

ABDOMINAL OBESITY IN ADULTS: PREVALENCE AND RELATED FACTORS**Maryam Esmaeili¹, Maryam Eskafi Noghani², Amirhosein Basirimoghadam³, Mehrdad Kianmehr⁴, Mustafa Pouryousef⁵, Hamid Rasekhi⁶, Mojtaba Kianmehr^{7*}**¹Social Development and Health Promotion Research Center, Gonabad University of Medical Sciences, Gonabad, Iran²Department of Social Sciences, Faculty of Humanities, Islamic Azad University Gonabad Branch, Gonabad, Iran³Faculty of Medicine, Gonabad University of Medical Sciences, Gonabad, Iran⁴Department of Nutrition Sciences, Varastegan Institute for Medical Sciences, Mashhad, Iran⁵Department of Human Sciences, Shahid Rajaei Institute for Teacher Training, Torbat Heydariyeh, Iran⁶Department of Nutrition, Faculty of Nutrition Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran⁷Department of Medical Physics, Faculty of Medicine, Gonabad University of Medical Sciences, Gonabad, Iran

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Abstract

Obesity is one of the most important health problems; it has an increasing prevalence in Southeast Asia, the Mediterranean and Iran. The purpose of this study is to determine the prevalence of abdominal obesity and its relationship with individual, social, and economic characteristics and physical activity in adults in Gonabad in 2019. This cross-sectional study included 250 individuals aged 18-70 years living in Gonabad, Iran. Participants were selected by a multi-stage sampling method; they are randomly selected from areas sheltered by community health centers in zones 1, 2 and 3. Socioeconomic characteristics were determined using the Garmaroudi and Moradi questionnaire. Physical activity was measured by the Baecke Physical Activity Questionnaire. Anthropometric indices including waist circumference, hip circumference, height and weight were measured by the researchers. Multiple regression analysis was used to evaluate the relationship between waist circumference and other factors at a significance level of less than 0.05. Participants' ages range from 13.16±36.40 years, of whom 44.8% were male, 82.4% were married and 60% were employed. There were statistically significant relationships between waist circumference with age, sex, occupation, income, socioeconomic status, BMI and physical activity indices ($p < 0.05$). Waist circumference was directly related to quantitative variables of age, income, socioeconomic status, BMI and leisure-time physical activity; however, it was inversely correlated with physical activity index and physical activity index. Moreover, waist circumference was greater in men than in women and it was lower in the employed than in the unemployed participants. Individual and socioeconomic characteristics and physical activity are among the influential factors affecting the abdominal obesity in adults.

Key words: *Abdominal Obesity, Physical Activity, Adults***Introduction**

The World Health Organization defines health as complete state of physical, mental, and social well-being, rather than the absence of disease or disability (World Health Organization, 2005). Obesity is a chronic multifactorial metabolic disease caused by interaction of genetic, physiological, metabolic, socioeconomic, behavioral, cultural, psychological, environmental, dietary and physical activities (Aghapour et al., 2013; Moshkani et al., 2016; Rezazadeh et al., 2009). Obesity is one of the most important health problems, and its prevalence is increasing in Southeast Asian countries, the Mediterranean, and Iran (Ghaneh Basiri et al., 2014). Psychological, social, physical and economic

consequences of obesity are well known, including cardiovascular disease, kidney disease, insulin resistance, type 2 diabetes, high blood pressure, temporary sleep apnea, non-alcoholic inflammation of the liver, increased blood cholesterol and triglycerides, arthritis, asthma, decreased life expectancy, low self-esteem, reduced quality of life, and breast and colon cancer (Aghapour et al., 2013; Nazary, 2015).

The World Health Organization has defined general obesity as a body mass index greater than or equal to 30 kg/m² and abdominal obesity as a waist circumference greater than 88 cm for women and 102 cm for men. Accumulation of excess fat in the abdomen and upper torso, known as abdominal

obesity, is a prognosis for risk factors of cardiovascular disease and its consequences [6]. Increased visceral fat is far more dangerous than accumulation of fat elsewhere in the body and can increase the risk of premature death and chronic diseases (Mohan & Deepa, 2006). For this reason, waist circumference is a very important indicator for determining the risks of cardiovascular diseases, hypertension and diabetes (Shahi et al., 2014; Janghorbani et al., 2007).

