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Evaluation of Anthropometric Indices of Patients with Left Ventricle Dysfunction Fallowing First Acute Anterior Myocardial Infarction

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ABSTRACT

***Introduction*:** In the current study, we evaluated the effect of anthropometric indices on ejection fraction following first acute anterior myocardial infarction. ***Methods*:** In an analytic-cross sectional study, 50 patients with acute anterior myocardial infarction and abnormal anthropometric indices (Body Mass Index (BMI) ≥ 30, Waist Hip Ratio (WHR) ≥ 1 and ≥ 0.85 in males and females respectively and Waist Circumference (WC) ≥ 102 cm and ≥ 88 cm in males and females respectively) were recruited as case group and 50 patients with acute anterior myocardial infarction and normal anthropometric indices as control group. Subsequently, the relation between anthropometric indices and left ventricle dysfunction was evaluated and compared between two groups. ***Results*:** 77 people of the studied patients were male and 23 female with the mean age of 59± 1.2 years and an age range of 32-90 years. To evaluate the left ventricle function, the mean ejection fraction of the patients was measured as 34.3± 7.2 % and 44.8± 6.3% in patients with abnormal anthropometric indices and patients with normal anthropometric indices respectively (P= 0.0001). Calculation of the correlation coefficient between ejection fraction and BMI, WHR and WC in males and females revealed a moderate reverse (r=-0.521 to r=-0.691) and statistically significant (P= 0.0001) relations which was of more strength in females. ***Conclusion*:** Anthropometric indices including BMI and waist circumference influence cardiac function following myocardial infarction.

Introduction

Having a better understanding of the relation between anthropometric indices and left ventricle dysfunction could assist us in identifying mechanisms through which anthropometric indices would contribute to cardiovascular events and their related morbidity and mortality.[1]

There is a complicated relation between fat distribution pattern and cardiovascular diseases. One of the best methods to study this relation is to evaluate the relation between anthropometric indices and cardiovascular diseases. Obesity is one of the most important criteria and an independent risk factor for cardiovascular diseases and their increased morbidity and mortality rates; it also should be mentioned that BMI is considered as a risk factor for cardiovascular diseases. It seems that providing a better understanding of the relation between BMI and other anthropometric indices and left ventricle dysfunction could assist us to clarify the mechanisms through which cardiovascular events and their associated morbidity and mortality are affected.[2]

Materials and methods

After being approved by the scientific and ethics committee, the current study was performed in the inpatient wards of the Shahid Madani educational-therapeutic center affiliated to Tabriz University of Medical Sciences. In this analytic-cross sectional study, 50 patients affected by acute anterior myocardial infarction with abnormal anthropometric indices (Body Mass Index (BMI) ≥ 30, Waist Hip Ratio (WHR) ≥ 1 and ≥ 0.85 in males and females respectively and Waist Circumference (WC) ≥ 102 cm and ≥ 88 cm in males and females respectively) were recruited as case group (group A) and 50 patients with acute anterior myocardial infarction and normal anthropometric indices as control group (group B). Subsequently, the relation between anthropometric indices and left ventricle dysfunction was evaluated and compared between two groups.

Inclusion criteria to the study were as follows: First acute anterior myocardial infarction, willingness to participate in the study. Exclusion criteria from the study

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were as follows: history of previous myocardial infarction, atrial fibrillation rhythm, valvular heart diseases, cardiogenic shock status and unwillingness to participate in the study.

Acute myocardial infarction was defined based on clinical symptoms, echocardiographic signs and increased myocardial necrosis markers; anthropometric indices included BMI, waist to hip ratio, height and waist circumference. BMI was calculated based on body weight divided by height in meters squared; BMI ≥ 30 was considered as obesity. Waist to hip ratio was calculated based on the waist circumference above navel and hip circumference in its largest diameter in centimeters; the ratios more than 1 in males and 0.85 in females were considered abnormal. Waist circumference more than 102 and 88 was considered abnormal in males and females respectively.

