

Association between Body Mass Index and Mitral Valve Prolapse

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ABSTRACT

Introduction: Body mass index (BMI) can affect cardiac morphology; however, the relationship between BMI and valvular heart diseases has not been thoroughly evaluated. This study aimed to determine the relationship between BMI and mitral valve prolapse (MVP) as one of the most common valve diseases worldwide. It can help us to better understand pathophysiology of this common disease.

Materials and Methods: In this descriptive study we enrolled 200 patients with isolated MVP. This patient was referred from 2014 to 2015 to our cardiology clinic in Mashhad, Iran, with chief complaint of chest pain, dyspnea, and palpitation. patients underwent transthoracic echocardiography. We document the patients' height, weight, and demographics data. BMI distribution was categorized as higher and lower than 18.5 kg/m². Chi-square and independent samples t-test were performed using SPSS version 19 to analyze the data.

Results: The results showed that 92 (46%) and 108 (54%) of the samples were male and female, respectively, and their mean age was 24.29±3.75 years. Most of the patients (n=110) had low BMI (55% of the patients had BMI lower than 18.5 kg/m²). Left atrial and ventricular diameters had a significant relationship with BMI of all the underweight patients (n=110) (P=0.026 and 0.032, respectively). The main complaints were chest pain (n=55, 50%) and dyspnea (n=58, 64.44%) in the patients with low and normal BMI, respectively.

Conclusion: Symptoms and echocardiographic features in MVP patients vary with BMI. While mitral valve annulus diameter was the same in both BMI groups, the results showed that left atrial and ventricular diameters in the underweight patients were less than those with normal BMI.

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Introduction

Mitral valve prolapse (MVP) is a common disorder, which occurs in 2-3% of the general population. It is characterized by typical myxomatous changes in the mitral leaflet tissue with superior displacement of one or both of the leaflets into the left atrium. MVP is estimated to affect almost 7.8 million individuals in the United States and more than 176 million people

worldwide. MVP can be associated with significant mitral regurgitation, bacterial endocarditis, congestive heart failure, and even sudden death.

Despite being known for more than a century, there is a scarcity of information on this disorder. Nutritional status and weight may be associated with this syndrome (1). Body mass

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index (BMI) as an indicator of nutritional status has unique effects on cardiac morphology (2). For instance, obesity is associated with subclinical abnormalities in the right ventricular function and structure (2). However, few studies have evaluated the effect of BMI on valvular heart diseases such as MVP. MVP is one of the most common cardiac diseases with highly variable clinical syndromes secondary to diverse pathologic mechanisms of the mitral valve apparatus (3).

The pathology of MVP in most of the patients is unknown, but it appears to be a genetically determined collagen disease in some cases (4, 5). In this valvular heart disease, which can be detected by echocardiography, the posterior mitral leaflet is involved more than the anterior one, and the mitral valve annulus is often dilated (6). MVP varies in its clinical expression, ranging from only a systolic click and murmur with mild prolapse of the posterior leaflet to severe mitral regurgitation secondary to chordae rupture and leaflet flail (7, 8).

In many cases, MVP progresses over years or decades, and in some others it exacerbates rapidly as a result of chordae rupture or endocarditis (9). Most patients are asymptomatic and remain so for their entire lives.

Various symptoms (including atypical chest pain, exertional dyspnea, palpitations, syncope, and anxiety) and clinical findings (hypotension, lean body mass, and electrocardiographic repolarization abnormalities) are associated with MVP, and their constellation is called the MVP syndrome (10). Despite the known characteristics of MVP, the effect of BMI status on the heart has not been investigated in patients with MVP. In this study, we aimed to evaluate the effect of BMI on patients with mitral prolapse, and to investigate the association of BMI with MVP symptoms and echocardiographic findings.

Materials and Methods

This descriptive, cross-sectional study was done in a cardiology clinic of Mashhad, Iran from January 2013 to January 2014. All the patient aged 15 years and above who referred to this

cardiology center with chest pain, dyspnea, and palpitation were evaluated.

After obtaining verbal consent, the patients who were diagnosed with MVP in their transthoracic echocardiography, and did not have cardiomyopathy, congenital heart defect, congestive heart failure or atrial fibrillation, ischemic heart disease, heart failure, mitral valve annuloplasty, connective tissue disorder, and any other cardiovascular or systemic diseases were enrolled in this study (n=200). All the patients underwent transthoracic echocardiography by one cardiologist, using Esaote Mylab-50 echocardiography unit, and 1-5 MHz PA230E Italian probes.