Advances in technology, machine life, spread of motor poverty, changes in lifestyles, and departure of humans from normal living conditions have dramatically altered physical and mental health (Jackson et al., 2005). In 2015, about 2.3 billion adults gained weight and 700 million were obese, according to the World Health Organization (Nguyen, 2010). By 2030, the number of obese people worldwide will reach 1.12 billion and the number of overweight people will reach 2.16 billion (Kelly et al., 2008). In 2010, the increase in prevalence of obesity was recognized as one of the three high-risk factors in Iran. Abdominal obesity is present in 34% of women, 10% of men, more than 28% of urban residents, and 23% of Iranian villagers (Dugravot et al., 2010; Barzin et al., 2009; Dehghanpouri et al., 2010; Kelishadi et al., 2008).

A relationship has been reported between obesity and individual and social characteristics (Hassanzadeh et al., 2012; Wilsgaard et al., 2005; Hajian-Tilaki & Heidari, 2007). On the other hand, obesity can lead to social isolation, dissatisfaction with body weight, and decreased self-esteem (Annis et al., 2004). Health care costs 30 percent more for obese people than for normal-weight people (Thorpe et al., 2004). Physical inactivity is one of the effective factors in causing obesity. According to studies conducted in Iran, 40% of adult Iranians have low physical activity (Esteghamati et al., 2011). Most specialists in medical sciences and physical education agree on the method of diet control along with physical activity as the most basic and scientific method of weight loss (Dehghanpouri et al., 2010; Gokee-LaRose et al., 2009). A sedentary lifestyle reduces energy consumption and promotes overweight (Church et al., 2011).

Development of a society in all its dimensions requires a dynamic and healthy human resource. Currently, due to high cost of health care, need to change the treatment approach to disease prevention approach has been more emphasized. Due to the fact that overweight and obesity have spread rapidly in the last two decades and the age of obesity has decreased, this study tends to determine the prevalence of abdominal obesity and its relationship with individual, social, economic and physical activity factors in adults of Gonabad city in 2019.

Methods

This study was a cross-sectional analytical study. The population included all adult males and females

aged 18 to 70 years living in Gonabad in 2019. Using multistage random sampling, the samples were randomly selected from areas covered by urban public healthcare centers 1, 2 and 3. People who had any disease or condition affected their weight or height were excluded. Moreover, pregnant and lactating women, or people with a history of chronic diseases and thyroid disorders, or those who were on a diet for weight loss and obesity were excluded. After obtaining written consent from the subjects, demographic, social, economic and physical activity questionnaires were completed and anthropometric measurements were performed by the author. Sample size was set at 206 based on the formula for estimating a ratio in descriptive studies considering $p=0.26$ (obesity prevalence in men) (Damirchi et al., 2013), $d=0.06$ and 95% confidence interval; considering 20% sample loss, the sample size was set at 250.

The questionnaire of individual, socioeconomic characteristics by Garmaroudi and Moradi (2010) was used to assess socio-economic status in four items (education and occupation of the head of the family and spouse of the head of the family, family expenses and income, housing and facilities and leisure time. Anthropometric indicators included waist circumference, hip circumference, height, weight, and body mass index, which determine obesity. Weight of participants was measured with minimum clothing and no shoes at 100 g precision using Seca 881 digital scale, made in Germany. Height of the people was measured without shoes and while the shoulders were in normal conditions at 0.1 cm precision using a non-elastic measuring tape mounted on a vertical and flat wall. BMI was then calculated by dividing the weight in kilograms by height in square meter. Waist circumference in its narrowest area at the end of normal exhalation and hip circumference in its most prominent part and without imposing any pressure on the body were measured using a measuring tape at 0.1 cm precision so that it is exactly tangent to skin (Damirchi et al., 2016). Physical activity was measured by the Baeke Physical Activity Questionnaire. The questionnaire contained 16 questions based on Likert scale, and measured physical activity during work, exercise and leisure. Questions of occupation were about the type of job, intensity of activity at work and position of the person at work. Questions of exercise were about people who did regular physical activity and determined the duration, severity, and type of activity. In the leisure section, there were questions about cycling, walking, and watching TV that people did in their spare time (Damirchi et al., 2016).

For statistical analysis, data was inserted in SPSS software version 21. Kolmogorov-Smirnov test was used to test normal distribution of quantitative data. Because only the waist circumference had a normal distribution, the Spearman test was used to determine the correlation of quantitative variables. Chi-square test was used to determine the relationship between qualitative variables. Multiple regression analysis was used in different models to

investigate the relationship between waist circumference and other factors. The results were statistically analyzed at a significance level of less than 0.05.