Statistical analysis

The obtained data is presented as Mean ± SD, frequency and percentage. Statistical software package SPSS TM version 16.0 (SPSS Inc, Chicago, IL, USA) was used. To compare quantitative variables independent samples t-test and to compare qualitative variables Chi-square test and if required Fischer's exact test were used in both groups. Correlation test was used to analyze the relation between anthropometric indices and ejection fraction of the patients. $P \leq 0.05$ was considered statistically significant throughout the study.

Results

Of 100 patients studied, overall 77 people were male and 23 people were female; group A with 37 males (74%) and 13 females (26%) and group B with 40 males (80%) and 10 females (20%).

No statistically significant difference was observed regarding the gender distribution of the patients in both groups (*P*= 0.31). The mean age of the studied patients was 59± 1.2 years with an age range of 32-90 years. In the current study, the difference in mean age between both groups of the studied patients was not statistically significant (*P*= 0 .69). In the study, the patients in both studied groups were completely similar regarding age and gender. Patients were divided into four groups based on their ages: in group A, there were three people (6%), 26 people (52%), 19 people (38 %) and two people (4%) in the age groups of below 40 years, 41-60 years, 61-80 years and over 80 years respectively. In group B, there were three people (6%), 28 people (56%), 16 people (32 %) and 3 people (6%) in the age groups of below 40 years, 41-60 years, 61-80 years and over 80 years respectively (*P*=0.91).

Description of the anthropometric indices in the patients

Description and comparison of the anthropometric indices and laboratory tests in the studied patients between two groups with their related *P* values are presented in Table 1 and 2. Thirty two cases (64 %) in group A and 34 cases (68 %) in group B had received Streptokinase (SK) in the emergency department. The difference between two groups was not statistically significant (*P*= 0.35). Seventeen cases (36 .2 %) in group A and 13 cases (30.2 %) in group B had not received SK in the emergency department. Primary angioplasty was performed on three patients in group A and seven patients in group B.

Table 1. Comparison of the anthropometric indices between two groups

Variable	Abnormal anthropometric indices(n=50)	Normal anthropometric indices(n=50)	P
Weight (kg)	93.1±9 (68-112)	73.3±1 (48-92)	0.0001
Height (cm)	165.8±9.5 (148-186)	172.6±1 (148-190)	0.0001
BMI(kg/m2)	34.3±2.8 (30.1-40.5)	24.7±1.9 (20.1-29.2)	0.0001
Waist circumference(cm)	113.2±7.8 (95-135)	91.3±7.6 (73-101)	0.0001
Waist-Hip ratio	1.32±0.17 (0.8-1.7)	0.77±0.1 (0.58-0.96)	0.0001

Evaluation of systolic dysfunction in patients

Left ventricle systolic function was evaluated performing Trans-Thoracic Echocardiography and estimating left ventricle ejection fraction which has been used as an index of Left ventricle systolic function to evaluate its relations with anthropometric indices. Measured ejection fraction values of the patients in both groups are compared in details in Table 2. The statistically significant difference observed between two groups could have been due to the abnormal anthropometric indices in group A patients (*P*= 0.0001).

Figure 1-3 and Table 3 present the relation between EF and BMI, WHR and WC in males and females separately. Calculation of the correlation coefficient between ejection fraction and BMI, WHR and WC in males and females revealed a moderate reverse (r=-0.521 to r=-0.691) and statistically significant (*P*= 0.0001) relations which was of more strength in females.

Table 2. Comparison of the laboratory test and ejection fraction values between two groups

Variable	Abnormal anthropometric indices(n=50)	Normal anthropometric indices(n=50)	P
Trigelicerid	136.2±35.3 (83-190)	97.4±17.3 (70-158)	0.0001
High density LC*	31.7±8.9 (21-52)	39.3±8.3 (26-58)	0.0001
Fast blood sugar	113.7±27.5 (78-180)	96.4±14.8 (76-145)	0.0001
Cardiac Troponin I	19.3±8.1 (5-36)	11.2±8.2 (2-30)	0.0001
Ejection fraction	34.3±7.2 (15-55)	44.8±6.3 (30-55)	0.0001

*LC: Lipoprotein Cholesterol

Table 3. Correlation between ejection fraction and BMI, WHR, WC in males and females separately

