THE HEALER
Journal of Physiotherapy & Rehabilitation Sciences

Original Article

Relationship between Dietary Patterns and Central Obesity in Middle-Aged Adults

Mnahil Moazzam[1], Maryam Zahid[1], Zoha Sohail[1*], Noohela Khan[1], Aayeshah Firdous[1]

*1*Rashid Latif College of Allied Health Sciences, Lahore, Pakistan*

ABSTRACT

Background: An excess deposition of fat around the abdominal area leads to central obesity which increases the risk of many chronic diseases. Dietary patterns, physical inactivity, gender, ethnicity, economic, social and cultural factors are the main contributing factors. **Objective:** To assess the frequency of central obesity among middle-aged adults and to determine the relationship between central obesity and dietary patterns among middle-aged adults. **Methods:** This was a cross-sectional study; the sample size was 154 middle-aged adults aged between 44 to 60 years, were collected from Lahore via convenient sampling technique however chronically ill, bedridden, pregnant and postpartum women were excluded from the study and written informed consent was taken from the participants. A self-structured questionnaire with a combination of closed and open-ended questions was distributed among the participants. Questions asked from the selected sample included measurement of waist circumference. Males with waist circumference ≥35 inches (90cm) and females ≥31.5 inches (80cm) were considered centrally obese. Dietary history was taken using a food frequency questionnaire. Statistical analysis was done by applying chi-square to find the association between variables. **Results:** The frequency of different age groups showed more frequency i.e., 60(39%) in the age group 44 to 47 years and the frequency of waist circumference was given indicating more females i.e., 50(32.5%) were centrally obese and more males i.e., 43(27.9%) were non-centrally obese. A comparison of waist circumference with the frequency of meal and snack consumption was done showing significant p-values (p<0.001). **Conclusion:** It concluded that dietary habits directly affect central obesity; individuals with central obesity consumed more refined grains, whole milk, red meat, starchy vegetables, canned fruits, junk food, saturated fats and desserts. On the other hand, adults without central obesity consumed more whole grains, low-fat milk, lean meat, eggs, fresh fruits, non-starchy vegetables and unsaturated fats. It showed that females have a higher frequency of central obesity as compared to males. There was a strong association between central obesity and unhealthy eating patterns among middle-aged adults.

INTRODUCTION

Obesity has become an epidemic and a serious health disorder; its prevalence is increasing at a faster rate.[1] Obesity is characterized by increased body mass index (BMI) i.e. 30 kg/m² or more.[2] Central obesity is characterized by increased intra-abdominal fat accumulated around abdominal organs assessed by measuring waist circumference; central obesity is more dangerous than general obesity due to its correlation with high risks of heart disease, stroke, diabetes, hypertension, gallstones and some types of cancer. Central obesity is calculated by measuring waist circumference.[3-5]

According to World Health Organization (WHO), central obesity in females is characterized as a waist circumference of more than 35 inches and more than 40 inches in males. Predictors of metabolic problems state; central obesity measures i.e. waist circumference (WC) and waist-to-hip ratio (WHR) are rational measures as compared to the measures of general obesity i.e. BMI.[6] Males have a higher prevalence of upper body fat i.e. android obesity or apple-shaped obesity than females.[3] Dietary habits, physical activity, age, gender, socioeconomic status, marital status, education and ethnic groups are the main factors that influence waist circumference further leading to central obesity.

A study was conducted on 244 medical students residing in Pakistan to determine the frequency of central obesity and its correlation with diet and physical activity; the findings revealed that 46% of males and 31.4% of females had central obesity associated with increased caloric intake, physical inactivity, male gender and increased screen time.[7] According to WHO Asia Pacific cut-offs, the prevalence of generalized obesity was 42% in males and 58% in females and central obesity was 37.3% in males and 62.7% in females. The elevated incidence of general obesity was

found in Punjab at 60%, followed by Khyber Pakhtunkhwa at 59.2%. However, an increased incidence of central obesity was observed in Balochistan at 82.1%, followed by Punjab at 73.3%.[8] Some studies have also shown a higher prevalence of central obesity in females than in males.

