

# A Comparative Study of Left Ventricular Function of People with and Without D-Type Personality Hospitalized for First-Time Myocardial Infarction

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## Abstract

**Aim:** This study is aimed to comparison between left ventricular (LV) function for people with and without type D personality hospitalized for the first time of myocardial infarction (MI). **Materials and Methods:** In a descriptive-analytical study, 150 patient hospitalized in heart care centers in Isfahan with definite MI diagnosis were selected by simple available sampling method. Data regarding the determination of D and non-D type of personality were collected by a 14-item questionnaire (DS14) and the results from LV performance evaluation using echocardiograph after 1<sup>st</sup> time heart attack and before clearance from hospital. Collected data were analyzed using SPSS software and *t*-test, Chi-square, linear and multiple regression tests. **Results:** The average of ejection fraction (EF) index in total patient was  $43 \pm 9.47$  with the range of 15–60, 14 people (9.3%) normal EF and 136 people (90.7%) had abnormal EF. The average of EF index in 2 groups with D and non-D type of personality were  $43.2 \pm 10.5$  and  $42.9 \pm 9$ , respectively, and based on *t*-test, the average of EF index in 2 groups had no significant difference ( $P = 0.86$ ). Furthermore, 7 people (12.7%) in group D and 7 people (7.4%) in non-D group had normal EF, and in these two groups, 48 and 88 people had abnormal EF, respectively (87.3% vs. 92.6%), but according to Chi-square test, EF distribution in 2 personality types had no significant difference ( $P = 0.28$ ). **Conclusion:** There is no significant relationship of type D personality with LVEF in people with first-time MI.

**Keywords:** Left ventricular function, myocardial infarction, Type D personality

## INTRODUCTION

Myocardial Infarction (MI) occurs when coronary artery blood flow is reduced due to thrombotic obstruction of atherosclerotic coronary artery.<sup>[1]</sup> Clinical spectrum of coronary artery disease varies from silent ischemia to chronic stable angina, unstable angina, acute MI, and sudden cardiac death.<sup>[2]</sup>

More than 7 million people suffer from MI in the United States, and approximately, 650,000 new cases of acute MI and 450,000 patients with acute MI are referred to healthcare centers. This disease causes highest mortality and morbidity and financial burden in the developed countries,<sup>[1]</sup> and it is at the top of the list of predisposing factors of health care.<sup>[3]</sup> Left

ventricle dysfunction (marker of increased myocardial wall tension), as an important MI complication, is associated with increased mortality.<sup>[4]</sup>

Recent studies suggest that anxiety, anger, worry, and psychological stresses are associated with coronary heart disease, cardiac death, and MI.<sup>[5-11]</sup> Psychological stress may lead to coronary artery spasm, platelet activation, reduction of heartbeat

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variability, myocardial ischemia, thrombotic obstruction, cardiac arrhythmia, MI, and cardiac death,<sup>[12]</sup> and in this meanwhile, personality variable is an important determinant factor in stress experience.<sup>[13]</sup> Personality can alter their autonomic system and lead to ischemia via reduction of coronary artery blood flow.<sup>[14]</sup>

Recently, a theoretical structure has been purposed by Pedersen and Denollet on type D personality which seems to be an important factor in explanation of individual differences in response to stress, comorbidities, cardiac complications, psychological consequences, and mortality risk in heart diseases.<sup>[13,15]</sup> This personality type is based on two main and constant personality characteristics in psychological and physiological aspects. These characteristics include negative affectivity (NA) and social inhibition (SI).<sup>[16]</sup> NA means individual's desire to experience negative effects in different type and situations.<sup>[15-17]</sup> These people tend to worry so much and have a negative point of view toward both the environment and themselves and demonstrate symptoms of anxiety, depression, anger, and irritability.<sup>[18]</sup> SI represents individual's desire to avoid emotion and behavior expression in social communications for the fear of other's reactions.<sup>[19]</sup>

Although negative emotions are measured in this personality type, it is the association of tendency to experience negative emotions and avoidance from expressing them which brings about more negative consequences for their health rather than experiencing negative emotions.<sup>[20]</sup> Rate of cardiac events is 52% in type D personality, while it is 12% in nontype D personality.<sup>[11]</sup>

