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ORGINAL ARTICLE

The Relationship between Obesity and Effective Factors on Cardiovascular Health and Socio- Economic State of Male Students of Islamic Azad University- Fars Science and Research Branch

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Abstract
Field and aim: obesity is in parallel with raise in risk of a lot of disease such as atherosclerosis, hypertension and type two diabetes and has relation with lifestyle and socioe- economic state. Aim of present study was evaluation the relationship between obesity and effective factors on cardiovascular health and socio-economic state of male students of Islamic Azad university-Fars Branch Science and Technology. Research method: For this purpose 785 individuals with mean age 20.83 ± 1.72 year, height 174.50 ± 6.48 centimeter and weight 71.11 ± 12.35 kg) randomly selected among male student of Islamic Azad university-Fars Branch Science and Technology. For measure Weight and fat percentage used scale, and tape. Also socio-economic state measured by using socio-economic state evaluation questionnaire with acceptable reliability (r=0.75). For analysis of data, we used Pearson and Spearman correlation coefficient. Findings: Results showed there is significant positive relationship (r=0.19, p=0.001) between body fat percentiles and resting blood pressure. Also, it is obtained a significant negative relationship between waist to hip percentile and cardiovascular fitness (r=0.23, p=0.001). But did not observe significant relationship between obesity and socioe-conomic state (r=0.01, p=0.001).

Key words: Obesity; Socioe-conomic State; Cardiovascular Fitness; Physical Activity

Introduction

Obesity is defined as an excess of adipose tissue as a result of excessive energy intake (Bouchard., 2000). Obesity increases the risk of many diseases such as CAD, hypertension and non-insulin dependent diabetes followed by early death (Bouchard., 2000). In the second study in Western Samoa, it was determined that inactive and sedentary individuals have more mean body mass index (BMI) and more weight than people who are active (Hodge et al., 1994). Evidence shows that any reduction of the total daily physical activity may be an important factor in increasing body weight in the western countries (Roland et al., 1998). Rowland and Weinsier have reported a lack of physical activity as a major factor in increasing prevalence of obesity in the modern societies (Roland et al., 1998).

Obesity and overweight are affected by other factors such as socioeconomic conditions (Sallis et al., 1996). In some states of America, inverse relationship between socioeconomic status and obesity

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in 59,566 women has been reported (Oken et al., 1977). Similar results in other studies of urban areas (Saelens et al., 2003, Wang et al., 2006, Wang et al., 2007), suburban (Kyle et al., 2001) and rural (Bove et al., 2006) areas have been reported by them. Studies show that in rich countries, the prevalence of obesity in lower social classes is higher than the higher classes of society, while in the poor countries, the prevalence of obesity is higher in higher social classes (Shimakawa et al., 1994). In other studies, the relationship between socioeconomic factors and obesity has been noted (Prentice et al., 1995, Singh et al., 2008). According to a wide study made about the prevalence of obesity in 1999 in many European countries, it was determined that the lowest prevalence of obesity in all groups belongs to the people who have high social rank and grade (Martinez et al., 1999). Goldblatt (1965) studied over 1,660 people ranging in age from 20 to 59 residents of Manhattan's six urban areas that mostly were white- skinned people and found out that in the people with lower socioeconomic status, overweight increases around 20%, while in women with a low socioeconomic status, it is 6 times that of women with high socioeconomic status (Goldblatt et al., 1965). Silverstone (1970) has reported an inverse relationship between the obesity and socioeconomic status (Silverstone et al 1970). However, results of some studies contrast with the results from studies mentioned. Vijayalakshmi et al (2002) and Wang et al (2006) in their study showed that people with a good socioeconomic status, obesity is higher. The findings of the study conducted by Merchant et al (2007) and Popkin et al (1998) also show that individuals with favorable economic conditions and/or with moderate to low economic status were overweight, but there was no difference in amounts of their obesity. These results obtained indicate that in both poor and rich, there is the prevalence of obesity, and there is no significant relationship between obesity and economic status (Popkin et al., 1998, Merchant et al., 2007). While the prevalence of obesity has increased over the past years, various measures taken for preventing it have not been followed by considerable successes (Oken et al., 1977). In Iran, according to studies, overweight and obesity are higher than international standards defined by the Centers for Disease Control and Prevention, and the overweight and obesity have been reported more in girls more than boys (Mosavi Jazayeri., 2005). Definitely, many researchers reported obesity to have close ties with variables such as lifestyle and patterns of physical activity and the spatial factors such as age, gender, ethnicity and race and socioeconomic status are involved (Kelly et al., 2006, Lohman et al., 2006, Kyle 2001). Since the recent years, obesity and overweight has increased dramatically in different communities and researchers believe that obesity is a multi-dimensional phenomenon and non-biological factors and cultural factors can also be effective in its development. Also, considering the contradictions which exist in different countries' research results in view of the prevalence of obesity as influenced by factors such as lifestyle and economic situation, it is necessary to further study the issue raised and be more accurate about this so that we are able to find a clear and strategic view of the subject. Accordingly, the present study is looking for determining levels of obesity in male students of Fars Islamic Azad University, Fars Science and Research branch and it attempts to answer this question that to what extent is the relationship between obesity and cardiovascular factors affecting the health of the socioeconomic status of the students?