Results

In this study, 250 people aged 18 to 70 years were examined, of which 44.8% were men and 55.2% were women. The mean age of the subjects was 36.40±13.16 years and most people were married (82.4%) and had higher education (60.8%) and were employed (60%). The number of family members in most samples was between 3 and 4 people (53.2%). The mean body mass index of the samples was 25.29±3.53 kg/m² and the mean waist circumference of these people was 83.72±12.92 cm, 107 were overweight, 21 had general obesity and 59 had abdominal obesity. In terms of physical activity index, 201 people had low physical activity and 49 people had appropriate physical activity (Tables 1 and 2).

Table 1: the relationship between waist circumference and quantitative variables

Variable	mean±SD	R	P
Age (year)	36.40±13.16	0.12	0.05
Number of family members	3.45±1.09	-0.02	0.75
Income (million Tomans)	2.74±2.17	0.16	0.01
BMI (kg/m ²)	25.29±3.53	0.42	<0.001
Hip circumference (cm)	97.06±12.80	0.64	<0.001
Socioeconomic status	24.64±7.76	0.16	0.01
Work	2.73±0.81	-0.26	<0.001
Exercise	2.58±0.74	-0.05	0.45
Leisure	2.32±0.57	0.05	0.44
Total physical activity	7.63±1.27	-0.13	0.041

As shown in the table above, there was a direct relationship between waist circumference and age, income, BMI, hip circumference and socioeconomic status, and an inverse relationship between waist circumference and work and total physical activity (P<0.05).

Table 2: the relationship between waist circumference and qualitative variables

Variable	Group	Fit N (%)	Abdominal obesity N (%)	Total N (%)	Chi-square
Gender	Female	91 (65.9)	47 (34.1)	138 (55.2)	χ ² =18.68 p<0.001
	Male	100 (89.3)	12 (10.7)	112 (44.8)	
Marital status	Married	155 (75.2)	51 (24.8)	206 (100)	χ ² =0.87 p=0.35
	Single	36 (81.8)	8 (18.2)	44 (100)	
Age (year)	Younger than 30	94 (87.9)	13 (12.1)	107 (100)	χ ² =15.40 p<0.001
	30-50	65 (71.4)	26 (28.6)	91 (100)	
	Older than 50	32 (61.5)	20 (38.5)	52 (100)	
Occupation	Employee	62 (79.5)	16 (20.5)	78 (100)	χ ² =26.09 p<0.001
	Worker	65 (90.3)	7 (9.7)	72 (100)	
	Household	32 (53.3)	28 (46.7)	60 (100)	
	Student	32 (80.0)	8 (20.0)	40 (100)	
Physical activity	Low	151 (75.1)	50 (24.9)	201 (80)	χ ² =0.93 p=0.34
	Appropriate	40 (81.6)	9 (18.4)	49 (20)	
BMI (kg/m ²)	Fit	100 (82.0)	22 (18.0)	122 (49)	χ ² =5.27 p=0.07
	Overweight	78 (72.9)	29 (27.1)	107 (43)	
	Obese	13 (61.9)	8 (38.1)	21 (8)	
Education	Illiterate	25 (78.1)	7 (21.9)	32 (100)	χ ² =3.82 p=0.28
	Under diploma	51 (77.3)	15 (22.7)	66 (100)	
	Undergraduate	87 (79.8)	22 (20.2)	109 (100)	
	Higher education	28 (65.1)	15 (34.9)	43 (100)	

According to the table above, abdominal obesity was higher in women, people over the age of 50 and housewives than others (P<0.05).

Multiple linear regression analysis of waist circumference variations in relation to different variables is shown in Table 3. For gender, women were the reference group, and for occupation, the unemployed people were the reference group.

Table 3: the relationship between waist circumference and the studied variables using linear regression

Variable		B	T	P
Age (year)		0.17	2.92	0.004
Gender	Female	Referenc e	Referenc e	Referenc e
	Male	8.94	5.14	<0.001
Occupatio n	Unemploye d	Referenc e	Referenc e	Referenc e
	Employed	-6.33	3.84	<0.001
Income (million Tomans)		8.33	2.16	0.032
Socioeconomic status		0.27	2.26	0.025
BMI (kg/m ²)		1.29	6.75	<0.001
Work		-3.88	3.93	<0.001
Exercise		-2.65	2.78	0.006
Leisure		5.55	4.01	<0.001
Constant		40.11	5.30	<0.001

As shown in the table above, there was a statistically significant relationship between waist circumference and age, gender, occupation, income, socioeconomic status, BMI and physical activity indicators ($P < 0.05$). There was a direct relationship between waist circumference and age, income, socioeconomic status, BMI and leisure time, but there was an inverse relationship between waist circumference and work and exercise. Moreover, waist circumference was higher in men than in women and it was higher in unemployed than in employed people. These variables predict a total of 36% variance in waist circumference (0adjusted $R^2 = 0.36$).