This personality type is 13% to 32.5% prevalent among general population, while it is reported to account for 26% to 53% of patients with cardiovascular diseases.<sup>[21,22]</sup> Previous studies proved the relationship between cardiac risk factors and type D personality. For example, in Schiffer *et al.* study, this personality type, whether as a biological phenomenon (temperament) or as a habitual behavioral pattern, may be considered as a risk factor in the incidence of cardiac diseases,<sup>[23]</sup> increased negative outcomes and mortality of cardiac diseases and other physical diseases including hypertension, diabetes, osteoporosis, and peptic ulcer disease.<sup>[24]</sup> This personality type is also associated with hyperlipidemia in which elevated cortisol level may be a mediator in the association between type D personality and increased risk of hyperlipidemia,<sup>[25]</sup> while hyperlipidemia is an important and common risk factor of cardiovascular diseases.<sup>[26]</sup>

Nowadays, it is proved that left ventricle function is a predicting factor for long-term survival after acute MI recovery which is explained by ejection fraction (EF).<sup>[4,27-29]</sup>

$$\text{LVEF} = \frac{\text{End Diastolic Volume} - \text{End Systolic Volume}}{\text{End Distolic Volume}} \times 100$$

EF below 40% indicated increased risk of coronary events and poor prognosis in MI patients.<sup>[1]</sup> Patients with EF below 50% are at 3-fold risk of cardiac events compared with patients with EF above 50%.<sup>[11]</sup> On the other hand, Staniute *et al.*

study suggested that type D personality and EF below 50% are independent prognostic factors for all cardiac events.<sup>[12]</sup> Zhang *et al.* study proved that personality type affects clinical course of patients with low EF. In their study, 21 patients of 87 patients experienced cardiac complications of MI in 5–10 years. These complications were associated with EF below 30%, low exercise compliance, previous MI, anxiety, anger, and depression, and patients with type D personality were at higher risk of cardiac complications compared with non-type D personality.<sup>[28]</sup>

Consequently, several evidences have shown the mediator role of type D personality between life events and stress and NA experience through which it leads to exacerbating some cardiac risk factors by increasing some pathophysiologic mechanisms. It appears that severity of these risk factors be involved in determination of MI extent and post-MI EF reduction. Limited studies have been performed on the relationship between personality type and MI patients and left ventricle function, though approving this relationship requires further investigations to definitely show which patients are at real risk of cardiac events. Thus, due to the limited studies, lack of similar domestic study, and relatively high prevalence of type D personality in the society, the current study was conducted to determine and compare left ventricular EF (LVEF) in type D personality and nontype D personality patients with first episode of MI.

## MATERIALS AND METHODS

The research method was descriptive from type of a cross-sectional study conducted in 2013 in educational therapeutic centers affiliated to Isfahan University of Medical Sciences. Statistical society of this study included MI patients hospitalized in those centers in 2013. Sample size of this study was calculated to be 120 according to the sample size estimation formula for correlation studies considering 95% confidence level and 80% power of test, and correlation between EF index and score of personality type was considered approximately 20%. For more assurance, 150 patients entered this study. The sampling method was random.

Inclusion criteria of this study included approved MI diagnosis by cardiologist according to MI diagnostic criteria which included characteristic angina pectoris for myocardial ischemia lasting for at least 20 min, the presence of pathologic changes implying ischemia, infarction in electrocardiogram waves, elevated cardiac enzymes, as well as patients' consent to participate in the study. Exclusion criteria consisted of secondary MI to coronary artery bypass graft surgery or angioplasty, other serious physical disease affecting function of left ventricle, and major psychological disorder.

Score above 10 for both features is used for determination of type D personality. Those who catch the score above 10 are categorized as individuals with type D personality and those who catch the score below 10 are categorized as individuals with non-D personality.

After coordination with hospitals with CCU (Al-Zahra, Khorshid, and Chamran Hospitals), cardiac patients with first episode of MI approved by cardiologist entered this study successively. Afterward, by evaluation of last echocardiogram report taken after MI, EF of patients were extracted and entered in a special form as well as demographic information of patients. Then, they were asked to fill out type D personality questionnaire (DS<sub>14</sub>).

