2.04
	61 – 80	2.03
	Above 80	1.26
CONTROL GROUP	20 – 28	2.31
	29 – 36	2.19
	Above 36 *	1.76

*Women above the age of 36 years and have not attained menopause.

The study also revealed that a majority of the women in their pre-menopausal period had normal levels of serum magnesium. However, this behaviour deviated in the women after menopause due to decreased oestrogen levels. The mean value of serum magnesium in the case group was 1.95 ± 0.376 mg/dL which is comparatively lower than that of the control group estimated as 2.23 ± 0. 364 mg/dL. [Figure 1]. However, the difference in the mean serum magnesium levels between the two groups is not very large due to a small sample size. Also, women in the early post-menopausal years had lesser deviation from the normal serum magnesium levels.

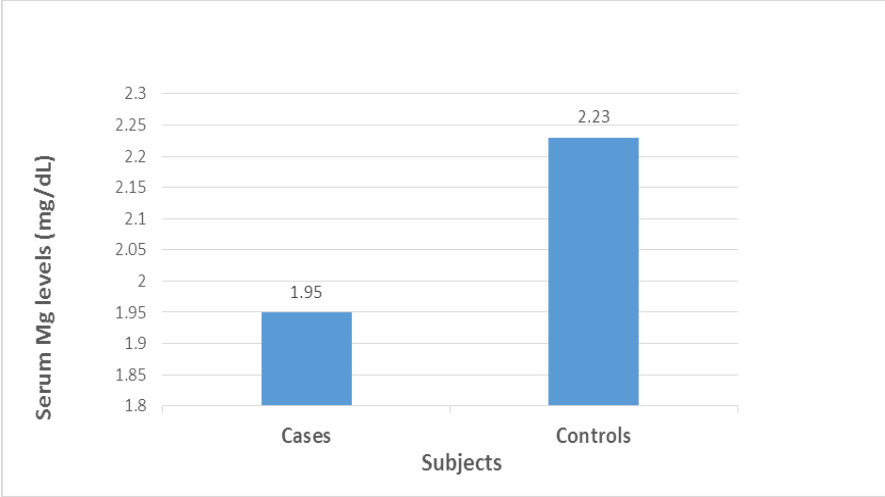

Figure 1: Serum magnesium levels in the Case and Control groups.

The two-tailed p value calculated from the student 't' test was 0.058, which is statistically a significant value according to the conventional criteria.

The deviation of serum magnesium from normal level for both the groups is depicted in the chart. [Figure 2].

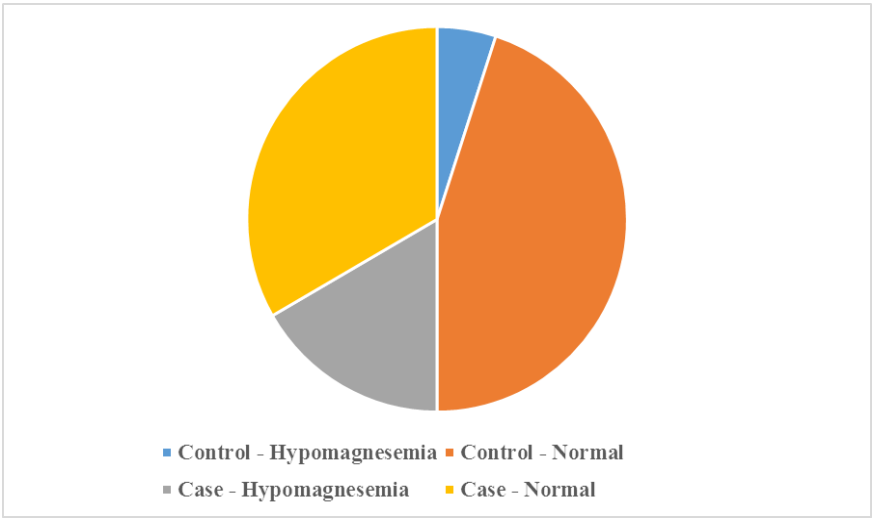

Figure 2: Differences in serum Magnesium levels in Case and Control groups.

DISCUSSION

The deviation in levels of serum magnesium due to various underlying disorders or inadequate intake can affect metabolic functioning of an individual. Also, hypomagnesemia is often associated with hypokalemia (decreased potassium levels) and hypocalcemia (decreased calcium levels) that leads to further increase in the risks involved.[15] Study conducted by Tonick et. al has shown that there exists a significant relationship between oestrogen levels and serum magnesium concentration . Low serum magnesium levels are often associated with post-menopausal syndromes.[19] Similar to this study, Zheng et. al observed that serum magnesium are lowered in post-menopausal women.[20] Adequate supplementation of magnesium through diet and medication is therefore, a necessity after the age of menopause in order to cut down the risk of complications and ill- effects of diseases that may arise out of this deficiency. A pilot phase II trial of magnesium supplements to reduce menopause hot flashes found that patients who received magnesium oxide had 41.1% reduced hot flash frequency per week.[21] Hence, it is a fundamental requisite to monitor magnesium levels in women past the age of menopause and provide the due care to erase out the chances of being affected by the disorders. Moreover, the increasing awareness among women about the changes after menopause has also contributed to a significant change by decreasing the number of women diagnosed with hypomagnesemia.

CONCLUSION

Magnesium, often regarded as the 'forgotten cation'[22] is gaining increased attention. Its pivotal role in maintaining the various metabolic functioning must be understood. A proper balanced diet is essential in avoiding the chances of developing hypomagnesemia. Low serum magnesium levels in women who have attained menopause is associated with decreased levels

of oestrogen. This must be corrected promptly and adequately in order to lead a healthy and fruitful life. Further, a study needs to be conducted among a larger population with evaluation of multiple parameters associated with the changes due to menopause in order to yield better results.

CONFLICT OF INTEREST

None.

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