The patients' height and weight were recorded by a researcher, and their BMI was calculated. The patients were divided into two groups according to BMI, and the BMI scores less than 18.5 kg/m² were considered as underweight. Chi-square and independent samples t-test were performed, using SPSS version 19 to analyze the data. P-value less than 0.05 was considered significant.

Results

The obtained data showed that 92 (46%) and 108 (54%) of patients were male and female, respectively, and their mean age was 24.29±3.75 years (age range: 17-37 years). Most of the samples 55%(n=110) were underweight, while 45%(n=90) patients had BMIs above 18.5 kg/m². Chest pain was the main complaint of the patients with low BMI (n=55,50%) but was infrequent in patients with normal BMI.(n=10,11.11%). Dyspnea was more common in patients with normal BMI (n=58,64.44%) but was infrequent in patients with low BMI (n=12,10.90%) (P<0.00; Table 1).

In the echocardiographic parameter, left atrial and ventricular end-diastolic diameters were significantly lower in the patients with low BMI. Left atrial diameter was 29.31mm in patients with low BMI but was 29.69 mm in patients with normal BMI (P=0.02). left ventricular end-diastolic diameter was 50.02mm in patients with low BMI but was 50.94 mm patients with normal BMI (P=0.03; Table 2).

Table 1. Comparison of symptoms in mitral valve prolapse patients according to body mass index

Variable	Body mass index (BMI)<18.5 (n=110)	BMI 18.5 - 24.9 (n=90)	P-value
Age	24.45±3.65	25.37±4.45	0.08
Gender (male), n (%)	49 (44.54)	43 (47.78)	0.07
Presenting symptom			
Chest pain	55 (50%)	10 (11.11%)	
Palpitation	43 (39.10%)	22 (24.45%)	<0.001
Dyspnea	12 (10.90%)	58 (64.44%)	

Table 2. Comparison of echocardiographic findings in mitral valve prolapse patients according to body mass index

Variable	Body mass index (BMI)<18.5(n=110) Mean (SD)	BMI 18.5–24.9 (n=90) Mean (SD)	P-value
Leaflet displacement (mm)	2.02 (0.12)	2.01 (0.14)	0.41
Leaflet thickness (mm)	5.53 (0.24)	5.48 (0.32)	0.78
The involved leaflet			
Anterior	102 (92.73%)	83 (92.22%)	0.17
posterior	8 (7.27%)	7 (7.78%)	
Left atrial diameter (mm)	29.31 (1.5)	29.69 (1.3)	0.02
Left ventricular end-diastolic diameter (mm)	50.02 (2.4)	50.94 (1.7)	0.03
Mitral annular diameter (mm)	28.39 (1.3)	28.66 (1.49)	0.19
Aortic diameter(mm)	28.94 (1.3)	29.29 (1.4)	0.01
Stroke volume (ml)	62.14 (2.3)	62.73 (2.4)	0.26

Discussion

Although few studies were conducted on the prevalence of MVP in patients with different BMIs, it is believed that MVP patients are leaner than healthy individuals (4). In our study, most of the MVP patients were underweight as well. Despite the fact that underweight adults are usually physically active and young, MVP is more prevalent in this group. Similar to other cardiac abnormalities, MVP has its own unique echocardiographic characteristics. Abnormal leaflet and chordae tendineae are the main findings in pathophysiology of MVP (5). Chordae tendineae is lengthened and thickened in MVP patients, and MVP patients have larger aortic root, while they are the same as healthy individuals in terms of left ventricular dimension or volume (5, 6).

Left atrial and ventricular diameters in underweight patients were less than the rest of the samples, while mitral valve annulus diameter was the same in both BMI groups. These results confirm the higher prevalence of underweight condition in MVP patients, which is in line with a large, population-based study of Movahed et al. (7). Also, Theal et al. suggested that there is a trend toward lower BMI in patients with MVP, as compared to healthy samples (8). Van Der Ham et al. confirmed this result in children as well (11). Although there is a scarcity of studies on the influence of BMI on the left chamber diameter of MVP patients, there are several studies available on the effect of obesity on this disorder.

Kumar et al. found that high BMI score is one of important predictors for left atrial enlargement, which can affect cardiac geometry (12). Yiginer et al. reported that left ventricle enlargement in MVP patients was not associated with higher height (13). Gottdiener et al. found that the strongest predictor of left atrium size in hypertensive patients was obesity (14). Despite these findings on the effects of BMI

on cardiac morphology in MVP patients, conducting further studies in different races seems to be necessary, especially in underweight patients.

Conclusion

Given the association between lower BMI and left atrial and ventricular diameters, based on result of this study, screening the underweight patients presenting with chest pain, palpitation, or dyspnea for MVP is indicated.

Conflict of Interest

The authors declare no conflict of interest.

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