Physiology

EFFECT OF BODY MASS INDEX AND WAIST HIP RATIO ON COGNITIVE PERFORMANCE IN PRE- AND POST-MENOPAUSAL WOMEN .

Parvatha Rani.N*	Assiatant Professor, Department of Physiology Tirunelveli Medical College,.Tirunelveli *Corresponding Author
Neelambikai. N	HOD and Professor Department of physiology, Coimbatore medical college, Coimbatore

ABSTRACT

BACKROUND: Menopause is the period of declined ovarian activity and decreased oestrogen level with increased chances of obesity and co-morbidities like Hypertension, Hyper-cholestrelemia, Impaired cognitive function and Cardio vascular dysfunction. Menopausal women are at high risk of obesity and impaired cognitive function which increases the mortality, morbidity and socio economic burden.

AIM & OBJECTIVE: To study the effect of menopause on BMI and WHR and compare the cognitive function in pre and post menopausal women. DESIGN: Cross sectional study.

PARTICIPANTS: Apparently healthy 30 post menopausal women in the age group of 55-60 years as study subjects and 30 pre menopausal women aged 40-45years as controls.

METHODOLOGY The study was initiated with the approval of Institutional Ethical Committee. Standardised measurements of height, weight, waist circumference and hip circumference were taken. BMI was calculated using QUETELET'S INDEX. Participants completed a Standardised Mini-Mental State Examination(SMMSE- Questionnaire). Results were analysed by T –Test. Statistical analysis was performed to find the association between SMMSE score, BMI and WHR of premenopausal and post-menopausal women.

RESULTS: Post- menopausal women are likely to be obese (Mean BMI 26.34) compared with the pre-menopausal women (24.39); with tha significant 'p'value of p<0.05. The post-menopausal women had a higher waist (91.14) and hip circumference (84.64); p<0.05 as compared with the pre-menopausal women (84.64 and 98.06 respectively) with significant difference (p<0.05). When compared with WHR, there is no significance difference between pre- menopausal (0.8618) and post-menopausal (0.8724); p>0.05. Post-menopausal women had less cognitive functioning (SMMSE 15.08) compared with pre-menopausal women (21.08); p<0.01. These findings suggest that obesity has significant impact on cognitive function among the post-menopausal women when compared with premenopausal women.

CONCLUSION: Post menopausal women have high BMI and higher WHR with decreased cognitive function.

KEYWORDS : Menopause, Body mass index, WHR, Cognitive function.

INTRODUCTION

Menopause is a global physiological milestone in every women's life and they become non reproductive due to aging characterised by declining ovarian follicles and ovarian hormones with termination of menstrual cycle[1]. Age of menopause is genetically determined and is not related to race or nutritional status, it is around 40-55 years[2]. Post menopausal women are at risk of conditions precipitated by oestrogen deficiency. More than 35 symptoms are associated with menopause[3]. Women have to spend 1/3 of their lives with these symptoms in postmenopausal period as average life expectancy is increasing. Menopause has its impact on women's health and sense of wellbeing. Oestrogen act as a shield and protect the women from cardio vascular dysfunction, impaired cognitive function, obesity, osteoporosis and related comorbidities[1].Prevalence of obesity increases in each decade but 20% weight gain occurs in the first three years of menopause. As age advances, the metabolic rate slows down and the energy expenditure become less. The body mass index is commonly used as index to assess the degree of body fat and various studies shown that normal BMI with increased waist hip ratio have a two fold increase in cardio vascular dysfunction. WHR is a better predictor to assess the risk of developing CVD in women compared to BMI[3].

In post menopausal women the estrogen deficiency plays an important role in the change of body composition and adipose tissue distribution Decline in cognition is a frequent complaint among peri and post menopausal women. During this transitional period there will be inability to learn and recall new information which can be a very early sign of dementia. Estrogen influences brain function by inducing structural changes in the neuron like increase in dentritic spine density, synapse formation by its neurotrophic response. Estrogen may exert neuroprotective effects on apoptosis and oxidative stress..Verbal memory scores are frequently used as one of the measure of higher level cognition and these scores are directly proportional to the levels of estrogen. The Mini Mental State Examination questionnaire was widely used among health care professionals as a universal screening tool to evaluate the cognitive functins. Obesity in post menopausal women are multifactorial like reduced basal metabolic rate, less physical work and altered eating habits.[4]. Around 35% of post

menopausal females and 19% of males are osteoporotic. The measurement of BMI,WHR and cognitive function by MMSE are very simple, non invasive, effective tool to assess the health status of women.

As it is well accepted that the health of postmenopausal women represents the health of the society, this study concentrates on problems related to menopause by estimating BMI, WHR, Cognitive function. The special medical care related to post menopausal women will form a specific field of medicine in future.

MATERIALS AND METHODOLOGY

This cross sectional study was conducted in the Research laboratory, Department of Physiology, Tirunelveli medical college between July 2016- October 2016 after obtaining ethical committee clearance. This Study involved 30 postmenopausal women in the age group of 55-60 years as subjects and 30 premenopausal women aged 40-45 years as controls. The study protocol was explained in detail to them and written consent was obtained.

