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Title: Cardiac Function Modeling in Patients with Acute Myocardial Infarction Based on Type D Personality Considering the Mediating Role of Health Promoting Life Style

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Abstract

Background: The cardiac function of patients with acute myocardial infarction plays an important role in disease prognosis. The risk of ischemic heart disease and its death in people with type D personality is four times higher than those with lower levels of negative affect and social inhibition and life style is the objective and quantifiable dimension of human personality.

Objectives: The purpose of this research was to model the cardiac function based on type D personality with the mediating role of health promoting life style in patients with acute myocardial infarction.

Materials and Methods: The present research has employed a correlation method based on the structural equation modeling especially regression equations. The statistical population of this research was all patients with acute myocardial infarction (ST-segment Elevation MI) under Primary PCI referred to Mazandaran Cardiac Center in Sari in 2017-18. 220 patients were selected through Muller Regression Equation Modeling Formula (1996) considering the ratio of the sample size to the free parameter by purposive sampling method. They responded to the D-personality questionnaire(DS14), (Denolt, 2005) and the Health Promoting Life style Questionnaire (HPLP II).

Results: type D personality variable can directly predicts of the cardiac function of patients with acute myocardial infarction. This variable also predicts the cardiac function of these patients through the mediation of Health Promoting life style.

Conclusion: type D personality has a direct and indirect effect on heart disease and prognosis of patients with myocardial infarction (due to the mediating role of health promoting lifes tyle) and screening for this personality type is necessary.

Keywords: type D personality, life style, cardiac function, acute myocardial infarction

1. Introduction

Cardiovascular disease is the most common cause of death in most countries of the world, including Iran, which will be the leading cause of mortality and death across the world by 2020 according to the World Health Organization (WHO) (2,1). Myocardial infarction is one of the main causes of infection, hospitalization, disability, and death in human societies that do not dedicate to a specific age or gender (4,3). Acute myocardial infarction is an emergency. If a significant part of the myocardium suffers from ischemic injury, the pumping function of the left ventricular is reduced. This disorder is the most important single predictor of mortality following STEMI (6,5). Medical treatments, including thromboembolic drugs and angioplasty using balloon or spring, are used to limit myocardial infarction and prevent damage to the myocardium (7).

Known biological agents cannot fully explain the incidence of cardiovascular disease (8), but psychological and personality factors have a direct and indirect role in initiating and exacerbating cardiovascular disease (7,9). Personality is a set of relatively durable and unique features that may vary in response to different situations (10). In the late nineties and early twenty one centuries, Denolt emphasized a new type of personality type called Type D by the typology of cardiovascular patients, which can predict heart disease with its own characteristics (11). The type D personality is defined as the interaction of two fixed and general personality traits, consisting of negative emotions and social inhibition. In negative emotions, the individual tends to experience negative feelings at different times and situations and feels more emotional, anxious, and irritable feelings. Social inhibition refers to people's desire to avoid negative emotions in social interactions, and individuals in this feature interact with others, feel distracted, stress, and insecurity (14, 13, 12). The risk of ischemic heart disease and its death in people with type D personality is four times higher than those with lower levels of negative affect and social inhibition, and this is independent of the risk factors of traditional biomedicine (17,16,15).

The aspect of negative affect of type D personality in patients with myocardial infarction is the predictor of disability and low quality of life (16). The low quality of life predicts mortality in cardiovascular patients (15). However, since there was no relationship between the behavior of type D personality and the risk of cardiovascular disease in all studies, this kind of personality type needs more types of research (18). Although extensive research in

Western countries confirms the relationship between type D personality and the occurrence of cardiac problems, but this study needs to be reviewed in other countries (11).

Life style is the objective and quantifiable dimension of human personality. Adler introduced the concept of life style in the early 1900s, which is his personality theory. Life style is the most important factor that everyone regulates his\her life based on it and the healthy life style includes behaviors that guarantee the physical and mental health of a person (20,19).

The World Health Organization considers the term life style to be based on personal and identifiable patterns of behavior that results from the interaction between personal characteristics, social relationships, environmental conditions, and socioeconomic situations (21). Health promotion life style includes behaviors such as nutrition, physical activity, health responsibility, stress management, interpersonal relationships, and spiritual growth (22). Inappropriate life style is one of the factors affecting the development of chronic diseases and one of the most important causes of death in Iran (23).

