



## *The Relationship between General and Central Obesity with Anxiety among Iranian Young Men*

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### ABSTRACT

**Background:** Anxiety is a common psychological disorder that impacts on the quality of life. In recent decades, anxiety has increased, as well as obesity especially among young people. The aim of this study is to investigate the relationship between general and central obesity with anxiety among Iranian young men. **Methods:** This cross-sectional study was conducted in 2016 on 246 men who were selected through cluster sampling according to the inclusion criteria. Anthropometric measurements were performed according to the standard procedure. Anxiety was assessed by DASS questionnaires with Cronbach's coefficient 0.78. In the final analysis, confounding factors were controlled and  $P < 0.05$  was considered statistically significant. **Results:** In this study, 27% of the population had extreme anxiety and 29% had moderate anxiety. In the adjusted model, there was an inverse relationship between anxiety and central obesity (OR = 0.25, 95% CI: 0.07-0.85,  $P$ -trend  $< 0.01$ ), as well as total body fat. The odds ratio of anxiety based on body mass index groups was not significant. **Conclusions:** Overall central obesity and total body fat have an inverse relationship with anxiety. Prospective studies are required to confirm these associations in young populations.

**Key words:** Anxiety; Obesity; Total body fat; Abdominal obesity.

### Introduction

We are living in "the age of anxiety" (Spielberger, 1983), an age that people are more anxious than before (Lader, 1985). In recent decades, new media, society change, security, social acceptance, jobs and ... make people more anxious (Menzies, 2009, Rosen, 1998, Sloan, 1996, Wainwright and Calnan, 2002). Several studies have suggested an increased rate of anxiety in different society. Anxiety increased by 5.23% during the years 1990-2003 in the United

States of America (Kessler, 1994, Kessler *et al.*, 2005). And similar results obtained in Japan (Demyttenaere *et al.*, 2004) and Lebanon (Tanios *et al.*, 2009) have confirmed this subject. In Iran, 8.35% of people are suffering from anxiety; thus the anxiety pattern in Iran is similar to Western countries (Mohammadi *et al.*, 2005).

Anxiety is one of the most common psychological disorders that play a significant role in increasing global burden of disease (Whiteford

et al., 2013). It is an emotion characterized by an unpleasant state of inner turmoil, often accompanied by nervous behavior, such as pacing back and forth, somatic complaints, and rumination. (Seligman *et al.*, 2001). An increase in anxiety can affect other levels of public health and leads to depression (Seligman *et al.*, 2001). Anxiety leads to absenteeism in workplace and economic losses (Hoffman *et al.*, 2008). It is associated with chest pain, lack of self-control, isolation, and irritable bowel syndrome (Barlow, 2004, Hoffman *et al.*, 2008). It may also increase self-injury (self-harm) (Carr *et al.*, 2007, Yuan and Devine, 2016).

On the other hand, an increase in overweight and obese began in the years 1976-1980 (Flegal *et al.*, 2002, Ogden *et al.*, 2002); therefore, it is possible that the relationship between increased incidence of obesity and anxiety has been existing. However, cross-sectional studies have suggested a direct relationship between increase in obesity and anxiety (Mather *et al.*, 2009, Scott *et al.*, 2008, Simon *et al.*, 2006). In contrast, some studies suggested that there is an inverse relationship between obesity and anxiety called "jolly fat" theory (Jasienska *et al.*, 2005, Palinkas *et al.*, 1996).

Obesity results from an imbalance energy and the accumulation of fat in the body, which can disrupt health (WHO, 2013). Obesity is a risk factor for many health problems and diseases (Hall, 2015). The prevalence of this disease in many industrialized countries, especially the United States and the developing countries is rapidly growing. Systematic study on 191 countries showed that 1.46 billion people are overweight and 504 million people are obese in the world (Finucane *et al.*, 2011). The complications of obesity and overweight are type 2 diabetes, cardiovascular disease, some cancers, neurological disorders and mental illness (Popkin and Doak, 1998, WHO, 2000). Obese people are prodigal individuals, chaotic, curious and self-centered (Sullivan *et al.*, 2007).

