



EFFECT OF BODY MASS INDEX, WAIST HIP RATIO AND WAIST CIRCUMFERENCE ON COGNITIVE FUNCTIONS IN PERIMENOPAUSAL WOMEN

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ABSTRACT

Cognitive performance is predictive of subsequent dementia; the assessment of risk factors might have a protective or detrimental effect on cognitive performance in perimenopausal women. The objective of the present study was to elucidate the effect of BMI, waist circumference and waist hip ratio on various cognitive function parameters such as Mini Mental Scale examination (MMS-E), Orientation, Attention, Memory, Visuo Spatial ability, Verbal Fluency and Language in perimenopausal age women. The present study included a total of 60 healthy women (40-60 years). Participants were categorized into control group and overweight/obese groups based on the body mass index. The results of the present study showed a significant decrease ($P < 0.05$) in all the cognitive parameters in the overweight/obese group when compared to the control group. In conclusion the present study suggest that increased waist circumference, waist hip ratio and BMI are the risk factor for cognitive impairment in perimenopausal women.

KEYWORDS: Body Mass Index, Perimenopause, cognitive functions, waist circumference, waist hip ratio



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INTRODUCTION

Obesity poses a significant health threat to individuals throughout much of the developed world and places a major burden on the health care system. Cognitive dysfunction has increased in menopausal women which indicate the initiation of dementia¹. The prevention of cognitive impairment through the identification and management of risk factors is important in woman. The physical health consequences of obesity have been documented extensively, with most studies showing that the risks of chronic illness and mortality increase as one's body adiposity increases²⁻⁴. Higher levels of all adiposity measures were associated with worsening cognitive function in men⁵⁻⁷. However, few studies in association between adiposity and cognitive changes in women was reported⁸⁻⁹. The consequences of obesity on cognitive function in perimenopausal women are less well understood with widely varied results and conflicting evidences^{10, 11}. The most widely used index of obesity is body mass index (BMI), calculated as weight (kg) divided by height (m)². Growing evidence supports the idea that an increased body mass index (BMI) is a risk factor for dementia¹². Body mass index may influence or be influenced by brain structures and functions involved in dementia processes¹³, and have been shown to influence brain development in relationship to early and late measures of cognitive function, intelligence, and disorders of cognition^{14,15}. Obesity is not only a weight problem, but it is linked to adverse neurocognitive outcomes¹⁴. In addition recent studies suggest a strong interaction between brain areas involved in cognitive, emotional, and metabolic regulatory functions controlling body weight¹⁵. It seems that obesity complications are spreading in all directions reaching the brain and the neurocognitive functions.

Women's weight gain and increase in adiposity in mid-life are thought to occur through a number of mechanisms, including lowered physical activity and resting metabolic rate. The distribution of body fat in the abdominal region, referred to as central obesity and measured by waist circumference and Waist Hip Ratio, is an

independent and more potent risk factor for type 2 diabetes, insulin resistance, coronary heart disease, stroke, and mortality than total body obesity¹⁶. Currently, it is unclear whether central obesity predisposes patients to cognitive impairment independently of other risk factors. Cognitive performance is predictive of subsequent dementia; the assessment of risk factors might have a protective or detrimental effect on cognitive performance in normal perimenopausal women is an important area of investigation. The present study was planned to explore the relationships between BMI, waist-hip ratio (WHR), and waist circumference on various cognitive function parameters such as Mini Mental Scale examination (MMS-E), Orientation, Attention, Memory, Visuo Spatial ability, Verbal Fluency and Language in perimenopausal age women.

MATERIALS AND METHODS

In the present study a woman was considered perimenopausal if her menstrual cycles had been irregular or her last menstrual bleeding occurred >3 and ≤12 months prior to study baseline. This cross sectional study included a total of 60 healthy women (40-60 years). During orientation each subject was briefly explained the purpose, procedure and confidentiality prior to their written informed consent. Participants were categorized into control group and overweight/obese groups based on the body mass index (control group, BMI of 18.5-24.9; overweight/obese group, BMI ≥ 25.0; n=30 in each group) in accordance with World Health Organization Criteria. After detailed enquiry of the medical history of the subjects, those with history of smoking, alcoholism, medical illness were excluded. Subjects on oral contraceptive pill, hormonal replacement therapy, drugs that alter the cardiovascular functions were also excluded from the study. Informed written consent was obtained from all participants, and the experiment protocol was approved by Ethics committee of the college. Cognitive function

was evaluated by ADDENBROOKE'S COGNITIVE EXAMINATION-ACE-R. Addenbrooke's Cognitive Examination (ACE)¹⁷ and its revised version (ACE-R)¹⁸ were developed as a brief test of cognitive functions. This includes the MMSE (Mini mental scale examination), consists of five domains, each representing a specific cognitive function: (1) attention and orientation (18 points), (2) memory (26 points), (3) fluency (14 points), (4) language (26 points), and (5) visuospatial ability (16 points). The total score of ACE-R is 100

points, which includes the MMSE score (30 points). Higher scores indicate better cognitive functioning.