DS<sub>14</sub> is a standardized questionnaire consisting of 14 questions to assess NA and SI personality features. This 14-question version takes 5 min to be filled out. Questions of this questionnaire are scored based on 5-score Likert scale as true, partially true, no idea, partially false, and false with 0, 1, 2, 3, and 4 scores, respectively. The highest score for NA and SI is 28. Score above 10 for both features is used for determination of type D personality. The cutoff point of the scale is 10 score. A study on psychological feature on DS<sub>14</sub> by Denollet showed that NA and SI scales include  $n = 3678$ ;  $\alpha = 0.88/0.86$ , and it is persistent for 3 months. NA (test-retest  $r = 0.72/0.82$ ) has a correlation coefficient ( $r = +0.68$ ) with neuroticism. SI has a correlation coefficient ( $r = -0.59/-0.65$ ) with extroversion. Persian version of this questionnaire provided by Bagherian and Bahrami Ehsan is used in this study.<sup>[30]</sup>

Finally, the collected data were entered to and analyzed with SPSS software version 20 (IBM, Armonk, NY, United states of America), and Chi-square, *t*-test, linear regression test, simple, and multiple logistic statistical tests were used for data analysis. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 in Medical University of Isfahan in a research project with code of 390612. Informed consent was obtained from all participants for being included in the study.

## RESULTS

Distribution of demographic variables in both D and non-D personality types are presented in Table 1. *T*-test showed that the mean age of the two groups were not significantly different ( $P = 0.3$ ). Sex distribution was assessed by Chi-square test. Female sex ratio was higher in D group compared with non-D group which was slightly statistically significant ( $P = 0.058$ ). However, the distribution of other demographic variables including education, residence, and marital status did not show significant differences among the two groups ( $P > 0.05$ ).

Mean EF index in all patients in this study were  $43 \pm 47.9$  ranging from 15 to 60, and accordingly, 14 patients (9.3%) had normal EF while 136 patients (90.7%) had abnormal EF. Mean EF index in D and non-D personality type were  $43.2 \pm 10.5$  and  $42.9 \pm 9$ , respectively, and *T*-test proved no significant difference ( $P = 0.86$ ). Furthermore, 7 patients (12.7%) in type D group and 7 patients (7.4%) in type non-D group had normal EF, while 48 patients (87.3%) in type D group

**Table 1: Frequency distribution of demographic variables of the two groups**

Variables	Personality type		P
	Type D (n=55; 36.7%)	Type non-D (n=95; 63.3%)	
Age (mean)	56.9±11.9	58.9±10.8	0.3*
Sex			
Male	38 (32.8)	78 (67.2)	0.058**
Female	15 (51.7)	14 (48.3)	
Education			
Diploma and below	46 (83.6)	80 (85.2)	0.8**
Above diploma	9 (16.4)	15 (15.8)	
Residence			
Urban	43 (78.2)	79 (83.2)	0.36**
Rural	12 (21.8)	16 (16.8)	
Marital status			
Single	3 (5.5)	8 (8.4)	0.38**
Married	52 (94.5)	(91.6)	

\*Results of independent paired *t*-test, \*\*Results of Chi-square test

**Table 2: Comparison of ejection fraction in D and non-D personality types**

Variable	D	Non-D	P
EF score	43.2±10.5	42.9±9	0.86*
Normal EF (%)	7 (12.7)	7 (7.4)	0.28**
Abnormal EF (%)	48 (87.3)	88 (92.6)	

\*Results of paired *t*-test, \*\*Results of Chi-square test. EF: Ejection fraction

and 87 patients (92.6%) in type non-D group had abnormal EF. Although based on Chi-square test, distribution of EF in two personality type groups did not show a significant difference ( $P = 0.28$ ) [Table 2].

As it is shown in Table 3, 25 patients (45.5%) in type D personality group had EF above 40% and 30 patients (54.5%) had EF equal to or below 40%. In type non-D personality, 48 patients (50.5%) had EF above 40% and 47 patients (49.5%) had EF equal to or below 40% ( $P = 0.16$ ).

Linear regression was used to evaluate the relationship between personality type and EF score. In simple model, only the relationship between personality type and EF score was assessed. Regression coefficient was calculated to be  $-0.110$  which was not statistically significant ( $P = 0.99$ ).

In multiple model, confounding variables such as age, sex, residence, marital status, and education were controlled. Though, the coefficient did not change and the relationship was not significant, as well.

Logistic regression was used to assess the relationship between personality type and EF status (normal or abnormal). In the simple model, only the relationship of personality type was assessed. Odds ratio of 1.83 with confidence interval of 0.61–5.4 was calculated which was not statistically significant ( $P = 0.282$ ).