Unhealthy eating habits, lack of exercise, and smoking are three common behaviors that pose us at the risk of developing physical and chronic illnesses, especially hypertension and cardiovascular problems, in the long run (24,18). Having a healthy life style can prevent many diseases (25). Various studies show that life style changes not only inhibit heart disease but also control its progress and reduce cardiovascular events in patients with cardiovascular disease (26). For example, quitting smoking after myocardial infarction reduces the relapse risk up to 35% (25).

The World Health Organization stated in the first statement of the World Health Conference in Moscow that currently 60% of global mortality and 80% of deaths in developing countries are due to unhealthy life style, which will reach 70% of global mortality by 2030 (27).

Urbinati showed that in spite of the severe adherence to drug therapy in patients with coronary heart disease, proper blood pressure (BP), low density lipoprotein (LDL) and diabetes regulation was not achieved except for people who had taken a healthy life style after diagnosis (28). Cardiovascular disease is a curable disease, and the only way to reduce its rate of progress is to change the healthy life style and adapt to heart disease prophylaxis (29). Shanshan Li et al. (2013) showed that higher-quality diet in post-myocardial infarction patients reduces mortality in all cases (30).

Several studies have examined the risk factors for cardiovascular disease. However, few studies have been conducted regarding the role of personality traits in life style as well as the relationship between cardiovascular life and cardiovascular risk factors (19,22). Considering the high contribution of psychological risk factors in coronary artery disease (CAD), considering these issues into life style interventions is an inevitable and essential part of all stages of prevention and treatment of these diseases, but attention to this dimension is often overlooked (20). Many studies have been conducted on the psychological factors and coronary heart disease through correlation, causality, and effectiveness methods, but in this research, it has been tried to use the new method of structural equation modeling for type D personality on the cardiac function of myocardial infarction patients with mediating role of lifestyle. considering the importance of individuals' life style and its significant effect on preventing diseases and protecting the health of individuals, and on the other hand, given the increasing number of people suffering from chronic disease, the need for research in this field is a necessity.

2. Materials and Methods

This basic research has employed a cross-sectional method to collect the required data. Data analysis was carried out through the descriptive and correlational method based on Structural Equation Modeling (SEM), in particular regression equations (integration of path analysis and factor analysis of the second level), which was based on covariance approach (CBSEM) and AMOS software. This approach estimates path coefficients, factor loadings by minimizing the difference between a sample-based covariance matrix and a model based covariance matrix. Also, Baron and Keni step approach was used to investigate the correlation between variables, exogenous and mediator, mediator and endogenous. Finally, the mediating role of exogenous and endogenous variables is examined (31).

The statistical population of this study was all patients with acute myocardial infarction (ST-segment Elevation MI) who referred to the Emergency ward of Mazandaran Cardiovascular Hospital in 2017-18 under Primary PCI (percutaneous coronary intervention).

Inclusion criteria were: A) patients aged 30-65 years old with the diagnosis of acute myocardial infarction (ST- segment Elevation MI) under Primary PCI (percutaneous coronary intervention). Individuals diagnosed with ST-segment Elevation myocardial infarction diagnosis have the following clinical features:

ST-segment elevation, high levels of cardiac enzymes and clinical history of angina and coronary artery stenosis above 50%, which are characterized by angiography (5); B) Participate in research based on desire; C) Having at least reading and writing literacy to complete questionnaires.

Exclusion criteria were: A) failure to complete the questionnaire; B) withdrawal from continuing research activities; C) physical problems; D) psychological and emotional problems.

Muller Regression Equation Modeling Formula (1996) was used to determine the sample size with the sample size ratio to the free parameter (32). Regarding the number of free parameters, a total of 220 samples were obtained according to the average in the targeted sampling method.

