

# An Epidemiological Study of Cardiovascular Risk Factors in Patients with Myocardial Infarction: A Prospective Study

Hosseinali Jelveh Moghaddam,<sup>1</sup> Azar Avazeh,<sup>2</sup> Shahram Saifi,<sup>3</sup> Masoum Khoshfetrat,<sup>4</sup> Alireza Sedaghat,<sup>5</sup> Reza Shahrami,<sup>6</sup> Sevak Hatamian,<sup>7</sup> Ali Amirsavadkouhi,<sup>8</sup> Mehdi Ghahremani,<sup>9</sup> Seyed Mohammadmasoud Moosavinasab,<sup>9</sup> Mohammadali Khabirikhatiri,<sup>10</sup> Hosna Forooghira,<sup>11</sup> Farzaneh Baghernezhad,<sup>12,13</sup> Leila Safaepoor,<sup>13,14</sup> and Farshid Rahimibashar<sup>15,\*</sup>

<sup>1</sup>Department of Anesthesia, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>2</sup>Faculty of Nursing and Midwifery, Zanjan University of Medical Sciences, Zanjan, IR Iran

<sup>3</sup>Anesthesia and Critical Care Medicine Department, Rohani Hospital, Babol University of Medical Sciences, Babol, IR Iran

<sup>4</sup>Anesthesia and Critical Care Medicine Department, Khatamolanbia Hospital, Zahedan University of Medical Sciences, Zahedan, IR Iran

<sup>5</sup>Anesthesia and Critical Care Medicine Department, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, IR Iran

<sup>6</sup>Kowsar Hospital, Alborz University of Medical Sciences, Karaj, IR Iran

<sup>7</sup>Anesthesia and Critical Care Medicine Department, Shahid Madani Hospital, Alborz University of Medical Sciences, Karaj, IR Iran

<sup>8</sup>Anesthesia and Critical Care Medicine Department, Mehrad Hospital, Tehran, IR Iran

<sup>9</sup>Anesthesia and Critical Care Medicine Department, Shahid Modares Hospital, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>10</sup>Anesthesiology Research Center, Taleghani Hospital, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>11</sup>Biology Department, Basic Sciences Faculty, Payame Noor University, Tehran, IR Iran

<sup>12</sup>Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

<sup>13</sup>Nursing Faculty, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

<sup>14</sup>Behavioral Sciences Research Center, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

<sup>15</sup>Department of Anesthesiology, School of Medicine Hamadan University of Medical Sciences, Hamadan, IR Iran

\*Corresponding author: Farshid Rahimibashar, Department of Anesthesiology, School of Medicine Hamadan University of Medical Sciences, Hamadan, IR Iran. Tel: +98-8132640031, Fax: +98-8132651515, E-mail: fr\_rahimibashar@yahoo.com

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## Abstract

**Background:** Stress is one of the most important factors that may be accompanied with increased possible prevalence of cardiovascular diseases including myocardial infarction.

**Objectives:** The purpose of this study was to investigate the correlation between perceived stress intensity and some cardiovascular risk factors in myocardial infarctions' patients.

**Methods:** The design of the study was cross sectional. Overall, 2400 patients with myocardial infarction were chosen through multistage random sampling. A three-part questionnaire including demographic characteristics, perceived stress, and a checklist to record laboratorial test and electrocardiography changes were used for data collection.

**Results:** The results of the present study showed that 45% of the patients had moderate and 55% had severe stress. Moreover, findings of the research indicated that there were significant differences between the mean stress level in various categories of the variable including gender, education, history of hypertension, blood pressure, diabetes, cigarette smoking, exercising, job, and family history of myocardial diseases.

**Conclusions:** Regarding the high level of perceived stress in patients with myocardial infarction, it is necessary to devise a program and determine stressor factors to modify and decrease them.