Can obesity with multiple complications reduce anxiety? The results of several studies conducted

in this regard are not conclusive. Although in most of the studies, the relationship between anxiety and general obesity has been measured, central obesity or abdominal circumference is a more important factor in predicting physical and mental chronic diseases (Esmailzadeh *et al.*, 2006, Wei *et al.*, 1997). Several studies have shown that race, age and gender have effect on anxiety and obesity (Caprio *et al.*, 2008, Low *et al.*, 2009, Toufexis *et al.*, 2006), but one of these study did not investigate this relationship in young men. Therefore, this study was carried out to investigate the relationship between general and central obesity with anxiety among Iranian young men.

### Materials and Methods

**Study population:** This cross sectional study was performed in 2016 on 246 Iranian young men, who were selected through cluster sampling from the Tehran. The inclusion criteria included having no specific diet or food allergies, lack of physical illness and drug use.

**Anxiety:** Anxiety was assessed by DASS questionnaire (Henry and Crawford, 2005, Lovibond and Lovibond, 1995). This questionnaire was confirmed by Cronbach's alpha coefficient of 0.78 for measuring self-esteem in Iran (Sahebi *et al.*, 2005, Samani and Joukar, 2007). Based on this questionnaire, people earned points between 0 to 42. The lower the score obtained, the lower the anxiety. In order to perform statistical tests, participants were divided into two groups: low anxiety (Score:  $\geq 14$ ) and high anxiety (Score  $> 14$ ) (UNSW, 2014).

**Anthropometric measurement:** The body weight was measured using a Seca scale (made in Germany) with 100-gram accuracy, without shoes and with minimum clothing. Also, height was measured using a Seca portable stadiometer (made in Germany) with an accuracy of 0.1 cm in a standing position (the whole body in one direction, the eyes must look forward) without shoes. Thereafter, body mass index (BMI) was calculated by dividing the body weight (in kilogram) by the height (in meters squared).

Total body fat measurement using the method of skin folds: Skin folds were measured at three sites (abdomen, suprailiac, and triceps) using a standard caliper with the principles described by the American College of Sports Medicine (Kaminsky and Medicine, 2006). Subsequently, the Jackson and Pollock's equation was used to calculate the total body fat (Jackson and Pollock, 1985).

$$\% \text{ Body fat} = (0.39287 * \text{sums of three skinfolds}) - (0.00105 * [\text{sums of three skin folds}]^2) + (0.15772 \times \text{age}) - 5.18845$$

Evaluation of other variables: Socioeconomic status was assessed by questionnaire and physical activity was measured by the international physical activity questionnaire (IPAQ) (Ainsworth *et al.*, 2000).

**Obesity:** General obesity was determined based on BMI. BMI  $\geq 30$  as obese and  $30 > \text{BMI} \geq 25$  were considered overweight (Stunkard and Wadden, 1993). Central obesity based on waist circumference was divided into 3 groups: The first group with waist circumference less than 94 cm, second group with waist of 94-102 cm and the third group of people with waist circumference higher than 102 cm (Wang *et al.*, 2005). In order to divide the total body fat, fat less than 20% was considered normal, 20 to 25% overweight and over 25% were considered obese (Gallagher *et al.*, 2000).

**Data analysis:** All statistical analysis was performed using SPSS 23 (IBM SPSS statistics, IBM Corporation, Chicago, IL). In order to determine the significant relationship between quantitative and qualitative variables with body mass index, ANOVA and the chi-2 test were used. Multivariable logistic regression was used to investigate the relationship between body mass

index, waist circumference and total body fat with anxiety. Except for raw model, two other models were used for investigation. The first model was adjusted for age, and other models in addition to age, smoking, total energy intake, physical activity, marital status, family and educational and socioeconomic status were adjusted.  $P$ -value  $< 0.05$  was considered statistically significant.