The implementation method was initially reviewing the records of hospitalized patients in special wards of the hospital who were aged 30 to 65 years old with the diagnosis of acute myocardial infarction (ST- segment Elevation MI) under Primary PCI (percutaneous coronary intervention). D-personality questionnaire(DS14) and the Health Promoting Life style Questionnaire (HPLP II) were used in this research. In the first step, demographic information was obtained by taking the biographies of the patients and by studying the patient records and the rate of coronary artery involvement through the angiographic report sheet considering the inclusion criteria. The questionnaires were then given to the patient and they were asked to answer all the questions by explaining how to complete the questionnaire. Cardiac function was recorded with Ejection Fraction index recorded in the echocardiographic artery.

D- Personality Questionnaire (DS14): type D personality scale has 14 questions, which was made by Denolt (2005) with two subscales of negative emotions and social inhibition (12). This scale is at a desirable level in terms of reliability so that its reliability is obtained as much as 81% through a re-test method in Belgium. Based on the Cronbach's Alpha, the reliability of this scale is calculated as much as 0.86 (33). The validity of this scale is also at a desirable level so that the subscale of negative emotions with neuroticism has a correlation as much as 0.74, which is significant at the level of 0.001. There is a positive correlation between social inhibition and extroversion (-0.61) and there is a negative correlation between social inhibition and the level of consciousness (-0.40). There is a positive correlation

between social inhibition and neuroticism (0.50). These coefficients are significant at 0.001 (12).

Zoljanahi et al. (2007) in Iran obtained the internal consistency of the negative emotion and social inhibition scale as much as 0.77 and 0.69, respectively (34). Fakhari et al. (2013) calculated Cronbach's alpha for negative emotion and social inhibition scale as much as 0.79 and 0.56, respectively and the total alpha for the reliability of DS14 was as much as 0.83 (35).

The method of scoring the scale is the form of a 5-point Likert scale including incorrect, somewhat incorrect, I do not have any idea, somewhat correct, correct with the scores of zero, one, two, three, and four. The closer the score of a person to 56, it means that the person is in the type D personality.

HPLP2 questionnaire: Health Promoting Lifestyle Questionnaire (HPLP II) is a modified HPLP version presented by Walker et al. (1987) and measures the health promoting life style by focusing on innovative work and individual perceptions that act to maintain or increase the level of well-being, Self-actualization, and individual satisfaction.

This tool measures health promoting behaviors in 6 dimensions and has 52 items. Measurable dimensions include nutrition (having a food pattern and choosing food), sports (pursuit of regular sport patterns), health accountability, stress management (identifying stress sources and stress management practices), interpersonal relationships and support (maintaining relationships with the feeling of proximity), spiritual growth and self-development (having a sense of purposefulness, seeking to advance individuality and experience of self-awareness and satisfaction). Regarding the scoring, the respondent was asked to specify how much he/she performs health promotion behaviors on the 4-point Likert scale (never, sometimes, often, and normally). Generally, the health promotion life style score and behavioral dimension scores are calculated using average responses for a total of 52 questions and for each subcategory (8 to 9 items).

Hill-Polerecky and Walker reported the alpha value as much as 0.94 for the HPLPII tool and 0.79 to 0.94 for the six subcategories. The reliability of the 3-week retest for the whole tool was as much as 0.89 (36). In the study of Zaidi et al. (2011), Cronbach's alpha coefficient for the whole tool was as much as 0.82 and the Cronbach's alpha for the subcategories including nutrition, physical activity, health responsibility, stress management, interpersonal

relationships, spiritual growth, and the whole questionnaire was 0.81, 0.79, 0.86, 0.91, 0.75, 0.64 and 0.82, respectively (36). SPSS 18 and AMOS software were used to analyze the data.

The questionnaire has six dimensions, and the questions for each dimension are presented in the following table.

dimension	Related Questions
Nutrition	1-11
Sport	12-24
Health Responsibility	25-32
stress management	33-38
Interpersonal support	39-46
Self-actualization	47-54

3. Results

At the beginnings, data are identified by analyzing the statistical default by using tests, kurtosis and skewness, box, Kolmogorov-Smirnov, then the Mahalanobis test was removed and the final data were extracted with 201 samples. Also, after evaluating the normalized data, the measured model of two variables of research was evaluated and confirmed. Also, Average extraction variances (AVE) show that all sub-scales of character type-D variables, health promotion life style are greater than 0.5 the measured standards in the model, representing convergent validity and compound value (Construct validity) indicate that the values obtained from the components are greater than 0.07 the measured standards and therefore the subject of AVE and CR (Construct Reliability) for questionnaires are verified.