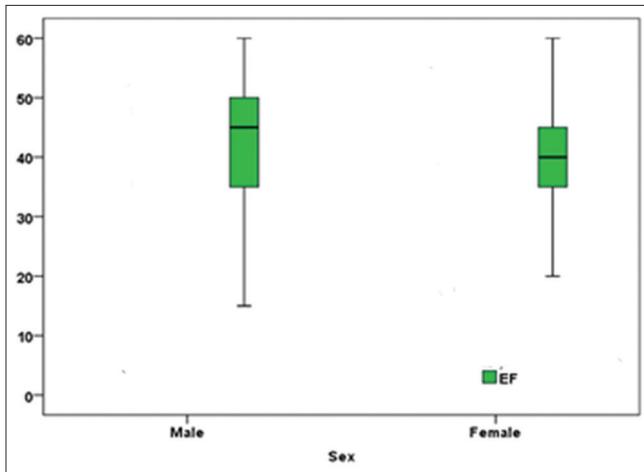
The relation of personality type and normal EF was assessed with multiple logistic regression in which the confounding effect of age, sex, residence, marital status, and education were modulated which led to  $tOR = 21$  with 95% confidence interval of 0.53–8.19 which was not statistically significant as well.

The below charts show distribution of EF score according to age, sex, residence, marital status, and education variables which does not imply statistically significant difference [Charts 1-5].

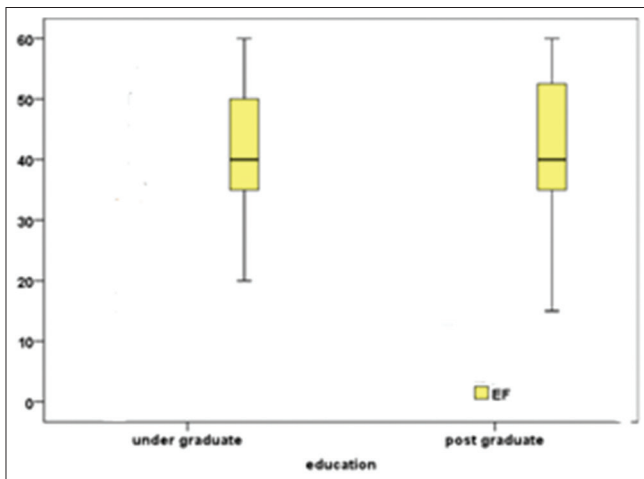
**Table 3: Comparison of ejection fraction above and below 40% in D and non-D personality type**

Personality type (EF)	D, n (%)	Non-D, n (%)	Sum, n (%)
EF >40%	25 (45.5)	48 (50.5)	73 (48.67)
EF ≤40%	30 (54.5)	47 (49.5)	77 (51.33)
Sum	55 (100)	95 (100)	150 (100)

$P=0.16$ . EF: Ejection fraction



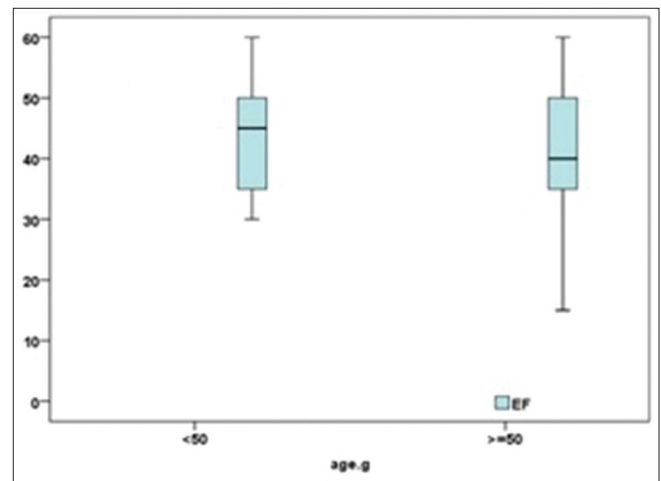
**Chart 1:** Median, range, 25% and 75% percentile, ejection fraction index according to sex



