VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

STUDY OF MICRO-NUTRIENTS STATUS AND ANTHROPOMETRIC MEASUREMENTS IN POSTMENOPAUSAL WOMEN

Physiology

KEYWORDS: Calcium, Magnesium, Cooper, Zinc, Blood pressure, Body mass index, Postmenopausal

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ABSTRACT

Background: Estrogen deficiency after menopause on the micro-nutrients and anthropometric variables has not et been extensively studied but the possible menopause related alterations in the trace elements levels and anthropometric variables may have an effect on the osteoporosis, cardiovascular disorders, hypertension, and disturbance of carbohydrate metabolism. Objective: The present study was conducted to evaluate the micro-nutrients status and anthropometric measurements in postmenopausal women. Methods: Fifty females were selected from out patient's clinic of RNT Medical College Udaipur for the present study, out of which 25 females were premenopausal (aged 25-40 years) and 25 were postmenopausal (aged 45-60 years, with a permanent termination of menstruation for more than 1 year). Anthropometric measurements and blood pressure were measured in each woman. The estimation of the serum calcium, magnesium, cooper, zinc and iron were performed in both the groups using commercial available diagnostic kit on appropriate biochemical analyzer. Results: There were statistically significant increases in the BMI ($p<0.001$), waist circumference ($p<0.01$), waist hip ratio ($p<0.001$), blood pressure ($p<0.001$), serum calcium ($p<0.0001$) and iron ($p<0.01$) levels whereas significantly decreases in the serum magnesium ($P<0.001$) and cooper ($P<0.05$) levels in the post menopausal women as compared to those in the premenopausal women. Conclusion: Postmenopausal females are exposed to higher risk of hypertension, abdominal obesity and alterations in micronutrients consequently leading to an increased jeopardy of osteoporosis, syndrome-X and cardiovascular diseases after menopause. Therefore present study may be helpful for early diagnosis and primary prevention of cardiovascular disease and osteoporosis.

Introduction:

Menopause is the outcome of the fatigue of the ovarian follicles, which consequences in a diminished manufacture of estradiol and other female sex hormones [(1)]. The decline in the status of the estrogen during menopause in female causes several turmoil's in the basic metabolisms of various organs. In this period of life, the jeopardy of osteoporosis, cardiovascular disorders, vascular hypertension, and disturbance of carbohydrate metabolism, breast carcinoma and degenerative cognition diseases increases. The effect of estrogen insufficiency after menopause on the micro-nutrients has not yet been extensively studied but the probable menopause related changes in the trace elements levels may have an effect on the above pathologies. The hazard of nutritional conflicts, a mainly calcium, magnesium, Zink, cupper and vitamin deficit is more throughout menopause [(2)]. Magnesium increases bone turnover via the activation of the osteoclastic cells function and its insufficiency may play a role in postmenopausal osteoporosis in women life. Magnesium acts as a substitute for calcium in the transport and mineralization method [(3)]. Its insufficiency may guide to disturbances in the cardiac rhythm, necrotic alterations, atheromatous plaques, dyslipidemia [(4)]. Calcium ion is vital to avoid bone loss and to assist restore the bone matrix that might have been lost due to osteoporosis. Menopausal women have an increase risk of cardiovascular disease and osteoporosis. Post menopausal women who are probable to have low serum magnesium levels are more susceptible to disseminated intravascular coagulation (DIC). Calcium and potassium ions are helps to maintain heart rate and magnesium and other trace elements like cupper and iron are helps to endorse healthy cardiovascular systems as well as to prevent heart attacks and anemia. Therefore various micronutrients or trace elements are also imperative in the normal functioning of all muscles, nerves, red bone marrow and nerve impulses [(5)]. Therefore the present study was undertaken to evaluate the micro-nutrients status and anthropometric measurements in post-menopausal women.

Materials and Methods:

This comparative study was performed in Department of physiology, R.N.T. Medical College, Udaipur, Rajasthan, India. Total 50 women were randomly selected from the out patients clinic and Department of Gynecology, RNT Medical College and associate hospital for the present study, out of which 25 were premenopausal with aged 25-40 years and remaining 25 were post menopausal with natural menopause, permanent termination of the menstrual cycle for more than one year and aged 45-60 years were included for present study. Women with history of malignancy, pregnant, liver disease were excluded from study. They were also excluded if they were used any oral contraceptives, hormone replacement therapy (HRT), estrogen therapy or any supportive treatment for the menopausal symptoms prior to the study. A comprehensive reproductive and menstrual history of all the females was taken and their general physical and systemic examination was performed to exclude any disease which was known to affect the present study. Trained interviewers, using a structured questionnaire, interviewed the all females to obtain the information on socio-demographic characteristics, physical activity, dietary characteristics, personal and family history of diseases and hospitalization. Informed consent was obtained from all the females prior to start the study. The study protocol was approved by institutional ethics committee.