Table 1: Average, standard deviation and correlation of type D personality, life style and promotion of health with heart function

Variable	<u>M</u>	<u>SD</u>	1	2	3	4	5	6	7	8
Nutrition	22.91	7.24	1							
Exercise	20.89	7.64	39**	1						
Responsibility of Health	20.42	7.25	24**	34**	1					
stress management	13.27	3.65	48**	51**	44	1				
Interpersonal support	17.27	5.75	46**	57**	52**	38**	1			
Self-actualizing	20.70	6.45	68**	46**	46**	62**	58**	**1		
Personality type- D	24.67	4.91	55**	48**	30**	25**	21**	20	1	
EF heart function	42.33	8.45	66**	58**	23**	24**	20**	34**	27**	1

*P<0/05 ** P<0/01

The results are shown in Table (1) shows significant correlation between type D personality, life style, and health promotion with heart function, and there are at the level of 0.01.

Table 2: fit indicators obtained from data analysis and variables after two correction steps

Exam's Name	Description	Acceptable values	The amount obtained before correction	The amount obtained after correction
χ^2/df	Relative Chi-square	<3	3.20	2.795
χ^2	Chi-square goodness-of-fit test		220.467	198.457
DF	Degrees of freedom		73	71
RMSEA	root mean square approximation error	<0.1	.052	0.044
GFI	Adjusted fitness indexes	>0.9	0.918	0.938
NFI	Soft fitness index	>0.9	0.904	0.931
CFI	Comparison fitness index	>0.9	0.899	0.914

According to table (2). The value of RMSEA is 0.444, hence this value is less than 0.1, which indicates that the root mean square approximation error is appropriate and the model is acceptable. Also, the chi-square to the degree of freedom is (795/2) Between 1 and 3, and the GFI, CFI and NFI indices are approximately equal to 0.9 and show that the model for measuring variables is appropriate

Table 3: Direct estimation of the model with the maximum-likelihood estimation (ML).

Variable	B	B	R ²	Significant
character type-D on Heart function	0.21	0.19	0.039	0.034
Health promoting style on Heart function	-0.54	0.34	0.183	0.01

According to table (3) type D personality, health promotion life style have a direct effect on Heart function.

Table 4: Indirect Estimation of Model using the Bootstrap Method

Variable	B	Lower boundary	Upper boundary	Significant
type-D personality on heart function by mediating life style	0.318	0.296	0.423	0.001

As in Table (4). It is observed that the indirect route is considered according to the standardized values (β), Not standardized (b). And (R2). Obtained, the path of type D personality with mediating the life-style of promoting health on heart function has significant effects with respect to the obtained values and is confirmed by the Bootstrap estimation method.

Note: In the final model for creating latent variables, it is necessary to have multiple markers of each of the variables, usually we use the subscales of the measurements as separate indicators of the construct, but in some cases, sub-scales There is no specific design of a particular structure. In this case, the item packets described by Russell, Spoth, Kahon and Altmaier (1998) are used. In this study, this method is also used to analyze the variables of the personality type-D and the heart function according to the single Variables were used to

improve the overall variance of the model according to Russell's method in the hidden variable (37).