	Female(n=23)		Male(n=77)	
	P	r	r	P
EF and BMI Association	0.0001	-0.557	-0.691	0.0001
EF and WHR Association	0.0001	-0.610	-0.630	0.001
EF and WC Association	0.0001	-0.521	-0.605	0.002

Discussion

There have been ambiguous and unsolved issues regarding the relation between obesity, obesity type (general or central), cardiovascular diseases, cardiovascular mortality and morbidity, left ventricle dysfunction and dysfunction type (systolic or diastolic) which could be considerably solved by studying anthropometric indices.[2] Central obesity which is usually measured by waist hip ratio (WHR) is considered as one of the most important anthropometric indices related to cardiovascular diseases.[3] Kazemi *et al.* in a descriptive-analytic study carried out in Birjand University of medical sciences in 2010, evaluated the prevalence of obesity and body fat distribution in patients with acute myocardial infarction. This study was carried out on 98 patients with acute myocardial infarction who were below 50 years and 98 healthy people who were similar to the case group regarding age and gender.

The results obtained from the mentioned case-control study revealed that the mean BMI and WHR were significantly higher in case group compared with the control group. Obesity prevalence was significantly higher than normal in case group as well.[4]

Similar to the study of Kazemi *et al.*, all the participants in our study were affected by acute anterior infarction and two groups were separated from each other based on having or not having anthropometric indices. In our study, waist circumference was 113.2± 7.8 cm and 91.3± 7.6 cm in the case and control groups respectively which was associated with a statistically significant difference (P= 0.0001). Waist hip ratio (WHR) was 1.32 ± 0.17 and 0.77± 0.1 in the case and control groups respectively which was associated with a statistically significant difference as well (P= 0.0001). This confirmed that there were no confounding factors and two groups were completely separated from each other regarding anthropometric indices.

In a similar study conducted by Kumar *et al.* in South Asia in 2008, anthropometric indices were studied in the patients with acute anterior infarction with normal lipid profiles.[5] Eventually, it was concluded that patients with abnormal anthropometric indices would have increased proportional risk of myocardial infarction and its related complications including left ventricle systolic dysfunction 2.6 times more than the patients with normal anthropometric indices.[5] Like the study of Kumar *et al.*, in our study the mean ejection fraction of the patients was 34.3± 7.2 % and 44.8± 6.3% in groups A (patients with abnormal anthropometric indices) and B (patients with normal anthropometric indices) respectively. The related difference was statistically significant. Khawaja *et al.*, in a cross-sectional study titled as "the relation between left ventricle dysfunction and mortality and morbidity in the society" which was carried out on 2042 males and females older than 45 years in 2008, concluded that increase in waist hip ratio (WHR) compared to increase in BMI is of stronger relation with the lower ejection fraction values and left ventricle systolic dysfunction.[6] Likewise, in the study of Thompson *et al.*, android obesity (mostly concentrated in the lower parts of the abdomen rather than hip) was associated with increased risk of symptomatic cerebral and cardiovascular diseases in both males and females. This relation remained intact after elimination of the effects caused by age, serum lipid levels, body mass index, and history of hypertension, diabetes and smoking which is indicative of an independent effect of abdominal obesity on increasing the risk of cardiovascular diseases.[7]

Zeller *et al.*, in a study in 2008, evaluated the relation between BMI and waist circumference and death caused by acute myocardial infarction in 2229 patients with acute myocardial infarction. The results obtained from

the study revealed that almost half the patients were overweight, one fourth of them were obese or very obese, and increase in waist circumference could be observed in half of the patients.[8] In this study, increase in BMI was associated with increased mortality whereas waist circumference had no effect on all death reasons. Furthermore, BMI was not an independent mortality prognostic factor; a group of the patients with large waist circumference and low BMI had increased one-year mortality rates.[8]

