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Comparison of serum mineral levels in perimenopausal women with surgical menopausal women: Analytical cross sectional study

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Abstract

Aim: comparison of serum mineral levels in perimenopausal women with surgical menopausal women.

Methods: The present analytical cross sectional study was conducted on patients (out patients and in patients) in Department of Obstetrics and Gynecology, Kamla Nehru Hospital, attached to IGMC Shimla. Group 1 (N=60): Perimenopausal women aged 40-45 years as control. Group 2 (N=60): Women who had undergone hysterectomy with bilateral salpingoophorectomy at least 6 months ago. Serum calcium was estimated by Arsenazo colorimetric method in mg/dl after the relevant quality control checks. Serum magnesium was estimated by magnesium by Xylidyl blue colorimetric assay in mg/dl after the relevant quality control checks. Serum phosphorus was estimated by Molybdate U.V. method in mg/dl after the relevant quality control checks.

Results: In the present study the mean age of post-surgical menopausal group was 46.0 years and in the perimenopausal group the mean age was 42.4 years. Mean parity in post-surgical menopausal group was 3.03 and 2.5 in the perimenopausal group.

Conclusions: The prevalence of osteoporosis is very high in this part of India. Both peri and post-surgical menopausal women have lower levels of serum calcium, magnesium and phosphorus.

Keywords: Postmenopausal women, Osteoporosis, Serum Calcium, Serum Magnesium, Serum Phosphorus

Introduction

The word menopause is derived from the Greek words “meno” means month and “pause” to stop [1]. Menopause is defined as permanent cessation of menses resulting from reduced ovarian hormone secretion that occurs naturally or is induced by surgery [2].

At menopause the ovarian follicles lose their function and thus results in decreased production of estradiol and other hormones. Decreased estrogen also affects the serum and urinary level of calcium, and magnesium indirectly at various levels. Decreased estrogen also alters the intestinal absorption, bone resorption and renal reabsorption of calcium, magnesium and phosphate [3].

However after surgical menopause the blood supply to the ovaries are affected, thus the women who have surgical menopause at early age have changes in their endocrinological status early and attain menopause 3.7 years earlier than the women who attain the natural menopause. The onset of endocrinological changes after surgical menopause is very sudden unlike natural menopause. Very few studies have been conducted to see the effect of sudden decrease and early onset of decreased oestrogen levels (endocrinological changes) associated with surgical menopause on serum levels of calcium in north Indian women. Hence the present study is aimed at comparing and treating the levels of Calcium, Magnesium and Phosphorus among surgical and perimenopausal women of north Indian.

Materials and methods

The present analytical cross sectional study was conducted on patients (out patients and in patients) in Department of Obstetrics and Gynecology, Kamla Nehru Hospital, attached to IGMC Shimla.

Ethical approval and Informed consent

The study protocol was reviewed by the Ethical Committee of the Hospital and granted ethical clearance.

After explaining the purpose and details of the study, a written informed consent was obtained.

Inclusion criteria

- Women who had undergone hysterectomy with bilateral salphingoophorectomy at least 6 month ago.
- Women who have attained natural menopause at least 1 year ago
- Women who had signed the informed consent

Exclusion Criteria

- Women on HRT therapy
- Women with other endocrine and metabolic disease which affect calcium, magnesium and phosphorus levels
- Chronic use of drugs such as steroid therapy

Grouping

Group 1 (N=60): Perimenopausal women aged 40-45years as control.

Group 2 (N=60): Women who had undergone hysterectomy with bilateral salphingoophorectomy at least 6 month ago.

Methodology

Blood samples of all patients of study groups were collected in a plain vacutainer tubes under all aseptic precautions. Serum was separated after twenty minutes of collection by centrifuging the sample. After that serum was stored in a vial at 4 degree celsius. All the estimations were done within two days of storage by fully automated chemistry auto-analyser. Serum calcium was estimated by Arsenazo colorimetric method in mg/dl, serum magnesium was estimated by magnesium by Xylidyl blue colorimetric assay in mg/dl and serum phosphorus was estimated by Molybdate U.V. method in mg/dl after the relevant quality control checks.

Statistical Analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 20 (SPSS Inc., Chicago, Illinois, USA).

Descriptive statistics included computation of percentages, means and standard deviations were calculated. The statistical tests applied for the analysis was chi-square test and student t-test. For both the tests, confidence interval and p-value were set at 95% and ≤ 0.05 respectively.