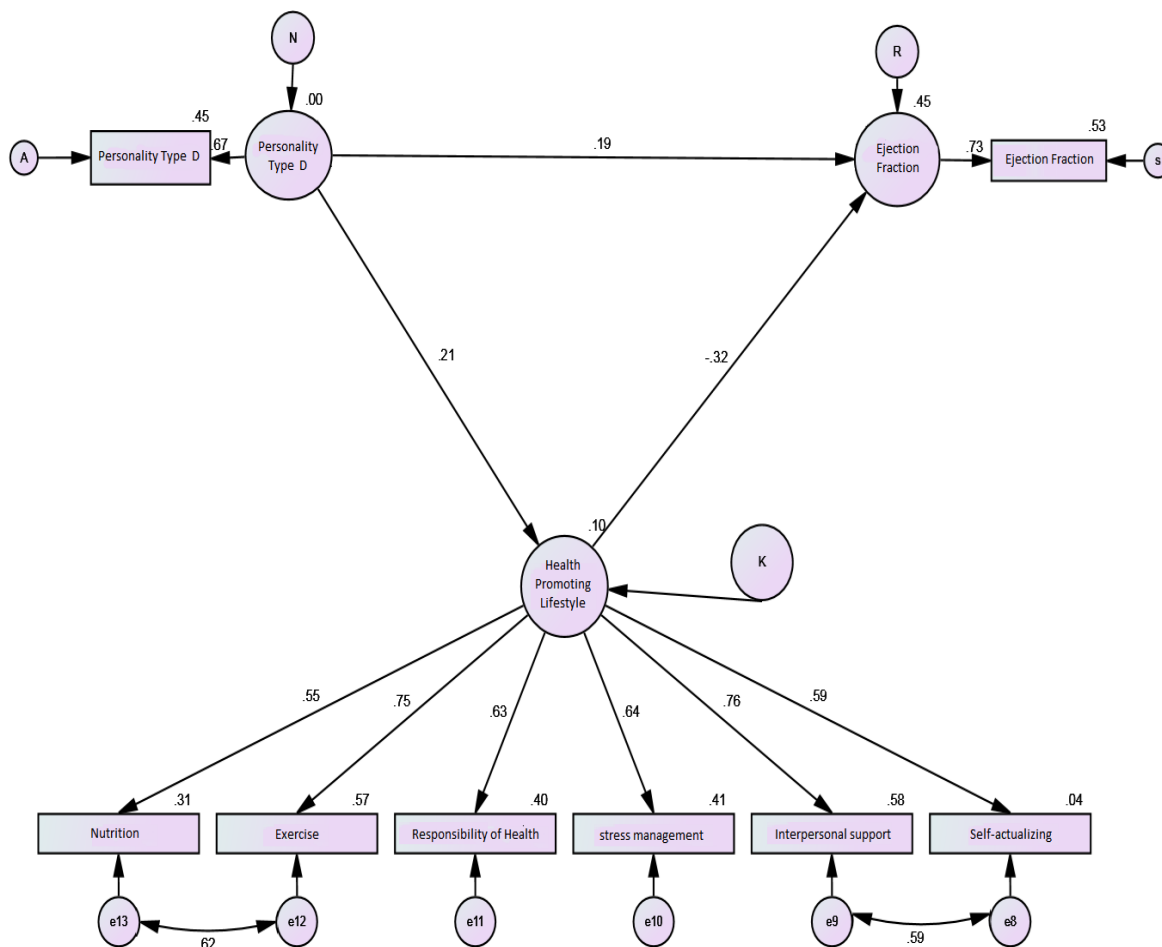


Diagram 1: The final model of the tested paths with standardized predictive statistics for predicting heart function in the indirect pathway by the type-D character variable by mediating a health promoting life style.

4. Discussion

The purpose of the present research was to model the structural relationships of type D personality with the cardiac function of patients with acute myocardial infarction with the mediating role of health promotion life style. According to the final model of the research, the type D personality variable can predict of cardiac function in patients with acute myocardial infarction, and the research model was generally approved. Investigating the predictive role of type D personality and health promoting life style in predicting cardiac

function in patients with acute myocardial infarction also showed a correlation coefficient as much as 0.039 and 0.18 of cardiac function variance in patients with acute myocardial infarction. Also, the indirect path of type D personality variable on the cardiac function of patients with acute myocardial infarction with mediating the health promoting life style according to the obtained value has an explained variance (R^2) as much as 0.37, which indicates an indirect effect on the cardiac function of patients with acute myocardial infarction. These results are consistent with Urbinati et al. (2015), Shanshan Li et al. (2013), Hemati Pak Maslak et al. (2017), Mazloumi et al. (2016) based on the fact that having a health promoting life style affects cardiovascular patients, especially those with myocardial infarction to achieve therapeutic goals such as blood pressure, cholesterol, diabetes, cardiac function and death rate reduction from myocardial infarction (26,27,30,28). In addition, this research is in line with the research by Mohseni Pouya et al. (2015), Saber Moghaddam Ranjbar et al. (2013), Besharat and Hosseini et al. (2015), Aminpour et al. (2014), Etemad and Ismail Nasab (2012) regarding the effect of life style in the development of coronary heart disease (39,38,20,23,22). The results were also consistent with Sedaghat et al. (2015), Stein et al. (2014), Mirzaie et al. (2014) based on the fact that adherence to a promoting life style especially in cardiac patients is not simply influenced by their awareness of a healthy life style but is influenced by psychological factors such as personality type and motivation (19, 29, 24), which emphasizes the importance of psychological issues in the health area in cardiac patients.