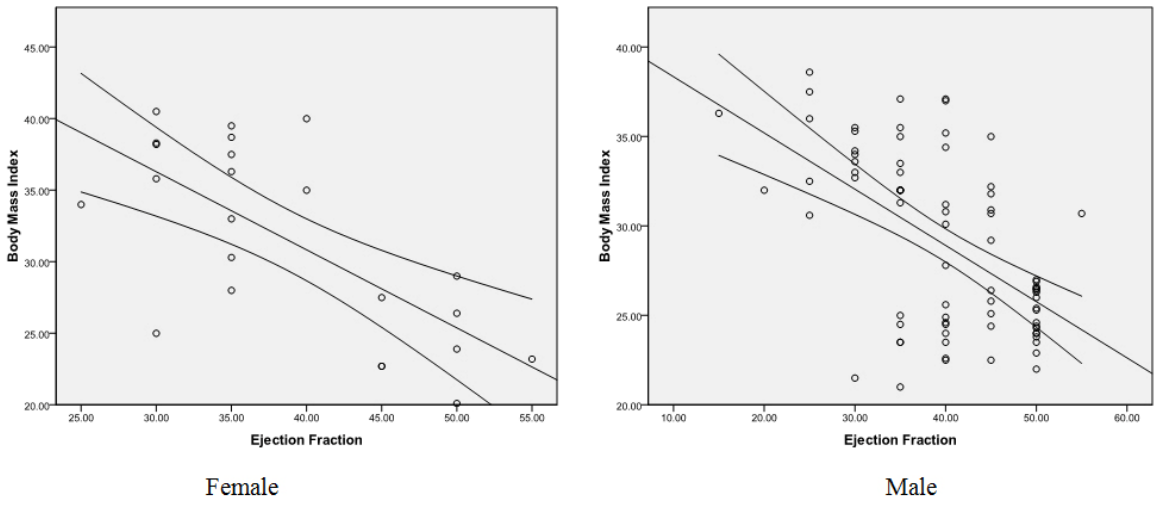

Figure 1. Reverse relation between ejection fraction and BMI in males and females separately

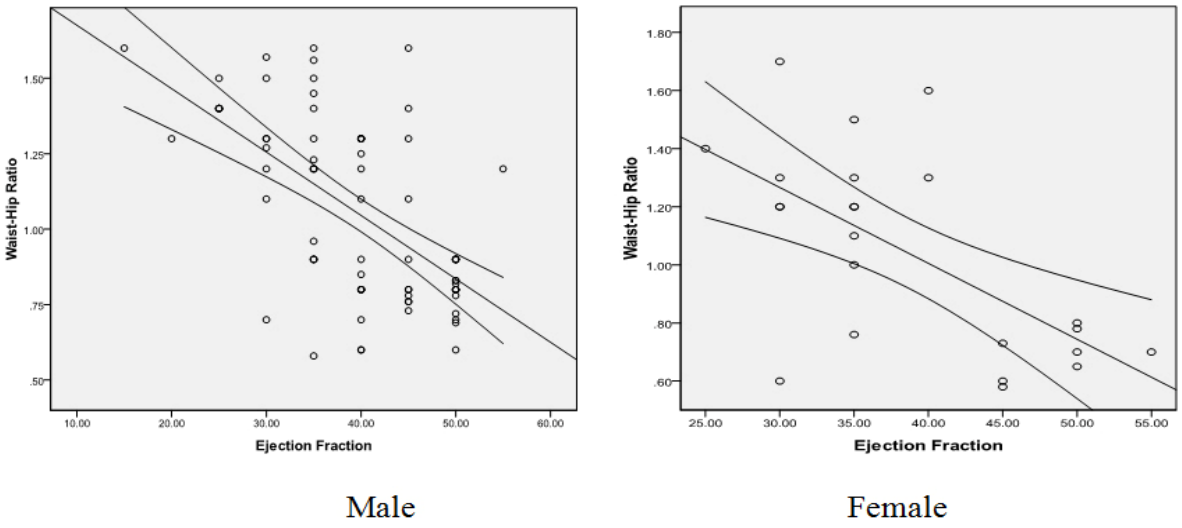

Figure 2. Reverse relation between ejection fraction and WHR in males and females separately