Methodology

This study is of the survey-correlation type and its statistical society consists of all male students of Fars University of

Science and Research (4616 people). The people in this community sample are 785 subjects who were selected by using random sampling with replacements. The total number of male students in the sample amount was determined in Cochran formula.

Measurement Tools

Socio-economic status was evaluated by a socio-economic status assessment questionnaire. The content validity of the questionnaire was reviewed by the professors of sociology and economics and then, it was approved. For compiling it, using the three variables of income, education and occupational status of parents were assessed. All three variables necessary which are necessary for calculating the index of socioeconomic status were scaled with the same weight and scale and then they combined with each other in format of an ascending equation. In order to address the probable shortcomings of this questionnaire, 30 copies of the questionnaire being studied, were distributed and collected in the study group. The reliability of it was evaluated and the Korenbakh's alpha coefficient was obtained as equal to 0.75, respectively. A digital scale is used to read subjects weighing 160 kg with an accuracy of 0.1 kg, The DLT-411 model, which was made in Germany. The height of the subjects was read by means of a wall length gauge device of Sakka with an accuracy of 0.1 centimeters. Measures of heights were read without wearing shoes and minimal clothing, while a person standing motionless, with an accuracy of 100 grams. Measurement of height without shoes were written down against the height metering system which was mounted on the wall, and while the back of the heel, hip and shoulder contacted the wall and with an accuracy of 1.0 cm. Waist of the subjects was measured by a muscle-bound tape measure. The area between the lowest rib and iliac waist up to the tip of the tail was measured three times and the average was considered. Subjects and hip circumference were measured by muscle-bound tape measure which was the most prominent area of the buttocks. Subcutaneous fat subjects (for measuring percentage of body fat) were measured by the caliper device made in Britain. 3-point formula was used in order to determine the amount of body fat of the males (pectoral muscles, triceps and scapular). Systolic blood pressure measurements of subjects were conducted after 10 minutes of relaxing and sitting by the use of digital barometer of Hartmann Tensoval made in Germany. Measurements of cardio-respiratory improvements the Cooper field test was used which was running for 12 minutes. In this test, the subjects ran for 12 minutes and the distance traveled by the subjects was recorded. Then, the cardio-respiratory readiness or maximum oxygen consumption of subjects were recorded in the following formula for the distance traveled by each subject and the rate of their cardio-respiratory amount of readiness was determined (American College of Sports Medicine., 2005).

Cardio-respiratory fitness (V_{O2max}) = $\frac{Distance\ in\ meter - 504.9}{44.73}$

Statistical methods

All the information obtained from variables being measured was reported as the mean and standard deviation. Pearson and Spearman correlation coefficients were used to determine the relationship between the variables studied. The Korenbakh's Alpha test was used for internal consistency and reliability coefficients. Significant level of analysis was done for all p=0.05 all the calculations were performed using SPSS 15 software.

Findings

Presenting a definition of the general characteristics of the subjects (mean of age, height and weight) and also the results of statistical analysis of rest, the blood

pressure, cardio-respiratory readiness, body fat percentage, waist to hip ratio and body mass index of subjects are presented in Tables 1 and 2. In Table 3, percentile of cardio-respiratory readiness is presented in Table 4, percentile of body fat and Table 5 presents the percentile of waist to hip ratio of subjects with the dangers that put them at risks. Percentiles of percent body fat with the standard of the American College of Sports Medicine (ACSM) in terms of subjects' gender and age, whom amongst them, those above the 90th percentiles are underweight, those between 90 and 70 percentiles, are exposed to the risk of impotence, between 70 and 30 percentiles are at the normal state, between percentiles of 20 to 20 are overweight and less than 10th percentile were rated as obese. The findings of this study showed that 19.1 percent of students have high levels of the socio-economic conditions, 8.5 percent of them are overweight ones. While 16.7 percent of students with very low socio-economic conditions are low-fat and 11.8 percent of them are overweight (Figure no.1).