**Keywords:** Cardiovascular Diseases, Cardiovascular Diseases Risk Factors, Perceived Stress, Myocardial Infarction

## 1. Background

Today, cardiovascular diseases are considered as the most common and serious diseases in developing countries (1-6). In 2013, the rate of prevalence of cardiovascular diseases was about 71.3 million (34.2%) in the United States (7). Coroner vessel diseases had the first rank and these

kinds of diseases were the most common causes of death in both developed and developing countries (8, 9). American researchers of the Heart Association showed that about 13.2 million patients (6.9% of the whole American population) had heart coroner vessel diseases in 2013. The rate of death was about 479300 people, where 53% of the total deaths had occurred in the United States (7). Researchers also

showed that the rate of survival after confinement was very low (10). The World Health Organization's report approved that the rate of cardiovascular diseases is increasing, with these diseases being the underlying cause of 48.6% of all deaths, and the rate is expected to rise to 46.4% by 2020 (11-13).

In Iran, like most countries, the main cause of death is cardiovascular diseases (5, 14) and causing 35% of deaths in Iran. The number of deaths due to cardiovascular diseases has been reported as 15326 cases (36.35%) in Tehran for the year 2010 (5).

There are many risk factors associated with cardiovascular diseases. Recent advancements for the control of risk factors associated with cardiovascular diseases can help us deal with this health hazard (15-17). Many researches have focused on the context of cardiovascular diseases. Some studies are based on the treatment of these diseases and others are trying to determine the risk factors. Framingham's study showed that 50% of cardiovascular diseases depend on nine main risk factors. Risk factors include: age, gender, family history of cardiovascular diseases, the rate of blood cholesterol, the rate of high density lipoprotein of blood, hypertension, smoking, diabetes mellitus, and left ventricular hypertrophy (5, 18-20).

Effective factors in cardiovascular diseases are divided to three main types including: unchangeable factors (age, gender, preterm menopause and family history), changeable factors (smoking cigarettes, fatness, hypertension, diabetes mellitus, insufficient physical activities, increase of blood cholesterol, low lipoprotein and high lipoprotein of blood), and unapproved risk factors (insufficient use of vitamin B-complex, and hyper insulinemia) (21). Psychological factors are the other group of risk factors. They include depression, anxiety disorders, anger problems, roughness, and chronic stresses during life (22-24).

Stress may be accompanied with increase in the possibility of cardiovascular diseases. Some researches illustrated that stress is an important risk factor in cardiovascular diseases (25). In addition, stressful situations could effect peoples' health and also cause diseases such as coroner vessel disorders and hypertension (6).

Stress activates biological responses and also activates neural system, glands and the immune system. One of the main effects of biological stress response is sympathetic system activation and release of epinephrine. The most important systems that are affected by release of epinephrine are the cardiovascular systems. Sequential increase of heart rate and hypertension are expected with stress (26).

Studies have shown that the activation of the sympathetic system leads to the release of epinephrine by different stress factors, and subsequently, an increase in heart

rate (27, 28). In this condition both blood pressure and pulse rate are increased (29-32) but the volume of lungs is decreased. Finally this marker can cause incidence of myocardial ischemia (33). Therefore, biologic response to stress can increase the possibility of cardiovascular diseases.

## 2. Objectives

However, this study attempted to show the relationship between rate of perceived stress and other main risk factors of heart coroner vessels diseases in patients with myocardial infarction.

## 3. Methods

This research was a cross sectional study, conducted from May 2011 to October 2013 on 2400 patients with myocardial infarction. The patients were hospitalized at coronary and post coronary heart units of ten affiliated hospitals to Tehran University of Medical Sciences (TUMS) during the process of research accomplishment. Sampling was done by multistage random sampling. Sampling in the first step was cluster random sampling. All educational and non-educational hospitals affiliated to TUMS were considered. From the 45 affiliated hospitals, ten hospitals were selected. In the second step, all coronary and post coronary heart units were considered as a cluster, and at each hospital, one unit through cluster random sampling was selected. In the third step, simple random sampling through computerized random sampling was done. The sample size was calculated through a pilot study ( $\alpha = 0.05$  and  $\beta = 0.80$ ). Ten percent attrition was considered for preventing of sampling bias. Inclusion criteria were patient's awareness, approval of myocardial infarction by clinical symptoms, serum enzyme tests, and heart tape pathological changes. For data collection, a three-part questionnaire including demographic characteristics (including age, gender, marital status, education, weight and height), perceived stress, and a checklist to record laboratorial test and Electrocardiography (ECG) changes were used. The validity of the three parts of the questionnaire was confirmed by a panel of experts, including three cardiologists, one interventionist, ten head nurses, and twenty nurses working at the coronary and post coronary units. The perceived stress questionnaire was designed by Kohn and Kamark (34). The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress, which is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to