## Results

In this study, 246 young men were examined. Their age ranged from 21 - 29 years with a mean age of  $24.1 \pm 1.5$ . The average BMI was  $23.9 \pm 3.8$  kg/m<sup>2</sup> and mean waist circumference was  $88.7 \pm 10.6$  cm. Thus 44% of the population had normal anxiety, 29% moderate and 27% had high anxiety. Age distribution was significant on BMI and those with higher BMI had a higher mean age (**Table 1**). Other demographic variables distributed according to the BMI are shown in **Table 1**. People with higher BMI have a better economic situation.

By increasing the percentage of body fat, the anxiety levels reduced. This figure shows that the top 25% fat (obese people) as compared with the other two groups, had lower chances of developing anxiety ( $P$  trend = 0.01).

The crude model suggests that individuals with higher waist circumference had lower odds of having severe anxiety ( $P$ -trend = 0.03). This relationship remains after the adjustment for confounding factors such as age, marital status, smoking, total energy consumption, education, household members, physical activity and economic situation ( $P$ -trend = 0.01). But the odds ratio of anxiety based on body mass index in crude model ( $P$ -trend = 0.75) and adjusted models ( $P$ -trend = 0.70) was not significant.

**Table 1.** Characteristics of participants in term of body mass index

Variables	Body mass index classification (kg/m <sup>2</sup> )			P- value
	< 25 N = 158	25 - 30 N = 72	30 < N = 16	
Age (year)	23.9 ± 1.4	24.2 ± 1.3	25.6 ± 1.9	0.001 <sup>a</sup>
Waist circumference (cm)	83.2 ± 5.9	95.3 ± 7.7	113.1 ± 5.1	0.001 <sup>a</sup>
Marital status, (Single) (%)	84.2	94.4	93.8	0.06
The economic statuses (%)				
Poor	43.0	33.3	0	0.001 <sup>b</sup>
Moderate	51.3	59.7	56.3	
Good	5.7	6.9	43.8	
Non-Smoking (%)	89.9	98.6	81.3	0.02 <sup>b</sup>
Physical activity (%)				
Low	8.2	56.9	43.8	0.001 <sup>b</sup>
Moderate	47.5	41.7	18.8	
Severe	44.3	1.4	37.5	
Anxiety (%)	27.2	29.2	18.8	0.69 <sup>b</sup>

<sup>a</sup> : ANOVA test, <sup>b</sup>: chi-square test

**Table 2.** Results of adjusted multiple logistic regression for review of odds ratio of anxiety in general and central obesity

Variables	Central obesity			P-value	General obesity			P-value
	Waist circumference (cm)				Body mass index (kg/m <sup>2</sup> )			
	1 < 94	2 94 -102	3 102 ≤		1 < 25	2 25 - 30	3 30 ≤	
Crude Model	1.00	0.53 (0.27-1.01)	0.48 (0.19-1.20)	0.03	1.00	0.90 (0.49 - 1.68)	1.62 (0.44 - 3.96)	0.75
Model 1	1.00	0.52 (0.27-1.01)	0.58 (0.23-1.48)	0.07	1.00	0.94 (0.50 - 1.78)	2.18 (0.57 - 6.28)	0.45
Model 2	1.00	0.35 (0.13-0.90)	0.25 (0.07-0.85)	0.01	1.00	0.99 (0:39 - 2.46)	1.57 (0.31 - 4.88)	0.70

Model 1: Adjust for age, Model 2: Model 1 with marital status, smoking, total energy consumption, education, household members, physical activity and economic status.

## Discussion

This study was conducted on young Iranian men with the aim of investigating the relationship between total body fat, general and central obesity with anxiety. The results of this study suggest an inverse association between central obesity and the risk of anxiety. The study also showed a significant inverse relationship between total body fat and anxiety. This relationship does not apply to body mass index.

The results of the present study are in agreement with those of previous studies (Jasienska *et al.*, 2005, Palinkas *et al.*, 1996). These studies supported the theory of “jolly fat” and showed that with an increase in obesity, psychological disorders, such as anxiety disorders, are reduced (Crisp *et al.*, 1980). Certainly, these studies are limited to body mass index and did not consider the waist circumference and total body fat. But their conclusions are in line with the present study.