Results of the Pearson correlation test showed a significant and direct relationship between body fat percentile and resting time's blood pressure (p=0.001) and a significant inverse relationship with cardio-respiratory readiness (p=0.001). A direct significant relationship was observed between percentile ratio of waist to hip ratio with resting time blood pressure (p=0.001). Also, a significant inverse relationship (p=0.001) between cardiac-respiratory readiness and this ratio were observed (Table 6). On the other hand, Spearman's correlation test results indicated a lack of the significant relationship (p=0.63) between obesity and socioeconomic status of the subjects (Table 7).

Table 1. Describes the general characteristics of subjects

Sex	Total	Age (years)	Height (cm)	Weight (kg)
Male	785	1.72 ± 20.83	6.48 ± 174.50	71.11 ±12.35

Table 2. Description of Variables

Item	**Variables**	**Mean ± standard deviation**
1	Average blood pressure during rest	11.70 ± 115.43
2	Average cardio-respiratory readiness	6.98 ± 36.02
3	Average body fat percentage	6.61 ± 15.49
4	Average body mass index	3.66 ± 23.32
5	Average waist to hip ratio	0.04 ± 0.82

Table 3. Percentile of cardio-respiratory readiness (maximum oxygen consumption) of the subject

Percentile (ml/kg of body weight/min)	**Total**
Percentile 10 (34.5)	332
Percentile 20 (37.1)	129
Percentile 30 (39.5)	93
Percentile 40 (41.0)	51
Percentile 50 (42.5)	49
Percentile 60 (44.2)	46

Percentile 70 (46.8)	46
Percentile 80 (48.2)	8
Percentile 90 (51.4)	31

Table 4. Percentile of body fat of the subjects

Percentile (the percentage of body fat)	**Total**
Percentile 10 (25.9)	138
Percentile 20 (22.4)	83
Percentile 30 (19.5)	67
Percentile 40 (17.4)	41
Percentile 50 (15.9)	79
Percentile 60 (14.1)	93
Percentile 70 (11.8)	136
Percentile 80 (9.4)	95
Percentile 90 (7.1)	53

Table 5. Percentile of waist to hip ratio

No.	**The risk's limit**
443	Low (<0.83)
272	Medium (0.83 - 0.88)
60	High (0.89 – 0.94)
10	Very high (>0.94)

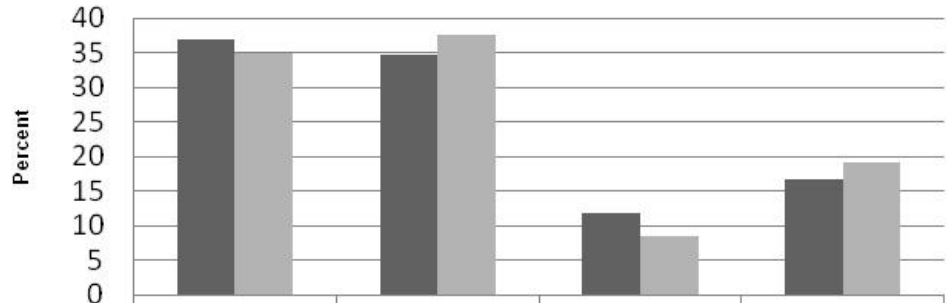
Table 6. Pearson correlation coefficient between body fat and waist to hip ratio, blood pressure and at rest times' cardio-respiratory readiness

Cardio-respiratory readiness	**Resting blood pressure**	**Variables**
$p=0.001^{*}$ and r=0.19	$p=0.001^{*}$ and r=0.19	**Body fat percentage**
$P= 0.001^{*}$ and r= -0.23	$p=0.001^{*}$ and r =0.19	**Waist to Hip Ratio**

* A significant relationship between variables in $p<0.05$

Table 7. Spearman's Coefficient obesity and the socio-economic status

Spearman correlation coefficient	**Socio-economic status**
Obesity	0.01



	Obese	Natural	Overweight	Fat
Low socio-economic status Slim	36.9	34.7	11.8	16.7
High socio-economic status Slim	35	37.5	8.5	19.1

Figure 1. Frequency of obesity, overweight, normal weight and slimness regarding the students with higher and lower socio-economic status