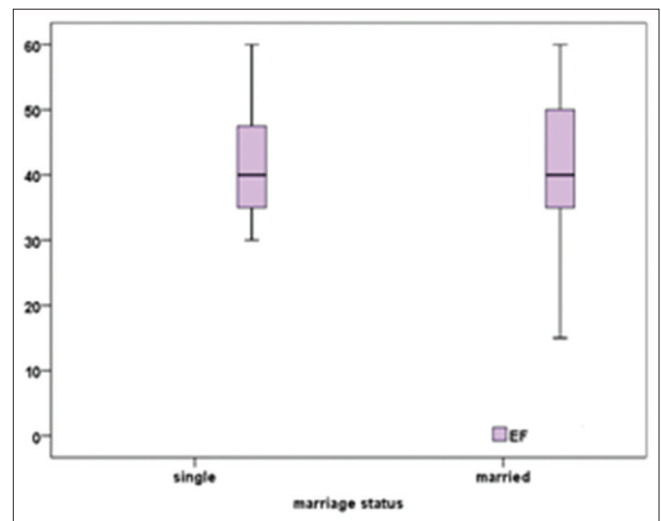
**Chart 3:** Median, range, 25% and 75% percentile, ejection fraction index according to education

## DISCUSSION

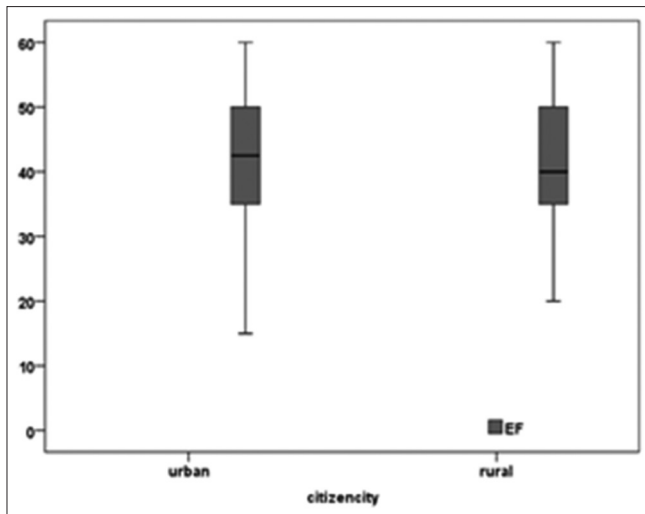
The main goal of this study is to determine and compare the function of left ventricle in patients with and without type D personality who are hospitalized for first episode of MI. According to the results of this study, mean EF index in D and non-D personality types were not significantly different, and distribution of normal and abnormal EF index was not different in the two groups. Moreover, no significant difference was observed on the distribution of patients with EF equal to or below 40% in the two groups of personality type. Frequency of type D personality was significantly higher among women, but no other significant differences were observed in terms of age, education, marital status, and residence. In addition, according to multiple regression test, demographic variable which has a significant effect on the dependent variable, EF index here, did not imply confounding effect. Nowadays, it is proved that left ventricle function is a predicting factor



**Chart 2:** Median, range, 25% and 75% percentile, ejection fraction index according to age group



**Chart 4:** Median, range, 25% and 75% percentile, ejection fraction index according to marital status



**Chart 5:** Median, range, 25% and 75% percentile, ejection fraction index according to residence

for survival after acute MI recovery which is explained by EF,<sup>[11]</sup> and on the other hand, other studies showed that this index is related to individual's personality type. For example, Denollet and Vase study proved that LVEF below 50%, type D personality, and age below 55 years increase the risk of cardiac events, and association of these factors predicts treatment failure. On the other hand, it is proved that D personality type and LVEF below 50% are independent predicting factors for all cardiac events inclining revascularization processes.<sup>[12]</sup> In Denollet and Brutsaert's study, it was demonstrated that personality type affects clinical course of patients with low EF. In this study, 21 patients of 87 MI patients showed cardiac complications which were associated with EF below 30%, low exercise compliance, previous MI, anxiety, anger, and depression. Moreover, patients with D personality type were more prone to cardiac complications compared with patients with non-D personality type.<sup>[31]</sup> Thus, the relationship between these personality factors and left ventricle dysfunction may be assumed, although such a relationship was not proved in our study. Yet, higher prevalence of type D personality in patients compared with general population in our study was consistent with other studies.

Statistical society of this study were patients with MI, and their personality type was assessed after MI. As numerous studies have shown, MI patients are at risk of psychological disorders due to MI such as depression which can affect their responses to the questionnaire and confound the accurate evaluation of personality characteristics.

## CONCLUSION

According the results of the research, there is no significant relationship between type D personality with LVEF in people with first-time MI. Therefore, it can be concluded that the type D personality have no direct effect on LVEF among MI patients.

## Study limitations

Cross-sectional design of this study and lack of control for factors affecting LVEF are limitations of this study.

## Suggestions

Conduction prospective longitudinal studies by controlling confounding factors affecting function of left ventricle is our main suggestion for future studies.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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