EXCLUSION CRITERIA:

Women with diabetes, hypertension, alcoholism, smoking habits, Amenorrhoea due to surgical removal of uterus and with history of estrogen or hormonal replacement therapy were excluded from the study.

Anthropometric measurements.: Weight in (kg) was measured using portable calibrated electronic weighing scale with study subjects wearing light cloths and height in meters was obtained using stadiometer. The BMI was calculated using Quetlet's formula BMI=weight in Kg/height in m^2 as a measure of relative weight. The BMI values determining the health status was divided into groups based on WHO classification. Using the flexible meter tape the waist circumference was measured at a point midway between lowest rib and iliac crest. Hip circumference was measured at the widest level over the greater trochanter..(9). TheWaist to hip ratio indicating central fat deposition was calculated using the formula WHR= waist circumference (cm)/ hip circumference (cm). Menstrual history

including age at menarche, age of attaining menopause and number of years after menopause were recorded. Participants completed a Standardised Mini-Mental State Examination (SMMSE- Questionnaire).

## RESULTS ANALYSIS

Table 1: DISTRIBUTION OF BODY MASS INDEX

BMI	Pre menopausal group		Post menopausal group	
	NUMBERS	%	NUMBERS	%
Under weight (< 19)	3	10	-	-
Normal (19 - 24.9)	23	76.7	11	36.7
Overweight (≥25)	4	13.3	19	63.3
Total	30	100	30	100
BMI Range Mean SD	21.6 - 27.7 22.3 2.6	20.3-29.3 24.8 2.4		
P VALUE	0.0017* (Significant)			

The difference between pre and post menopausal group regarding BMI is statistically significant.The post menopausal group have higher BMI than pre menopausal group.
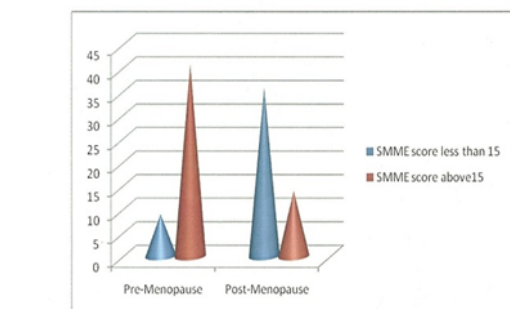
FIG 1: DISTRIBUTION OF BMI IN PRE AND POSTMENOPAUSAL WOMEN
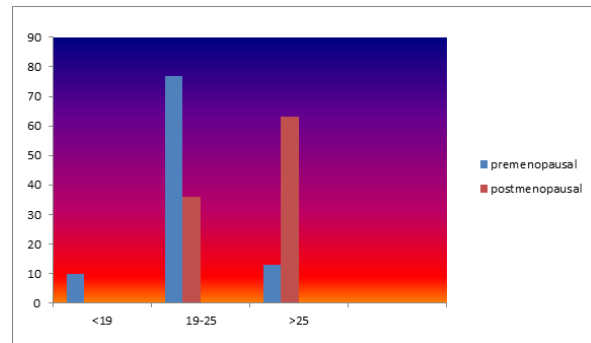
FIG II: DISTRIBUTION OF WHR IN PRE AND POST MENOPAUSAL WOMEN
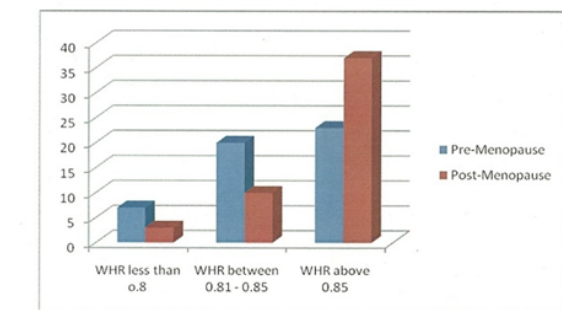
FIG :III COGNITIVE FUNCTION BETWEEN PRE AND POST MENOPAUSAL WOMEN

Post menopausal women had less cognitive functioning (SMMSE 15.08) compared with pre- menopausal women (21.08) ; p<0.01