Discussion

Results showed that there is a significant relationship between body fat percentile and blood pressure during resting times. The Results of this study were all in line with the results obtained by Martinez et al (2006). In their study, they found a significant relationship between obesity and risk factors for cardiovascular diseases (Martinez et al., 2006). The blood pressure is produced through the force of blood against the walls of arteries and veins and then, the heart pumps blood to all parts of the body. Hypertension or high blood pressure refers to a situation during which the blood pressure (systolic blood pressure and either both or a diastolic blood pressure), the chronic level is desirable or optimal. This situation occurs when the heart or the ability to pump blood is low or high resistant against the blood vessels. Many factors are involved in this to happen. Body fat increases cholesterol levels and subsequent storage of triglyceride in our body. In the body, the cholesterol is carried by high-density lipoprotein (HDL-C), low density lipoprotein (LDL-C) and very low density lipoprotein (VLDL-C). In fact, LDL-C and VLDL-C, during passage through the blood vessels, are attached to the walls of the arteries and cause narrowing of the vessels' walls and subsequent rise in blood pressure are produced (Moffat et al., 2005). However, sports activities in general, and endurance exercises, in particular, can reduce both the rate and the body fat and thereby, we can witness effects of the subsequent decrease in blood pressure (Moffat et al., 2005).

The results also showed a significant inverse relationship between the body fat percentiles with cardio-respiratory readiness. This relationship confirms that while the percentile increases in the body fat, cardio-respiratory readiness is reduced. Cardiovascular readiness which is also called the cardio-respiratory endurance and cardiovascular readiness is defined as the heart's ability to drive a high volume of oxygen-rich blood to the muscles and the muscles subsequently consume more and more oxygen. For this reason, the best indicator in order to evaluate cardiovascular readiness includes the measurement of breathing and the maximal oxygen consumption. Sometimes, the indirect measures such as time and distance and heart rate during exercise in endurance tests or quickly return to heart rate during resting times is applied in order to assess cardio-respiratory fitness (Bouchard., 2000). High cardio-respiratory readiness or fitness will cause

reduction of LDL-C and VLDL-C, blood pressure, anxiety, depression, mental stress, and also the increased HDL-C, muscular mass, endurance and strength, flexibility and the optimal use of the leisure time (Martinez et al., 1999). Fats are the dominant metabolism in the long-term and moderate intensity aerobic activities. These types of physical activities can improve cardio-respiratory readiness (American College of Sports Medicine., 2005). The results of this study showed a significant inverse relationship between body fat percentile and cardio-respiratory readiness. These results were in line with the results of Marshall et al (2004). In their studies they stated all the activities planned for the prevention of obesity and body fat as necessary (Marshall et al., 2004). The results of Kyle et al (2001) showed that while age is increased, the weight also increases and this increase in weight in the middle-aged individuals has been due to increasing levels of body fat mass (Kyle et al., 2001).

Another study found a significant relationship between the percentiles of waist to hip ratio with blood pressure during rest times. Waist-hip ratio is a comparison between waists circumference to hip circumference. This ratio clearly shows the relative distribution of body weight and probably the body fat in individuals (Lohman et al., 2006). The pattern of body weight as an important predictor of health risks of obesity has been identified. The individuals who have more weight or body circumference are more at the risk hypertension, type II diabetes, high blood fats and coronary artery disease than those whose body weights are moderately distributed (Sobal et al., 1989). Upper body obesity is associated with the increased risk of mortality. An individual with the upper body obesity carries more amount of weight in the upper body part in comparison with the torso and buttocks and he/she has a higher ratio of waist to hip ratio compared to the lower body obesity (Sobal et al., 1989).

One of the indirect effects of increased waist to hip ratio is increasing amount of blood pressure during resting times. As it was previously mentioned in the above paragraph, one of the effects of increased body fat is any increase of the LDL-C and VLDL-C levels in the blood circulation (Metcalf et al., 2007). Studies have shown that LDL can be deposited in artery walls and result in making the blood vessels smaller, and this is accompanied by increasing amounts of the blood pressure which enters into the vessel wall from the direction of blood. Thus, the increased fat around the waist has a direct relationship with the increased blood pressure. In a study conducted by Roland et al (1998) 40 percent of people with high fat around their waist had high blood pressure (Roland et al., 1998). The research results are in line with the results of Metcalf et al (2006). The researchers observed in their study that in individuals with high blood pressure, the waist to hip ratio is high (Metcalf et al., 2006).