determine how unpredictable, uncontrollable, and overloaded, respondents found their lives. The scale also included a number of direct queries about current levels of experienced stress. The PSS was designed for use in community samples with at least junior high school education. The items were easy to understand, and the response alternatives were simple to grasp. Moreover, the questions were of a general nature and hence were relatively free of content specific to any subpopulation group. The questions of the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way. The first version of this instrument had four questions, the second version had ten questions, and the third one had 14 questions. In this research, the third version, i.e. the 14-question instrument, was utilized. This instrument was designed, based on a Likert criteria including five choices (from never or none=1, to very much = 5), and has been utilized in many researches; which was accomplished by examining a number of female teachers. Internal consistency (Cronbach's alpha) of the aforesaid study was 0.89 (35). The reliability of the research was examined through internal consistency (Cronbach's alpha) and was equal to 0.89, which was acceptable. Questions number 4,5,6,7,9,10 and 13 are scored reversely (never or none = 5, and very much = 1). The least score that could be gained for perceived stress was 14, and the most 70. The ethical considerations were related to the participants' autonomy, confidentiality and anonymity during the study period and study's publication. The participants were informed of the aim, the design of the study, and the voluntary nature of their participation. After data collection, all data were entered in the Statistical Package for Social Sciences (SPSS) software and analyzed by descriptive and inferential statistics, the data included gender, education level, hypertension, history of hypertension, diabetes, cigarette smoking, doing exercise, job, and family history of myocardial infarction.

#### 4. Results

Overall, 2400 patients participated in this research; 6.5% of the patients were under 40 years of age, 15% between 41-50 years, 33% between 51-60 years, and 45.5% more than 60 years. Furthermore, 43.5% of the patients were female, and 56.5% were male; 81% were married, and the spouses of 19% had died. Regarding education, 45.5% of the patients were illiterate, 31.5% had elementary education, 17.5% high school education, and 5.5% had university education. 10.5% of the patients had less than normal Body Mass Index (BMI) (19.9), 50.5% had normal BMI and 39% had BMI more than normal. 65% of the patients had normal blood pressures, and 35% of them had hypertension.

2.6% of the patients had previously history of hypertension; while 97.4% of the patients did not have previously history of hypertension. Eighty-four percent of the patients had normal serum level cholesterol, 16% had serum level cholesterol more than normal. Eighty percent had normal serum level triglyceride and 20% of the patients had more than normal serum level triglyceride. Regarding diabetes, 15.5% of the patients were affected by diabetes and 84.5% were not affected by diabetes. Sixty-six percent had no history of cigarette smoking and, 23% had previous history of cigarette smoking and had given up before the research, and finally 11% were current smokers during the research. Four percent of the patients were exercising regularly, 30% were exercising irregularly and 66% were not exercising at all. Regarding job status, 10.5% were employees, 11.5% were workers, 38% were housekeepers, 2% were jobless, 11.5% were retired, and 26.3% had nongovernmental jobs. Furthermore, 88.5% of the patients were living in cities, and 11.5% were living in villages. Regarding history of cardiovascular diseases, 25.5% of the patients had a history of these diseases while 74.5% did not have so. Finally, 82.6% of the patients had no previous history of the use of contraceptive tablets and 17.4% had a previous history of utilizing contraceptive tablets. The mean and standard deviation of age, BMI, serum level of cholesterol, and serum level of triglyceride of the patients were  $59.18 \pm 11.06$ ,  $24.87 \pm 3.74$ ,  $154.62 \pm 88$  and  $206.70 \pm 56.39$ , respectively.