DISCUSSION

Menopause occurs as a continuous transition from a regular cycles of ovulation, not as a sudden event. The prevalence of obesity in women rises in each decade but 20% weight gain ie 4-5 kg occurs within 3 years of menopause. Over weight and Obesity have unfavourable impact on health of postmenopausal women. . Similar findings were observed in a study on postmenopausal women in Zaria, Nigeria[6]. The altered hormonal status precipitates central obesity which in turn leads to non communicable diseases like diabetes, dyslipidaemia, hypertension, cardiovascular dysfunction and altered mental status[9]. Kirchengast S et al confirmed the findings that increased BMI and WHR in post menopausal women in their study ,Anthropometric hormonal correlation in fertile and postmenopausal women from Austria. The change in level of sex steroid hormone may have direct effcts like cognition and indirect effects like mood in stability,sleep disturbances and hot flushes. The role of steroid hormone estrogen on mood,behaviour,and cognition can be explained by the widespread presence of estrogen receptors in regions invoved in cognitive process like learning, memory which includes hippocampus, amygdala and cerebrum. The estrogen receptors distributed in the brain regulates cerebral blood flow, neuronal action and synaptic activity. Estrogen induced opioid activity also play a major role in memory[10]. Degeneration of cholinergic neurons is the earliest change in dementia and estrogen improves cholinergic neuronal activity[11].Dementia is a major public health issue because of its rapidly increasing rate of occurrence in aging populations. Obesity and overweight increases the risk of vascular disorders and dementia. Early predictors of poor cognitive performance may denote a population at risk for the development of dementia and this finding is consistent with Barbara B.Sherwin et al Estrogen and cognitive function ,Department of psychology,Montreal ,Canada[12]. Identifying the populations at risk for dementia is becoming increasingly important as more information is available on possible preventative therapies to reduce or delay the incidence of dementia. Severine sabia et al suggested in their study that long term obesity as well as underweight were associated with low cognitive function[13] .Previous studied conducted in middle age population by Gustafson D, found the association of BMI and vascular disease. They explained that secretions of adipocytes like hormones, cytokines and growth factors cross the blood brain barrier and affect brain function. This study explored the relationships between waist–hip ratio (WHR), BMI, and cognition score. Kavitha et al concluded in their study that post menopausal women had higher BMI, elevated lipid status and decreased cognitive abilities[14]. Weight gain and increased WHR in menopausal women can be prevented by life style modification. To improve the quality of live after menopause they must aware of the influence of BMI on cognitive function. To conclude we found that increased BMI over the adult life period is associated with poor cognitive function and public health message should promote a healthy BMI at all ages for better quality of live.

CONCLUSION:

BMI and WHR are interrelated and associated with obesity and cognitive functioning in older women. Effects of obesity on cognition has a direct and indirect effect through higher endogenus estrogen levels improving cognitive function. Postmenopausal women have increased tendency to become obese and decreased cognitive function due to decreased level of estrogen and estrogen receptors which influences on cognitive functions like learning and memory. This studies provides evidence that estrogen protects memory and to maintain ideal BMI and WHR for better quality of life.

ACKNOWLEDGEMENT

REFERENCES

1. Diana R. Kerwin, MD, Yinghua Zhang, PhD, Jane Morley Kotchen, MD, MPH, Mark A. Espeland, The Cross – Sectional Relationship between Body Mass Index, Waist – Hip Ratio, and Cognitive Performance in Postmenopausal Women Enrolled in the Women's Health Initiative,2010.
2. Deborah Grady, MD, MPH, Kristine Yaffe, MD, Margaret Kristof, RN, MS, Feng Lin, MS. Effect of Postmenopausal Hormone Therapy on Cognitive Function: The Heart and Estrogen/progestin Replacement Study, AJM, 2002, Vol - 113
3. Divya Bishnoi,Tanveen kaur,Badaruddoza.Predictor of cardio vascular disease with

respect to BMI,WHR, and Lipid profile in females of three population groups. Biology and Medicine32-41,2010

4. Barbara A. Gower,* Julian Mun˜oz,* Renee Desmond,†TenaHilario-Hailey,* and Xiuxiang Jiao. Changes in Intra-abdominal Fat in EarlyPostmenopausal Women: Effects of HormoneUse, Vol. 14 No. 6 June 2006..
5. A.Colombel1 and B.Charbonnel. Weight gain and cardiovascular risk factors in the post-menopausal woman
6. Joyce T Bromberger et al:Prospective study of the determinants of age at menopause;American Journal of Epigemiology;1997;vol 145,
7. William's Text book of Endocrinology.8th Edition.p56,584.
8. J.Laary Jameson,Leslie J.De Groot.Endocrinlogy;VolumeII,6th Edition p2428-2435
9 . Berek & Novok's Gynecology:14th Edition p 1328-1329
10. Achie LN, Olorunshola KV, Toryila JE,Tende JA. The body mass index, waist circumference and blood pressure of Post menopausal Women in Zaria,Northen Nigeria. Curr Res J boil sci 2012:4(3) 329-33
11. Deborah Grady et al ,Effect of Postmenopausal Hormone Therapy on Cognitive Function:The heart and Estrogen/Progestin replacement study.
12. Gibbs RB, Hashash A, Johnson DA. Effects of estrogen on potassium stimulated acetylcholine release in the hippocampus and cortex
13. Barbara B. Sherwin ,et al, Department of psychology, McGill University, Montreal,Canada.
14. Severine sabia et al,Body mass index over the adult life course and cognition in late midlife: the Whitehall II Cohort Study .
15. Kavitha R et alAssociation of serum lipid profile,BMI,and Atherogenic index with cognitive functions in post menopausal women:NJBMS-2015p6-10.