Discussion

The results of the present study showed that prevalence of abdominal obesity was 34.1% in women and 10.7% in men. In a study conducted on adults in Rasht, the prevalence of abdominal obesity in men and women was 56% and 25.5%, respectively (Damirchi et al., 2013). In another study conducted in Iran, the prevalence of abdominal obesity in men and women was reported to be 54.5% and 12.9%, respectively (Janghorbani et al., 2007). In a study conducted in Spain, 36% of adults (39% of women and 32% of men) had abdominal obesity (Gutiérrez-Fisac et al., 2012) and in a study conducted in China, 45.9% of women and 27.8% of men had abdominal obesity (Xi et al., 2012). The prevalence of abdominal obesity in this study was lower than in other studies. The results of the present study also showed that 20% of the subjects had appropriate physical activity and 80% had low physical activity. Levels of physical activity vary from country to country and region to region. In a study conducted in Rasht, 22.5% and 11.5% of

men and 14% and 7% of women had moderate and severe physical activity, respectively (Damirchi et al., 2013). In a study on urban adults in Ethiopia, 54.9% had high physical activity (Mengesha et al., 2019). In a study on 22 African countries, adults who were physically active varied from 46.8% in Mali to 95.6% in Mozambique (Guthold et al., 2011). However, performing physical activity at the appropriate level in the present study was lower than in other studies. In addition to differences in population, another reason for low level of physical activity in the present study could be that most of the subjects in this study were women and evidence shows lower levels of physical activity in women than men (Bauman et al., 2012; Moniruzzaman et al., 2016). However, the significant point in the present study is that the prevalence of abdominal obesity is lower than other studies despite less physical activity. These findings can be explained by the fact that in addition to physical activity, other factors such as genetic predisposition, diet and socioeconomic characteristics can also affect the prevalence of abdominal obesity. In addition, climate change can affect levels of physical activity. Since the environment of this study is one of the regions with hot and dry climate, perhaps one of the reasons for low prevalence of abdominal obesity, despite low physical activity in the present study, is related to climate of the region (Bosdriesz et al., 2012).

In the present study, work and exercise had a significant inverse relationship and leisure had a significant direct relationship with waist circumference. This finding is consistent with the results of a study which was conducted in Rasht and reported an inverse relationship between abdominal obesity and physical activity (Damirchi et al., 2013). In a study conducted in Spain, the time spent in strenuous physical activity was inversely related to abdominal obesity (López-Sobaler et al., 2016). Physical activity is the main determinant of energy consumption in the body. Adults over the age of 18 should perform at least 150 minutes of moderate-intensity aerobic physical activity per week or at least 75 minutes of high-intensity aerobic physical activity per week (López-Sobaler et al., 2016).

The findings of this study showed a significant direct relationship between socioeconomic status (education, occupation, income and living facilities) with abdominal obesity, which is consistent with the findings of a study conducted in Spain (López-Sobaler et al., 2016) and reported that education, income and occupation were significant predictors of abdominal obesity. This finding can be explained by the fact that higher education was associated with increased income, which can affect the consumption of high-calorie foods and ultimately increase abdominal obesity. Employees are also more active than the unemployed, which can lead to reduced abdominal obesity.

In the present study, waist circumference increased with age. These findings are consistent with the results of a Spanish study (López-Sobaler et al., 2016), which is probably due to the fact that the level of attention to appearance decreases with age.

One of the strengths of the present study was that it was conducted on both genders and the effect of many distorting variables, particularly the effect of a special diet and a history of type 2 diabetes, was controlled. The limitation of this study was its cross-sectional nature, which did not allow for causal conclusions, and the findings were to be confirmed in prospective studies.

Conclusion

The prevalence of abdominal obesity in adults living in Gonabad is lower than in other studies. Individual, social, economic characteristics and level

of physical activity are effective factors on abdominal obesity in adults. Therefore, these factors should be considered in designing and implementing intervention programs to reduce abdominal obesity.

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Corresponding information:

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Correspondence to: Mojtaba Kianmehr

University: Gonabad University of Medical Sciences, Gonabad, Iran

Faculty: Department of Medical Physics, Faculty of Medicine

E-mail: mojtaba.kianmehr@chmail.ir