The results of the research showed that more than half of the patients had severe stress (55%) (Table 1). Statistical analysis showed that there was no significant differences between perceived stress categories and age ( $F = 0.780$  and  $P = 0.506$ ), marital status ( $F = 1.690$  and  $P = 0.092$ ), BMI ( $F = 0.981$  and  $P = 0.37$ ), blood cholesterol level ( $T = 0.691$  and  $P = 0.451$ ), blood triglyceride level ( $F = 0.912$  and  $P = 0.891$ ), contraceptive tablets ( $T = 0.641$  and  $P = 0.356$ ), and family relationship ( $F = 0.394$  and  $P = 0.811$ ).

Relative and absolute frequencies, and statistical analyses of gender, education level, hypertension, history of hypertension, diabetes, cigarette smoking, doing exercise, job, and family history of myocardial infarction to compare with perceived stress categories are presented in Table 2.

#### 5. Discussion

All subjects were affected with myocardial infarction; there was no one with low stress (score less than 23). This matter demonstrates that patients with myocardial infarction had more stress. This may be because of the increase of life stressors in various dimensions of life, such as social, political, cultural and economical dimension, and it indi-

**Table 1.** Absolute and Relative Frequencies of Perceived Stress Categories

Intensity of Perceived Stress	Number	Percentage
Low (14 - 32)	-	-
Moderate (33 - 51)	1080	45
Severe (52 - 70)	1320	55
<b>Total</b>	2400	100
<b>Standard deviation ± mean</b>		51.41 ± 7.89

cates the role of stress in development of cardiovascular diseases.

According to the American heart association (10) ageing is accompanied with an increase of cardiovascular diseases. The findings of the research according to the age factor were compatible with the results of Framingham's research. Framingham's research showed that 45% of subjects had more than 65 years of age, and only 5% had less than 40 years of age (36, 37). Therefore, it is believed that the age factor is responsible for arteriosclerosis. The results of this research indicated that the rate of males affected by cardiovascular diseases was more than females. The results of previous researches also showed that the prevalence of cardiovascular diseases in males was more than females. The reason for this matter may be due to hormonal differences between males and females. The results of Framingham's research in 1976 indicated that the incidence of cardiovascular diseases in females after menopause was 2.6 times more than females before menopause. The risk of cardiovascular diseases in females that had reached menopause by surgery was 2.7 times more than females at the same age that had not reached menopause. Also, this risk was 2.2 times more than females that had reached menopause normally (38-42).

Regarding education, most of the subjects were illiterate. This indicates the necessity and importance of education especially to learn about preventing cardiovascular diseases and emphasizes the role and importance of education to develop people's ability to deal correctly with difficulties and life problems and find right resolutions to encounter life stressors and to control them.

Sixty-five percent of the subjects did not have high blood pressure and only 35% of them had high blood pressure (systolic blood pressure more than 140 mm/hg and diastolic more than 90 mm/hg), while 94% did not have blood pressure in the past. The results of researches also indicate that high systolic and diastolic blood pressures are accompanied by other risk factors and also are the most important factors for the development of cardiovascular diseases (41).

The results of this research revealed that the mean

stress intensity in patients with high blood pressure was significantly higher than people without high blood pressure. Regarding the activation of biological stress responses, release of neurotransmitters of the sympathetic system such as epinephrine. So, it makes the rate of blood pressure higher in persons with high stress (26, 43).

According to the association with diabetes, the results of the research indicated that 84.5% of the subjects were not affected by diabetes but 15.5% were affected by diabetes. Also the results of this research showed that the mean stress intensity in the subjects without diabetes was higher than the subjects with diabetes although this difference was not significant. The results of this research indicated that 34% of the subjects were either current smokers or had a history of smoking cigarettes and 66% of them had not smoked cigarettes at all. The results of the research indicated that the mean perceived stress in cigarette smoking subjects was less than the other two groups (nonsmokers and patients that had given up smoking). This may be because of the belief that cigarette smoking will relief and decline stress.

The results indicated that subjects, who performed regular exercise, had less stress than the subjects that did not. Therefore, exercise through increasing a person's psychological comfort and releasing their energy can decrease stress (44).

Regarding employment, the highest rate of stress was seen in unemployed subjects. Also the rate of perceived stress had significant differences between various jobs. This may be because of the various stressors of different jobs (5, 45).