Personality can be considered as distinct patterns of thinking, emotion, and behavior that interact with each individual's physical and social environment (40). There are not many aspects of human action can reflect its personality (41). Whatever human beings have gained or will bring, including its general health status, is influenced by their own personality and those with which they are interacting (10). Personality types are a model by which the real person can be evaluated. Each type has certain reserves of attitudes and skills to overcome problems and environmental tasks (42). One of the personality types is D, and the theoretical basis for this personality was the study of heart patients in Belgium, in which the role of personality traits was studied in the outcomes of heart disease (12).

type D personality affects biological causes of coronary heart disease (blood pressure, blood lipids, and tobacco use) as a result of the severity of coronary artery stenosis due to life style (22,39,23).

In the present research, the mean scores of stress control and interpersonal relationships and support were as much as 13.27 and 17.27, respectively, which has dedicated lower scores to itself compared with the mean score of other 4 dimensions of health promotion life style. Given that The type D personality is defined as the interaction of two fixed and general personality traits, consisting of negative emotions and social inhibition. In negative emotions, the individual tends to experience negative emotions in different times and situations, and in social inhibition, people tend to avoid negative emotions in social interactions. In this feature, individuals feel distraction, stress, and insecurity when interaction with others (14,13,12). People with negative emotions and social inhibition often suffer from chronic stress, low social support, and a low level of well-being (11). The results of this study can be explained in such a way that personality is an important and significant component in explaining the life style as an internal and interpersonal factor. It is known that establishing social relationships can lead to more physical mobility, and this mobility is more related to physical and mental health (19). According to the social-cognitive theory of Bandura most of the information is obtained through our mutual interaction with others (43). Therefore, having social relationships provides a learning and modeling opportunity of other people's positive behaviors on issues such as stress management, proper nutrition, and quality. Moreover, having social relationships will lead to social support, spiritual growth and self-actualization. Studies have shown that heart patients with social support are more likely to recover and have lower death rate (7) Type D personality with social inhibition can interfere with interpersonal and social relationships, which is one of the important components of life style. In most of the mentioned studies, analytical-descriptive or interventional methods have been used and the effect of lifestyle in the development of cardiovascular disease or the effect of education on life style and achievement of therapeutic goals in cardiovascular patients were examined. However, the structural equation modeling has been used in this research, which investigated the effect of personality type on cardiac function that determines prognosis in patients with myocardial infarction through the mediating role of lifestyle. Therefore, this study is different from other studies in terms of methodology.

5. Conclusion

The results of this research will be proposed to general health specialties, health psychologists, cardiologists, and intensive care unit nurses. Interventions can be considered

for improving cardiac function and better prognosis in acute myocardial infarction by identifying factors that affect coronary heart disease and cardiac function. Life style is considered as the quantitative dimension of personality, which is an important factor in the development of chronic diseases, including coronary heart disease. Therefore, the timely identification of coronary heart disease patients with type D personality and psychological interventions can influence their life style through which the therapeutic goals, including the proper cardiac function in patients with myocardial infarction can be achieved. The research method can be mentioned as one of the limitations that has used self-report tools, which were sometimes long and boring and out of patient's physical condition. Therefore, it is suggested to conduct the present study prospectively and after the recovery of the disease. According to research conducted in the field of positive psychology and health psychology, it is recommended that the effects of other variables such as mindfulness, self-efficacy, optimism and coping styles on cardiac function of myocardial infarction patients should be investigated.

Ethical Considerations

Compliance with ethical guidelines

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All the participants were given information about the goal of the study. They were aware that taking part in this study was voluntary and had the right to refuse participation or leave the study whenever they wish.

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Authors contributions

All authors contributed in preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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