A study conducted by Prasad DS in 2020 on South Asians to determine the prevalence of central obesity concluded that females had a high prevalence of central obesity that is 48% as compared to males having 33%.[9] A study conducted on drivers residing in Multan showed a mean waist circumference of 93.48 cm; eating three meals regularly outside was concluded to be the main factor of obesity.[10] Another study conducted on students of Iran, showed that the prevalence of central obesity i.e. 33.2% was more as compared to general obesity i.e. 21.3%; fast food consumption was directly associated with increased prevalence of central obesity.[11]

Healthy dietary and lifestyle choices reduce the risk of central obesity. A study conducted on Iranian women focused on three eating patterns i.e. "healthy dietary pattern" included increased consumption of fruits, tomatoes, poultry, legumes, cruciferous, green leafy vegetables and whole grains, "western dietary pattern" included increased consumption of refined grains, red meat, butter, and fast food and "Iranian dietary pattern" included increased consumption of refined/whole grains, hydrogenated fats, potatoes and legumes; results revealed a direct relationship between western dietary patterns and central obesity.[12]

Shirasawa T et al. 2019 conducted a study on Japanese middle-aged adults to determine the association between normal-weight central obesity and cardiovascular risk factors; normal-weight central obesity was correlated with increased risk for

cardiovascular diseases i.e. hypertension and dyslipidemia.[13] The body composition is based on both diet quality and quantity.[14-16] Other than diet, insufficient sleep also increases the risk of central obesity. A study was conducted on Iranian female students to determine the association between sleep duration and diet quality with central obesity; females with less than 6 hrs./day sleep, who were consuming more calorie-dense foods, and who were consuming less fiber, fruits, whole grains, and beans had central obesity.[14] A study was conducted on premenopausal housewives residing in Sri Lanka to determine the relationship between dietary habits and central obesity; the study concluded 45% of women had central obesity as they consume more than 18 portions of starch and were physically inactive.[15]

Eating frequencies and portion size of meals along with dietary choices also influence a person's body weight. A study was conducted to identify the association between eating frequency and central obesity among middle-aged men and women. Results suggested that individuals with high eating frequency i.e. taking three big meals and two small meals including higher energy percentage from carbohydrate, relative fiber consumption, and lower energy percentage from fats and proteins was positively associated with a healthy lifestyle in both men and women, whereas individuals taking low eating frequency i.e. few big meals and few small meals including high percentage from fats were more centrally obese.[16]

METHODS

This was a cross-sectional study; the sample size of this study was 154[17] middle-aged adults aged between 44 to 60 years,[18] were collected from Lahore via convenient sampling technique however chronically ill, bedridden, pregnant and postpartum women were excluded from the study, written informed consent was taken from the

participants. A self-structured questionnaire with a combination of closed and open-ended questions was distributed among the participants. Questions asked from the selected sample included measurement of waist circumference.[19] Males with WC $\geq$ 35 inches (90 cm) and females with WC $\geq$ 31.5 inches (80cm) were considered centrally obese.[6] Dietary history was taken using a food frequency questionnaire.[10,20,21] Data were analyzed by using SPSS software version 25, statistical analysis was done by applying chi-square to find the association between variables and a p-value of $\leq$0.05 was considered as statistically significant.

RESULTS

The frequency of different age groups was given in Table I showing more frequency i.e., 60(39%) in the age group 44 to 47 years and in Table II the frequency of waist circumference was given indicating more females i.e., 50 (32.5%) were centrally obese and more males i.e., 43 (27.9%) were non-centrally obese.

A comparison of waist circumference with the frequency of meal and snack consumption was done showing significant p-values (p<0.001) in Tables III and IV respectively. A comparison of waist circumference with food preferences was also mentioned in Table V.

Table I: Frequency of Different Age Groups

Age groups (years)	Frequency (%)
44-47	60 (39)
48-51	40 (26)
52-55	29 (18.8)
56-60	25 (16.2)
Total	**154 (100%)**

Table II: Frequency of Waist Circumference

Waist Circumference	Gender Frequencys (%)			p-value
	Male	Female	Total	
Centrally Obese	34 (22.1)	50 (32.5)	84 (54.6)	
Non-centrally obese	43 (27.9)	27 (17.5)	70 (45.4)	0.01
Total	77 (50%)	77 (50%)	154 (100%)	