Statistical analysis

Parameters was analyzed statistically using SPSS (Statistical Package for Social Sciences) version 11.5. "Student t test was done to compare between the exercising and non exercising group. P- Value < 0.05 was considered as statistically significant.

Table 1

Waist hip ratio and waist circumference in control group and overweight/obese non exercisers perimenopausal woman. Values are expressed as Mean \pm SD. (n= number of subjects in each group)

Parameters	CONTROL GROUP (n=30)	OVERWEIGHT /OBESE GROUP (n=30)
BMI	5.019 \pm 1.41	5.751 \pm 1.579**
WAIST HIP RATIO	0.65 \pm 0.025	0.99 \pm 0.02**
Waist Circumference	74.08 \pm 2.30	98.05 \pm 2.21**

** P < 0.001; Control group versus Overweight/Obese group

Table II

Cognitive function analysis in control group versus Overweight/ obese group. Values are expressed as Mean \pm SD. (n= number of subjects in each group)

Parameters	Control group (n=30)	Overweight / Obese group (n=30)
MMS-E	26.69 \pm 0.54	23.0 \pm 3.5 *
Orientation	8.05 \pm 0.76	9.39 \pm 0.35*
Attention	7.49 \pm 0.35	6.94 \pm 0.88 *
Memory	21.8 \pm 1.01	18.7 \pm 2.8 *
Verbal Fluency	10.90 \pm 0.92	9.7 \pm 1.7*
Language	21.9 \pm 0.92	19.5 \pm 1.9*
Visuospatial Ability	12.9 \pm 10.7	11.32 \pm 2.1*
ACE- TOTAL	85.33 \pm 2.11	71.3 \pm 9.51 *

* P < 0.05; Control group versus Overweight/Obese group

The results of the present study showed a significant increase in the BMI, waist hip ratio and waist circumference (Table I) in the overweight/ obese group when compared to control group. Further, the cognitive function analysis parameters (Table II) in the overweight/obese group showed a significant decrease (P<0.05) in when compared to the control group.

DISCUSSIONS

Poor performance on memory tasks is common among obese individuals across the adult

lifespan .The results of the present study suggest that BMI, Waist Hip ratio and Waist

circumference is positively associated with decreased cognitive performance in perimenopausal women. The present findings are consistent with studies demonstrating the decrements in cognitive functions in adults with increased body weight^{19, 20}. Obesity is associated with vascular changes, impaired insulin regulation, and reduced cardiovascular fitness, which all might contribute to decreased cognitive function^{21,22}. In addition, nonvascular mechanisms linking obesity with cognitive impairment have also been suggested²³Leptin, an adipocyte-secreted protein related to obesity, may play a role in learning and memory²⁴. Interestingly, higher levels of serum leptin appear to protect against cognitive decline in elderly individuals, suggesting leptin resistance as a causal pathway from obesity to cognitive impairment²⁵.

Body fat distribution is an important factor in obesity. The waist hip ratio and waist circumference denotes the body fat distribution. The present study also supports the fact the abnormal body fat distribution causes abrupt decrease in the cognitive performance. Present findings in this study, suggest that, greater central adiposity, estimated according to increased waist hip ratio and waist circumference is associated with lesser

cognitive function in pre-menopausal woman. These findings do not support nor negate other research demonstrating that obesity is a major risk factor for cardiovascular disease and other chronic diseases, including those such as hypertension and diabetes mellitus, which have been found to increase dementia risk. The results of the present study suggest that increased BMI, waist hip ratio and waist circumference are the most potent risk factor for cognitive impairment in perimenopausal women.

CONCLUSION

In conclusion, Obesity parameters are directly associated with decreased cognitive abilities. Appropriate health intervention should be based on preventive programmes. Preventive aspects in this regard are: maintaining normal BMI and abdominal obesity during the young and middle ages, educating women to improve their lifestyle, and a promotion in life quality. While the specific regulatory mechanisms remains to be investigated, the study adds to the growing body of research suggesting a negative link between increased body fat and brain functioning in perimenopausal woman

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