Results

Table 1: comparison of mean age between the study populations

Variables	Perimenopausal (n = 60)	Post-surgical Menopausal (n=60)
Mean age	44.20	46.00
Mean Parity	2.5	3.03
p-value	>0.05	

Test applied: student t-test

Table 2: comparison of BMI between the study groups

BMI	Perimenopausal women (n =60)	Postsurgical menopausal (n =60)
< 18.5 (Underweight)	6 (10%)	0
18.5-24.9 (Normal)	33 (55.0%)	22 (36.6%)
25- 29.9 (Overweight)	17 (28.3%)	28 (46.6%)
>30 (Obese)	4 (6.7%)	10 (16.6%)
p-value	>0.05 (NS)	

Test applied: Chi-square test

Table 3: Comparison of serum calcium between the study groups

Serum calcium level	Perimenopausal women (n =60)	Post-surgical menopausal women (n =60)
< 8.10 mg/dl (Hypocalcemia)	8 (13.3%)	18 (30.0%)
8.10-10.4 mg/dl (Normal range)	52 (86.7%)	42 (70.0%)
>10.4 mg/dl (Hypercalcemia)	0	0
Mean±SD	9.85	9.10
p-value	>0.05 (NS)	

Test applied: student t-test

Table 4: Comparison of serum magnesium between the study groups

Serum Magnesium	Perimenopausal women (n =60)	Postsurgical menopausal women (n =60)
<1.7 mg/dl (Hypomagnesemia)	2 (3.3%)	17 (28.3%)
1.7-2.4mg/dl (Normal range)	49 (81.7%)	42 (70.0%)
>2.4 mg/dl (Hypermagnesemia)	9 (15%)	1 (1.7%)
Mean	2.30	1.92
p-value	<0.05 (sig.)	

Test applied: student t-test

Table 5: Comparison of serum phosphorus between the study groups

Serum phosphorus	Perimenopausal women (n=60)	Postsurgical menopausal women (n=60)
<2.7 mg/dl (Hypophosphatemia)	5 (8.3%)	9 (15%)
2.7-4.5 mg/dl (Normal range)	55 (91.7%)	47 (78.3%)
>4.5mg/dl (Hyperphosphatemia)	0	4 (6.7%)
Mean	3.52	3.50
p-value	>0.05 (NS)	

Test applied: Student t-test

Discussion

In the present study, 120 women were included having natural menopause, surgical menopause and perimenopausal group, attending the OPD of Obstetrics and Gynaecology department of Kamla Nehru Hospital for Mother and Child attached to Indira Gandhi Medical College, Shimla. These patients were evaluated for serum calcium, magnesium and phosphorus.

Even though studies on serum calcium, magnesium and phosphorus in menopausal and perimenopausal status have been conducted in various countries but still there is limited data available in our population hence this study was undertaken. It is fact the world population is getting older, this issue brought osteoporosis to the attention as it is known to be the disease of elderly. It increases morbidity among menopausal women. We studied the post-surgical menopausal women 6 months earlier as compared to the perimenopausal women for early detection of decreased levels of serum minerals in them so that we can treat them earlier and prevent osteoporosis in them.

Among perimenopausal group mean age was observed to be in agreement with the study conducted by Brot C *et al.*^[4] whereas in surgical menopausal group mean age observed was almost identical with the studies conducted by Kentaro *et al.*⁵ and Mean parity in perimenopausal group of present study was 2.5 and is comparable to Brot C *et al.*^[4]

In perimenopausal group of present study mean serum calcium

level found in agreement with the studies conducted by Manohari AL *et al.* [6], Sasmita *et al.* [7] and Sreekantha *et al.* [8]

In our study there is no increase in the postmenopausal serum calcium level the number of the patients included was mostly below the age of 65 years. These findings are explained by the following: Increased requirement of calcium to maintain calcium homeostasis with advancing age, continued decline in intestinal calcium absorption reported with ageing and apparent loss of intestinal adaptation to varying calcium intake of older women. Studies have stated that low estrogen levels and women with osteoporosis in postmenopausal have kidneys that did not reabsorb as much calcium as the women without osteoporosis [9-11]. However the serum calcium levels in all the three groups were within the normal range.

In our study as compared to the perimenopausal women, serum magnesium concentration in the post-surgical menopausal group was on lower limit levels. The decreased level of magnesium explained to be due to the uncoupling of bone formation as a result of loss of bone mass in post-menopausal women, it may also be related to increased renal loss and is exacerbated by dietary element deprivation and gastrointestinal losses. There is no significant difference of phosphorus level in both the groups. The reason may be the supplementation of calcium in both menopausal groups which in turn increases the level of phosphorus in post-menopausal women [12].

Conclusion

The prevalence of osteoporosis is very high in this part of India. Both perimenopausal and post- surgical menopausal women have lower levels of serum calcium, phosphorus and magnesium. Our study suggests that peri and postmenopausal women should take all three mineral rich foods. If these foods are not available or serum levels are too low supplementation can be given in the form of tablets.

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