Table III: Comparison of Waist Circumference with Frequency of Meal Consumption

Frequency of Meal Consumption		Waist Circumference Frequency(%)			p-value
		Centrally Obese	Non-Centrally Obese	Total	
Breakfast	Yes	68 (44.2)	67 (43.5)	135 (87.7)	0.01
	No	16 (10.4)	3 (1.9)	19 (12.3)	
	Total	84 (54.5)	70 (45.5)	154 (100)	
Lunch	Yes	54 (35.1)	57 (37.0)	111 (72.1)	0.01
	No	30 (19.5)	13 (8.4)	43 (27.9)	
	Total	84 (54.5)	70 (45.5)	154 (100)	
Dinner	Yes	82 (53.2)	55 (35.7)	137 (89.0)	0.00
	No	2 (1.3)	15 (9.7)	17 (11.0)	
	Total	84 (54.5)	70 (45.5)	154 (100)	

Table IV: Comparison of Waist Circumference with Frequency of Snack Consumption

Frequency of Snacks Consumption	Waist Circumference Frequency (%)			p-value
	Centrally Obese	Non-Centrally Obese	Total	
None	42 (27.3)	2 (1.3)	44 (28.6)	
1-2 Times a Day	32 (20.8)	17 (11.0)	49 (31.8)	
2-3 Times a Day	8 (5.2)	29 (18.8)	37 (24.0)	0.00
4 Times a Day	2 (1.3)	16 (10.4)	18 (11.7)	
>4 Times a Day	0 (0)	6 (3.9)	6 (3.9)	
Total	84 (54.5%)	70 (45.5%)	154 (100%)	

relationship with dietary patterns among middle-aged adults in Lahore. The results indicated that 54.6%(84) of middle-aged adults were centrally obese and 45.4%(70) had normal waist circumference. Out of centrally obese individuals, 22.1%(34) were males and 32.5%(50) were females. According to another study, the prevalence of generalized obesity was 57.9% i.e. 42% in males and 58% in females and the prevalence of central obesity was 73.1% i.e. 37.3% in males and 62.7% in females as per WHO Asia Pacific cutoffs. The elevated incidence of general obesity was found in Punjab at 60%, followed by Khyber, Pakhtunkhwa at 59.2%. However, an increased incidence of central obesity was observed in Baluchistan at 82.1%, followed by Punjab at 73.3%.[8]

Data obtained from the food frequency questionnaire in the current study showed that among centrally obese middle-aged

adults 10.3% skipped breakfast daily and 44.2% consumed daily. On the other hand, among subjects with normal waist circumference, only 1.9 % skipped and 43.5% consumed breakfast daily. However, a study titled "breakfast habits and differences regarding abdominal obesity in a cross-sectional study in Spanish Adults (aged 39±12 years)" aimed to determine the relationship between breakfast consumption and central obesity; showed that 3.6% of adults omitted breakfast and 14.1% usually ate breakfast, individuals who skipped breakfast were more centrally obese as compared to those who consumed breakfast daily. Daily breakfast consumption was inversely correlated with central obesity.[22]

According to the present study, 24.7% of abdominally obese adults consumed whole milk daily and 16.9% of adults consumed 4-6 days a week. 41.6% of centrally obese adults never consumed low-fat milk, 54.4%

of centrally obese adults never consumed packaged milk and 45.5% of normal waist adults never consumed packaged milk. Among centrally obese adults 7.1% daily consumed cheese and 45.5% of middle-aged adults with normal waist circumference never consumed cheese. On the other hand, a study among female students determined that the incidence of obesity, central adiposity, and excess weight was 1.7, 0.9, and 8.1%, respectively. The mean values of BMI and waist circumference were 21.54 kg/m2 and 70.37 cm, respectively. The mean value of dairy consumption was 444.24 g/day. The results identified no significant association between dairy or calcium intake and weight and waist circumference.[23] The outcomes of this study showed that daily egg consumption was high among middle-aged adults with a normal waist circumference by 24.7%.

Middle-aged adults with normal waist circumference consumed lean meat by 4-6 days a week by 28.6% and daily by 8.4%. Red meat consumption was high among centrally obese middle-aged adults. 20.1% consumed red meat 4-6 days a week and 3.9% consumed it daily. A study conducted among Iranian families showed a significant positive relationship between red meat consumption and abdominal obesity.[24] The current study manifested less consumption of fresh fruits and non-starchy vegetables among centrally obese individuals as compared to individuals without central obesity. Among centrally obese individuals only 6.5% consumed fresh fruits daily and 9.1% consumed non-starchy vegetables daily.