In a study on 2201 Korean women by Yim *et al.*, it was concluded that High waist circumference reduces depression and increases mental health. Thus this result is in line with that obtained in the present study (Yim *et al.*, 2012).

In contrast, the study concluded that the hope of life, depression and anxiety are inversely related to body mass index. The present study relied on body mass index and did not consider the total body fat. In another study, it was concluded that the relationship between anxiety and obesity is 30% (Strine *et al.*, 2008). Other similar studies also rejected the theory of “jolly fat” (Bodenlos *et al.*, 2011, Mather *et al.*, 2009, Rivenes *et al.*, 2009).

The results of other studies mentioned showed that apart from physiological mechanism, there can be a psychological answer. The most important issues affecting people's mental health and status of anxiety are media, the community and the social acceptance (Menziez, 2009, Rosen, 1998, Sloan, 1996, Wainwright and Calnan, 2002). Media has influence on activity, success and mental health of society by determining Community Standards and has profound impact on peoples' perception of their body (Posavac *et al.*, 2001, Yamamiya *et al.*, 2005). It can also affect health, nutrition, activity and people's confidence (Derenne and Beresin, 2006). Massive advertisements media causes people to worry about their own body condition (Grabe *et al.*, 2008). On the other hand, success and mental health are a deep connection with the social acceptance of body (Gottfried, 2003). The body acceptance criteria in each society are dependent on media criteria (Yamamiya *et al.*, 2005). The body shape has become a platform for cultural activities and social acceptability (Wellington and Bryson, 2001). The media and society play a fundamental role in accepting young people in the community and social success. They affect people's mental health and status anxiety. Advertising is an important tool for demonstrating the body model. Currently in Western societies, Slimming is a criterion for beauty and success (Jackson, 1995).

Different cultures and societies have different criteria for identifying obesity and ideals of life

(Klaczynski *et al.*, 2004). A recent study rejected the “jolly fat” Theory and expressed that with increasing body mass index and obesity, the rates of anxiety and psychological diseases increase (Bodenlos *et al.*, 2011, Mather *et al.*, 2009, Rivenes *et al.*, 2009, Strine *et al.*, 2008). While previous studies (Crisp and McGuinness, 1976, Palinkas *et al.*, 1996) or studies in Eastern countries (Yim *et al.*, 2012) have shown that, in Islamic countries, media advertising about body modeling is scanty, all types body, have social acceptance. In these countries, the individual and society should not be fully judged about model and body image yet. Therefore, in these countries, the theory of “jolly fat” ruling is effective. This is because all types of body have social acceptance, and body condition barely determines the success of the community. As a result, people with higher body mass index do not suffer from rejection and psychological distress. In contrast, in Western countries with media advertising of body types, obese people suffer loss of confidence (Derenne and Beresin, 2006) and as such, their social acceptance is affected (Grabe *et al.*, 2008). Reduced confidence and social acceptance in all social groups can lead to the psychological discomfort and anxiety (Budge *et al.*, 2013, Cheng *et al.*, 2015, Paul, 2016, Reitzel *et al.*, 2017).

The strengths of this study include the nutritional and psychological approach to the subject and not one-dimensional look at the problem. In addition, controlling for confounding by age, marital status, the number of household members, smoking, total energy intake, physical activity and socioeconomic status is the strength of this study. Moreover, since body mass index is defective to determining obesity (Burkhauser and Cawley, 2008), measurement of the amount of total body fat is one of the highlights of this study.

The major limitation is the cross-sectional design of the study, which does not allow causal inference. Prospective studies will help to understand these mechanisms. Prospective studies will help to understand these mechanisms.

The results of the present study showed that increasing waist circumference and total body fat

reduced the anxiety of population. This relationship is largely dependent on the society, culture and the media. BMI does not have a significant effect on the incidence of anxiety. More prospective studies could help to explain the physiological and psychological mechanisms of this issue.

#### Authors' contributions

Rahmani J and Dorosty AR participated to design the work and drafting the manuscript. Statistical

analysis: Rahmani J and Kord Varkaneh H participated to data collection and analysis data. All authors read the manuscript and verified it.

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#### Conflict of interest

The authors declare no conflict of interest.

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