All anthropometric and blood pressure measurements were obtained after complete physical examination in each women. Blood pressure (BP) was measured using a mercury sphygmomanometer with over the right arm with the participant in sitting position. Weight and height were measured using a daily calibrated digital scale and stadimeter with females wearing light clothing and no shoes and body mass index (BMI) was also calculated by using Quetlet index (weight/height^2- kg/m^2). Waist circumference (WC) was measured on bare skin during mid respiration at the narrowest indentation between the 10th rib and iliac crest to the nearest 0.1cm while the participant was standing [(6)].

Blood samples were collected from all participants under aseptic conditions after overnight fasting in dust free containers. After centrifugation, sera were quickly separated from these samples and it was stored at –60°C until analysis. The serum zinc levels were assessment by Makino method [(7)]. The serum magnesium levels were

determined by Bohoun method [8]. The serum calcium levels were estimated by using the Ortho-Cresolphthalein complex, as described by Gitelman [9]. The serum cooper and iron levels were measured by using Bathaocuproin disulphonate [10] and Zak method [11] respectively, using commercial available diagnostic kit on appropriate biochemical analyzer.

Statistical Analysis:

Statistical analysis was done on IBM statistical package for Social Science (SPSS) Version 20.0 and expressed as mean ± SD. Statistical analysis of the variance (micro-nutrients and anthropometric measurements) between pre and post menopausal women were compared by using unpaired independent Student's-t test. The p-values<0.05 were considered statistically significant.

Results:

Table-1: Comparison of anthropometric variables between premenopausal and postmenopausal

Anthropometric measurements	Premenopausal (Mean ± SD) (n=25)	Postmenopausal (Mean ± SD) (n=25)	t -Value	p value
Age (Years)	35.56±5.26	51.36±6.53	9.42	0.0001
Body Mass Index (Kg/m2)	24.38 ± 2.46	27.34 ± 4.08	3.10	0.003
Waist circumference (cm)	90.01 ± 5.89	96.51 ± 8.68	3.09	0.003
Hip Circumference (cm)	91.2 ± 5.96	95.42 ± 8.26	2.07	0.04
W/H Ratio	0.95±0.053	1.028±0.07	4.06	0.0002
Systolic blood pressure	120.62±5.39	136.25±10.62	6.56	0.0001
Diastolic blood pressure	81.03±3.43	85.42±6..25	3.07	0.003

Table-1 shows the mean ± SD of anthropometric parameters which were reported in the premenopausal and postmenopausal women. There were statistically significant increases in the age (p<0.0001), BMI (p<0.001), waist circumference (p<0.01), hip circumference (p<0.05), waist hip ratio (p<0.001) and systolic and diastolic blood pressure (p<0.001) levels in the post menopausal women as compared to those in the premenopausal women.

Table-2: Comparison of micro-nutrients between premenopausal and postmenopausal females.

Trace elements	Premenopausal (Mean ± SD) (n=25)	Postmenopausal (Mean ± SD) (n=25)	t -Value	p value
Serum calcium (mg/dl)	6.90 ± 0.43	8.30± 1.06	6.11	0.0001
Serum magnesium (mmol/L)	1.26 ± 0.10	0.88 ± 0.11	33.06	0.0001
Serum Zinc (µmol/l)	14.25±2.31	15.39±2.89	1.54	0.130
Serum Cooper (µg/dl)	15.50±3.85	13.14±3.46	2.27	0.027
Serum Iron (µmol/l)	17.23±2.68	19.89±2.95	3.33	0.01
* Note : — P>0.05 = Not significant, P<0.05 = Just significant, P<0.0l = significant, P<-0.001 =Very significant				

Table-2 shows the mean ± SD of micro-nutrients which were studied in the premenopausal and the postmenopausal women. There were statistically significantly increases in the serum calcium (p<0.0001) and iron levels (p<0.01) whereas significantly decreases in the serum magnesium (P<0.001) and cooper (P<0.05) levels in the post menopausal women as compared to those in the premenopausal women. There was no significant difference was found in the serum zinc (P>0.05) level in both the groups.