The consumption of fast foods, carbonated beverages saturated fat and dessert consumption was higher among centrally obese adults by 13% (for 4-6 days a week), 9.7% (4-6 days a week), 11.7% (daily) and 12.3% (4-6 days a week) respectively. However, the frequency of unsaturated fat consumption was 24% daily among middle-aged adults without central obesity. A study

showed that the frequency of whole fruit consumption reduces the incidence of abdominal obesity; the prevalence of subjects who consumed whole fruit daily was 32.6%, whereas 52.3% consumed fruit juice rarely. The standard intake of total sugars was 14.9% of total energy, which was within the recommended range (<20% of total energy) for Koreans. Intake of whole fruit ≥1 time/day was associated with a reduced risk of obesity, abdominal obesity, and hypertension.[25] The current study revealed an inverse correlation between central obesity and healthy dietary pattern including consumption of whole grains, lean meat, low-fat milk, fruits and vegetables. A cross-sectional study was performed in China on 1432 participants (aged 40-65 years) to investigate the relationship of dietary patterns with the risk of insulin resistance, diabetes mellitus, and central obesity.

Factor analysis extorted four major dietary patterns: vegetable-fruits, rice-meat, seafood-eggs, and sweet-fast. The vegetable-fruits pattern was not associated with abdominal obesity and also lowers the risks of diabetes mellitus. However, sweet-fast food pattern was significantly related to higher risks of diabetes mellitus and central obesity in males. T here was no relationship noticed between the rice-meat pattern or the seafood-eggs pattern with central obesity and insulin resistance.[26] Another study was conducted in Calcutta, India on middle-aged Bengalee Hindu men to examine the relationship between central obesity and food patterns with metabolic risk factors for coronary heart disease.

According to the results, almost all-central obesity measures; WC, WHR and conicity index were directly linked with risk factors for coronary heart diseases. The frequency of eggs, fried snacks and Bengalee sweets consumption was positively and remarkably connected with increasing all abdominal obesity measures. Whereas, the frequency of chicken and fish consumption was also

negatively associated with central obesity.[27]

CONCLUSION

The results of the current study showed that the overall frequency of central obesity among middle-aged adults was 54.6% (84) i.e. 32.5% female and 22.1% males. It concluded that dietary habits directly affect central obesity; individuals with central obesity consumed more refined grains, whole milk, red meat, starchy vegetables, canned fruits, junk food, saturated fats and desserts. On the other hand, adults without central obesity consumed more whole grains, low-fat milk, lean meat, eggs, fresh fruits, non-starchy vegetables and unsaturated fats.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.
Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.
Competing interests: None
Funding: No funding source is involved.
Authors' contributions: All authors read and approved the final manuscript.

REFERENCES

1. Castro-Pinero J, Ortega FB, Ruiz JR. Adiposity and cardiovascular risk in children and adolescents: implications of the amount of fat carried and where. Mayo Clinic Proceedings; 2019: Elsevier; 2019. p. 1928-30.
2. Seidell JC. Epidemiology-definition and classification of obesity. Clin Obes Adults Child 2007; 23(2): 1-11.
3. Rolfes S, Pinna K, Whitney EJCL. Understanding normal and clinical nutrition. ISBN: 1285458761. 2020: 1120.
4. Wong MC, Huang J, Wang J, et al. Global, regional and time-trend prevalence of central obesity: a systematic review and meta-analysis of 13.2 million subjects. 2020; 35: 673-83.
5. Nanan DJJoPMA. The obesity pandemic--implications for Pakistan. 2002; 52(8): 342.
6. Organization WH. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008. 2011.
7. Khan ZN, Assir MZK, Shafiq M, Jabeen AJIjoe, metabolism. High prevalence of preobesity and obesity among medical students of Lahore and its relation with dietary habits and physical activity. 2016; 20(2): 206.
8. Basit A, Askari S, Zafar J, et al. NDSP 06: Prevalence and risk factors for obesity in urban and rural areas of Pakistan: A study from second National Diabetes Survey of Pakistan (NDSP), 2016–2017. 2021; 15(1): 19-25.
9. Prasad D, Kabir Z, Devi KR, Peter PS, Das BJIHJ. Gender differences in central obesity: Implications for cardiometabolic health in South Asians. 2020; 72(3): 202-4.
10. Asif M, Aslam M, Altaf SJAoKEMU. Dietary Intake Pattern Associated with General and Central Obesity Among Professional Drivers of Multan, Pakistan. 2018; 24(S): 867-71.
11. Mohammadbeigi A, Asgarian A, Moshir E, et al. Fast food consumption and overweight/obesity prevalence in students and its association with general and abdominal obesity. 2018; 59(3): E236.
12. Esmaillzadeh A, Azadbakht LJTJon. Major dietary patterns in relation to general obesity and central adiposity among Iranian women. 2008; 138(2): 358-63.
13. Shirasawa T, Ochiai H, Yoshimoto T, et al. Associations between normal weight central obesity and cardiovascular disease risk factors in Japanese middle-aged adults: a cross-sectional study. 2019; 38: 1-7.