The results of this research revealed that there were significant differences between the mean of perceived stress in subjects with high serum cholesterol and triglyceride levels compared with subjects with normal serum cholesterol and triglyceride levels. This may be because of the utilization of fat decreasing medications by the subjects.

### 5.1. Conclusion

The findings of this research indicated that the rate of stress between the affected patients with myocardial in-

**Table 2.** Comparing Gender, Education Level, Hypertension, History of Hypertension, Diabetes, Cigarette Smoking, Doing Exercise, Job, and Family History of Myocardial Infarction With Perceived Stress Categories

Variables	Perceived Stress Categories				Mean ± SD	Statistical Significance
	Moderate		Severe			
	Number	Percent	Number	Percentage		
<b>Sex</b>						T = 5.20 P < 0.0001
Male	756	70	600	45.5	49.12 ± 8.103	
Female	324	30	720	54.5	54.51 ± 5.995	
Total	1080	100.0	1320	100	51.47 ± 7.725	
<b>Education</b>						F = 24.12 P < 0.0001
Illiterate	276	25.6	816	61.8	54.96 ± 6.265	
Primary School	366	36.7	360	37.3	50.23 ± 7.151	
Junior School	276	56.6	144	10.9	48.51 ± 6.975	
University	132	12.2	0	0.00	39.09 ± 5.629	
Total	1080	100.00	1320	100.00	51.47 ± 7.72	
<b>Hypertension</b>						T = 3.129 P < 0.019
Having	360	33.3	480	36.4	52.41 ± 7.22	
Not having	720	66.7	1560	65.00	50.96 ± 7.96	
Total	1080	100.00	1320	100.00	51.47 ± 7.72	
<b>History of hypertension</b>						T = 3.921 P < 0.017
Having	24	2.2	36	2.7	49.40 ± 7.15	
Not having	972	91.1	1272	16.4	51.72 ± 7.73	
Total	1008	100.00	100.00	100.00	51.66 ± 7.75	
<b>Diabetes</b>						T = 1.357 P < 0.176
Having	228	21.1	144	10.9	49.74 ± 7.79	
Not having	852	78.9	1176	89.1	51.78 ± 7.69	
Total	1080	100.00	1320	100.00	51.47 ± 7.72	
<b>Smoking cigarette</b>						F = 5.632 P < 0.004
No smoking	624	57.8	960	72.7	52.72 ± 7.68	
Past smoking	276	25.6	276	20.9	49.47 ± 7.44	
Smoking now	180	16.7	84	6.4	48.09 ± 7.13	
Total	1080	100.00	1320	100.00	51.4 ± 7.72	
<b>Exercising</b>						F = 11.94 P < 0.0001
Yes, regularly	84	7.8	13	0.9	44.25 ± 5.12	
Yes, irregularly	396	36.7	324	24.5	48.65 ± 8.03	
No	600	55.6	984	74.5	53.19 ± 7.09	
Total	1080	100.00	1320	51.47	51.47 ± 7.72	
<b>Job</b>						F = 11.61 P < 0.0001
Employee	192	17.8	60	4.5	46.14 ± 7.79	
Worker	24	2.2	252	19.1	55.78 ± 4.60	
Housekeeper	1488	26.7	624	47.3	54.62 ± 5.94	
Jobless	12	1.1	36	3.7	57.25 ± 5.28	
Retired	204	18.9	72	5.5	47.83 ± 6.82	
Nongovernmental	360	33.3	276	20.9	48.34 ± 8.43	
Total	1080	100.00	1320	100.00	51.47 ± 7.72	
<b>Family history</b>						T = 2.291 P < 0.002
Having	420	38.9	192	14.5	49.35 ± 6.80	
Not having	660	61.1	1128	85.5	52.19 ± 7.91	
Total	1080	100.00	1320	100.00	51.47 ± 7.76	

fraction is moderate to high; thus, it is a very strong risk factor for the onset and acceleration of cardiovascular diseases. Therefore, it is necessary to take stress into consideration and decrease it, by designing educational programs to determine its preterm resources. Increasing awareness and education especially for the patients, affected by cardiovascular diseases in the whole society is of great importance.

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