Discussion:

The outcomes of the present study indicated that the levels of all anthropometric parameters (p<0.01) and blood pressure (p<0.01) were significantly increases in postmenopausal women as compared to those in the premenopausal women. In our study we established that both systolic (136.25±10.62) and diastolic (85.42±6.25) blood pressure significantly (p<0.001) increases in the post menopausal women as compared to those in the premenopausal women with mean of 120.62±5.39 and 81.03±3.43 for systolic and diastolic respectively. The similar results have been reported in several other previous studies (12, 13, 14, 15). In a study done by Badaruddoza et al., on 191 post menopausal Punjabi women and they found that post-menopausal women had a higher blood pressure and pulse rate than pre-menopausal women (<0.001).The anthropometric measurements such as weight, BMI, waist and hip circumferences, WHR were also higher in post-menopausal women (<0.001) (16) which are in consistent with our findings.

Several studies have been found that body mass index, waist to hip ratio, waist circumference, body weight and numerous anthropometric measurements were significantly higher in post menopausal then in pre menopausal women (17,18,19). Increases in aforementioned anthropometric measurements in post menopausal women may be due to advancing age with deficiency of estrogen and progesterone and other female sex hormone which lead to decrease sympathetic activity and increasing parasympathetic activity resultant decline basal metabolic rate. In addition, increases secretion of others anabolic endocrine hormones as well increase production of serum leptin which are mainly responsible for gynoid fat pattern [20].

The increases in blood pressure in post menopausal women may possibly due to increasing age and body mass index. In older age arteries get stiffed which causes higher blood pressure. Other explanation may be due loss of female sex hormones (estrogen and progesterone) which are vasodilators of blood vessels, which escort to increase blood pressure in post menopausal women. Hence, the drop of female sex steroids hormones and increases of androgen after menopause influence the equilibrium between different vasoactive hormones in the female body which lead to increase blood pressure with menopause. The explanations accountable for increasing of blood pressure in post-menopausal women are multi factorial and complex interconnected [16].

The results of our study showed that the level of serum calcium was increase significantly (p<0.0001) in post menopausal women. The comparable results have been established in several other studies [21,22,23]. In a study was performed by Gupta et al., on 100 menopausal females as compared to that in premenopausal female and found that the serum iron (p<0.05) and the serum calcium (p<0.001) levels were significantly increased whereas the serum cooper (p<0.05) and the serum magnesium (p<0.05) levels were significantly decreased in the postmenopausal females. However, there was no significant difference found in the level of serum zinc in both the groups (p>0.05) [24] which is consistent with our results. The increases serum calcium levels in post menopausal women may be elucidated by lack of estrogen which provokes synthesis of cytokines by the osteoblasts, monocytes and the T-cells. Therefore, cytokines helps the stimulation of bone resorption through the increasing osteoclastic activity[25].

In our study, significant increase serum iron levels in the postmenopausal women as compared to those in the premenopausal women; this is in agreement with present findings which, may be due to the rising iron stores when menstrual cycle stop. The buildup of iron overfull is associated to a postmenopausal jeopardy of coronary heart disease[26].

We found that the serum cooper levels were significantly decreased in the postmenopausal women when compared to premenopausal women which agree with the previous study (Gupta). The management of estrogen during hormone replacements has shown an enhancement in the cooper levels in postmenopausal women [27].
In our study, serum magnesium levels were significantly declined in postmenopausal women, which may be due to the severance of bone formation as a result loss of the bone matrix. It may also be linked to

renal wasting and is aggravated by nutritional element deficiency and gastrointestinal losses with diarrhea or vomiting [28].

In our results, there was no significant difference found in the levels of zinc in both groups. Menopause causes raised bone resorption therefore enlistment of bone zinc along with an augmented urinary excretion with normal serum zinc levels [29].

Conclusion:

Based on the outcomes of our study, we concluded that there are changes in the anthropometric measurements and micro-nutrients in postmenopausal women. Therefore, appropriate trace elements can be given to postmenopausal women as an alternate or an adjunct to HRT, (Hormone Replacement Therapy) in order to get better the symptoms and to diminish the side effects of HRT. In addition, calcium and magnesium levels in plasma are relative to osteoporosis. Since the risk rises with advancing age, there is require for an increased consciousness of the significance of cardiovascular disease and osteoporosis as a chief public health problem for elder women. This study may also be helpful for early diagnosis and primary prevention of cardiovascular disease and osteoporosis.

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