14. Haghighatdoost F, Karimi G, Esmaillzadeh A, Azadbakht LJN. Sleep deprivation is associated with lower diet quality indices and higher rate of general and central obesity among young female students in Iran. 2012; 28(11-12): 1146-50.

15. Rathnayake KM, Roopasingam T, Dibley MJJBrn. High carbohydrate diet and physical inactivity associated with central obesity among premenopausal housewives in Sri Lanka. 2014; 7: 1-7.

16. Holmbäck I, Ericson U, Gullberg B, Wirfält EJBjon. A high eating frequency is associated with an overall healthy lifestyle in middle-aged men and women and reduced likelihood of general and central obesity in men. 2010; 104(7): 1065-73.

17. Silva DCGd, Pereira KAdC, Segheto W, Ferreira FG, Segheto KJ, Longo GZJRdN. Association of eating patterns and abdominal adiposity in Brazilian. 2017; 30: 783-93.

18. Dyussenbayev AJAiSSRJ. Age periods of human life. 2017; 4(6).

19. CDC HW. Assessing your weight. About Child & Teen BMI [updated May 15, 2015 417 Available from: 418 https://wwwcdc gov/healthyweight/assessing/bmi/childrens_ bmi/about_childrens_bmi html 419 2020.

20. Safdar NF, Bertone-Johnson E, Cordeiro L, Jafar TH, Cohen NLJJons. Dietary patterns of Pakistani adults and their associations with sociodemographic, anthropometric and life-style factors. 2013; 2: e42.

21. Safdar NF, Bertone-Johnson ER, Cordeiro L, Jafar TH, Cohen NLJAPjocn. Dietary patterns and their association with hypertension among Pakistani urban adults. 2015; 24(4): 710-9.

22. Navia B, Lopez-Sobaler AM, Villalobos T, et al. Breakfast habits and differences regarding abdominal obesity in a cross-sectional study in Spanish adults: The ANIBES study. 2017; 12(11): e0188828.

23. Bank SS, Ghanjali N, Ghalaeh RS, Azadbakht LJJoe, promotion h. Association between dairy and calcium intake and general and central obesity among female students. 2013; 2(1): 16.

24. Dabbagh-Moghadam A, Mozaffari-Khosravi H, Nasiri M, et al. Association of white and red meat consumption with general and abdominal obesity: a cross-sectional study among a population of Iranian military families in 2016. 2017; 22: 717-24.

25. Choi A, Ha K, Joung H, Song YJJotAoN, Dietetics. Frequency of consumption of whole fruit, not fruit juice, is associated with reduced prevalence of obesity in Korean adults. 2019; 119(11): 1842-51. e2.

26. Yin X, Chen Y, Lu W, Jin T, Li LJN, Diabetes. Association of dietary patterns with the newly diagnosed diabetes mellitus and central obesity: a community based cross-sectional study. 2020; 10(1): 16.

27. Ghosh A, Bose K, Das Chaudhuri ABJAPjocn. Association of food patterns, central obesity measures and metabolic risk factors for coronary heart disease (CHD) in middle aged Bengalee Hindu men, Calcutta, India. 2003; 12(2).