The results showed a significant inverse relationship between the percentile of waist to hip ratio with the cardio-respiratory readiness. Merchant et al (2007) during 8 years of research conducted about Australian men and women ranging from 15 to 24 years have approved that the individuals with more fat in the lower back area have had lower amount of cardio-respiratory readiness. These researchers concluded that this was one of the most common causes of obesity in women is the lack of regular participation in the physical exercises (Merchant et al., 2007). Arnab Gosh (2006) measured body mass index and waist to hip ratio in 500 men and women in Calcutta, India, the effects of their habits, behavioral patterns and in their socio-economic status with regards to inactivity and obesity and showed that inactivity, and the direct relationship between physical activity and exercise,

and obesity are all inversely related (Arnab Gosh., 2006). Jill (2006) in his study of epidemic of obesity and impact of this on health suggests that reduced physical activity will result in cardio-respiratory readiness and the reduction is one of the main factors affecting the obesity (Jill., 2006). Alicia B. Orden et al (2006) in a study conducted in Argentina, concluded that their lifestyle, eating habits and cardio-respiratory readiness developed by physical exercises have an active role in preventing obesity and excess fat in the waist and creating more weight and putting on weight (Orden et al., 2006). America College of Sports Medicine (2005) in a study entitled as the recommendations for exercise testing has shown that physical activity results in the health of women and men in all age groups and some of the advantages of physical activity include: increased muscle strength, increased ability of the cardiovascular system, the decreased blood pressure, improvement of the blood's lipid levels, reduced body fat and reduction of the incidence of type II of diabetes (America College of Sports Medicine., 2005).

The findings of this study indicate that there is no significant relationship between obesity and socio-economic status. In developed industrial societies, obesity is related to the low socio-economic status. Strong evidence for this has been demonstrated in the United States (Powell et al., 2007, U.S. Department of Health and Human Services., 2008, Zhang et al., 2007, LaFontaine., 2008), Australia (Sobal et al., 1989), China (Woo et al., 1999), Finland (Neuvonen et al., 2007), France (Lioret et al., 2007), Great Britain (Prentice et al., 1995), Italy (Cota et al., 2001), New Zealand (Metcalf et al., 2007), Northern Ireland (Sobal et al., 1989), Scotland (Lohman et al., 2006) and Spain (Simmons et al., 2008). Several cases including education, income, the socio-economic status and less physical activity, poor nutrition and socio-psychological factors are effective elements for obesity. Obesity in people with low socio-economic status is more prevalent because of low levels of awareness regarding the ways to stay healthy, stronger belief in the effect of having chances on health and lower levels of life expectancy (Moffat et al., 2005, Irala-Estevez et al., 2000, Swallen et al., 2005). The rate of obesity in some parts of the community with a better socio-economic status is more in developing countries. Some evidences exist in Brazil, Jordan, and Madagascar (Stunkard et al., 2003). It has been suggested that the increase in obesity can be used in different parts of the community in order to explain the state of its development, because simultaneous with an increase in GDP of a country, the obesity will be transferred toward a part or the society with lower socio-economic status (Stunkard et al., 2003). The findings of this study showed that there are no significant relationships between obesity and socio-economic status. As mentioned in the above sentences, many factors can increase both the body fat and obesity; in fact, it can be stated that the subjects of this study may have different physical activities and sports activities, and this difference could affect the relationship between obesity and the socio-economic status. In addition, the amount of calories gained through a nutrition diet is one of the other variables involved that can affect the relationship between the anticipating variables (socio-economic status) and the criteria (obesity) in this study (American College of Sports Medicine., 2005). Brown et al (2009) in their study state that the prevalence of obesity is lower in Asian Americans populations because of consuming low-calorie foods and it has no significant relationship with social-economic status (Brown et al., 2009). Therefore, U.S. Department of Health and Human Services (2009) in its research, states that the risk of obesity and being overweight is affected by the environmental factors, dietary habits and physical activity of the individuals as well

as being affected by the environmental factors.

Conclusion

The study results showed that there are no significant relationship between the obesity and the socio-economic status. The prevalence of obesity in Fars Islamic Azad University, Science and Research Department was high compared with developing countries and this should be considered a serious problem and public health strategies should be applied in order to mitigate the negative attitudes towards physical activity and to reduce television watching and to promote a vast range of physical activities in order to increase the levels of education, participation in physical activity and other healthy behaviors. Given that universities have less physical sports activities, our students are used to the bad habit of lack of physical exercise and also being inactive in universities and this habit still exists at home after graduating and they use most of their time for doing sedentary activities or to rest. Emphasis put on preventing from home-based programs is highly crucial to reduce obesity in groups of socio-economic conditions diversity. The findings of this study concluded that both elements of obesity and overweight have direct relationship with cardiovascular risk factors, while the maximum oxygen consumption or V_{O2max} as the most important indicator of cardio-respiratory readiness affected by physical exercise both are inversely related. It is recommended that the sports activities in leisure time should be considered as important tasks and in line with the increase of spaces and sports facilities, appropriate facilities should be provided for all the students in order to engage in sports activities. Otherwise, we will observe the prevalence of obesity and reduced health at the cardiovascular level among the students.

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