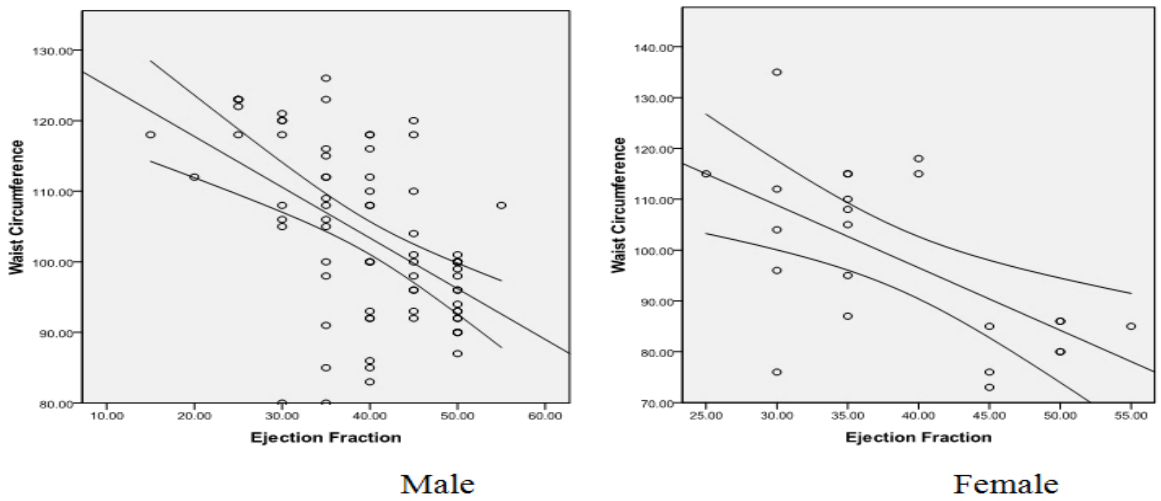

Figure 3. Reverse relation between ejection fraction and WC in males and females separately

Conclusion

considering the decrease in left ventricle function in patients with abnormal anthropometric indices and the significant difference between two groups it could be concluded that anthropometric indices including BMI and waist circumference influence cardiac function following myocardial infarction.

Ethical issues: The local ethics committee of Tabriz University of Medical Sciences approved the study and all patients signed informed consent.

Conflict of interests: The authors declare no conflicts of interest

References

1. Kenchaiah S, Evans JC, Levy D, Wilson PW, Benjamin EJ, Larson MG, et al. Obesity and the risk of heart failure. **N Engl J Med** 2002; 347:305-13.
2. Lopez-Jimenez F, Malinski M, Gutt M, Sierra-Johnson J, Wady Aude Y, Rimawi AA, et al. Recognition, diagnosis and management of obesity after myocardial infarction. **Int J obes (Lond)** 2005; 29:137-41.
3. Prasad SB, Fahrtash F, Malaiapan Y, Meredith IT, Cameron J. Obesity and the metabolic syndrome in patients with acute myocardial infarction. **Int J Cardiol** 2010; 144:450-1.
4. Kazemi T, Sharifzadeh GH, Zarban A, Fesharakiana A. Obesity and fat distribution in patients with premature myocardial infarction. **Modern Care, Scientific Quarterly of Birjand Nursing and Midwifery Faculty** 2011; 7: 5-9.
5. Kumar A, Sivakanesan R. Anthropometric Profile in Normolipidaemic Myocardial Infarction Patients In South Asia: A Case-Control Study. **Journal of Clinical and Diagnostic Research** 2008; 2: 997-1000.
6. Ammar KA, Redfield MM, Mahoney DW, Johnson M, Jacobsen SJ, Rodeheffer RJ. Central obesity: association with left ventricular dysfunction and mortality in the community. **Am Heart J** 2008; 156:975-81.
7. Thompson CJ, Ryu JE, Craven TE, Kahl FR, Crouse JR 3rd. Central adipose distribution is related to coronary atherosclerosis. **Arterioscler Thromb** 1991; 11:327-33.
8. Zeller M, Steg PG, Ravisy J, Lorgis L, Laurent Y, Sicard P, et al. Relation between body mass index, waist circumference, and death after acute myocardial infarction. **Circulation** 2008; 118:482-90.