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Clinical manifestations of myocardial infarction in diabetic and non-diabetic patients

Behzad Taghipour[1], Hamid Sharif Nia[2*], Hoda Kaveh[2], Esmail Heidaranlu[3], Samaneh Shahidi Far[1], Amir Emami Zeydi[4], Mohammad Ali Soleimani[5]

1. Student Research Committee, School of Nursing and Midwifery, Amol, Mazandaran University of Medical Sciences, Sari, Iran

**2. School of Nursing and Midwifery Amol, Mazandaran University of Medical Sciences, Sari, Iran*

3. Faculty of Nursing, Baqiyatallah Univesity of Medical Sciences, Tehran, Iran

4. School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran

5. School of Allied Medical Sciences, Qazvin university of Medical Sciences, Qazvin, Iran

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ABSTRACT

Aims: Cardiovascular diseases are the main causes of death in diabetic patients; so that acute myocardial infarction (AMI) symptoms differences in diabetic and Non-diabetic patients may influence diagnosis of the disease and the decision time for treatment and consequently disease outcomes. This study was conducted with the aim of investigating the differences of clinical manifestations between diabetic and non-diabetic patients with myocardial infarction.

Methods: This cross–sectional study was done on 366 patients with acute myocardial infarction hospitalized in Cardiac Care Unit (CCU) in 2013. Demographic information form and symptoms check list were used and symptoms of acute myocardial infarction (AMI) were asked from the patients and the results were entered into the checklist. Results were analyzed through $SPSS_{20}$ software, descriptive statistics methods and odds ratio.

Results: Results showed that diabetes increases chance of dyspnea, weakness, fatigue, belching, tinnitus, anxiety and hiccup. From the other side being a diabetic patient increases the chance of pain related to AMI in the neck, left shoulder, and the left arm.

Conclusions: Atypical symptoms, particularly in diabetic patient, may cause delay in patient's referring and also decision making for the diagnosis and treatment by the medical team as well; so staff of intensive units and the patients need more and specialized information regarding knowledge about AMI symptoms specifically by noticing diabetic disorder.

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* Correspondence Author: Hamid Sharif Nia
Faculty of nursing and midwifery of Amol, Mazandaran University of Medical Sciences, Sari, Iran. TEL:+989111275093.
Email: h.sharifnia@mazums.ac.ir

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1. Introduction

One of the most common causes of death in human society is cardiovascular diseases and acute myocardial infarction (AMI). Considering the report of health global organization, cardiovascular diseases caused 16.5 million death in 2002 and it is estimated that; in 2020, this number will reach to 25 million [1,2]. According to the achieved statistic from United States of America about 17.6 million of adults are suffering from cardiovascular diseases in USA and 8.5 million of them are suffering from AMI and 758 thousand of Americans experience serious heart pain that 470 thousand of them are recurrent pain. It is while that it is estimated; every 34 seconds, one American loses his/her life due to heart disease. US government had spent about 177.1 billion dollars for this disease [3,4].

Also in Iran, number of death due to heart diseases is increasing [5], so that the recent statistic of health, medical education ministry in Iran, about 39.3% of death in Iran is due to cardiovascular diseases that 19.5% of this number is because of MI [4].

The studies in 2001 showed that almost 46% of deaths in 18 cities were due to heart diseases and MI[6], along with that, three thousand years of the people's useful lifetime is lost every day [4]. It is while annually 3.6 million of heart patients are hospitalized in the hospitals covered by the health ministry [2,7].

Almost 150 million people in the world are suffering from this disease and it is expected that this number reach to 300 million people till 2050[8].

Diabetes is the fifth cause of death in the United States of America and more than 65% of this death is due to cardiovascular diseases [9]. As it has been said before ; mellitus diabetes, blood pressure and hyperlipidemia and other systematic diseases are common risk factors of cardiovascular diseases; in categorizing these factors, diabetes is counted as a strong and predicted risk factor for progression of heart failure, heart attack and long-term mortality [10].

Cardiovascular diseases in diabetic people are silent and because of that, losing symptoms and delay in immediate referral will happen. Risk of cardiovascular diseases death along with diabetes in women is 2 to 5 times and in men is 3 times in compare with non-diabetic patients [9].

MI clinical model is very varied, exact recognition of these varieties in different subgroups of the patients will definitely help in increasing diagnosis accuracy of specialists and physicians and medical staff's knowledge for immediate diagnosis of the symptoms [11], so we decided to conduct a study for more understanding of MI clinical symptoms in diabetic and non-diabetic patients and make patients' referring to the hospital as soon as possible and reduce pre-hospital delay time and minimize decision time for starting treatment with appropriate education to the society and increasing knowledge of the public people. It is hoped that results of this study can make a part of these complicated relationships clear to help the medical staff for more accurate diagnosis.

2. Methods

In this cross sectional study which was done in 2013, 360 hospitalized patients in ICU of Imam Reza hospital in Amol (The study is powered at 80% with a 2-sided 5% to achieve a statistically significance on a moderate standardized effect size of 0.3.) with diagnosis of MI were selected through purposive sampling. Patients suffering from diabetes had the history of diabetes at least for five years and they used hypoglycemic drugs. Non-diabetic patients had fasting blood sugar (FBS) less than 126 mg.dl [8].

Diagnosis and hospitalization criteria were determined by the cardiologist and based on ST-segment changes (STEMI: ST-segment elevation higher than 2mm in V1-V2 leads or higher than 1mm in other leads NSTEMI:1), pectoral angina more than twenty minutes along

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with increase of Troponin T or I level) ECG (Electrocardiography) changes as set-segment depression and T-wave is even possible to be reported as a normal ECG [11], and J point of clinical symptoms and the level of blood enzymes were formed (troponin and CK). 24 hours after hospitalization in CCU and stabilization of patient's situation, the researcher answered checklist questions by the help of patients for data collection.

Alcoholism, mental, emotional and verbal problems, loss of consciousness, history of acute musculoskeletal pain at least one week before the beginning of the symptoms, digestive diseases such as; peptic ulcer, gastrointestinal reflux disease, congestive heart failure were among the criteria of sample exclusion [6].

By assessing the published studies regarding AMI clinical manifestations which have been achieved from Pubmed, Medline and CINAHL database between 2000 to 2012, a two-part questionnaire was set. The first part was regarding basic and demographic information and the second part was regarding symptoms and signs of AMI which were achieved through interview from the patients.

The searched key words in this database were "AMI", "symptoms", "diabetes" and "clinical manifestations".

For determining content validity, the questionnaire was given to ten cardiologists and were judged and evaluated and its reliability was determined through internal consistency and Chronbach's alpha calculation (r=0.91) and also re-test method (r=0.88).

For observing ethical principles, samples of the study were ensured about confidentiality of the information

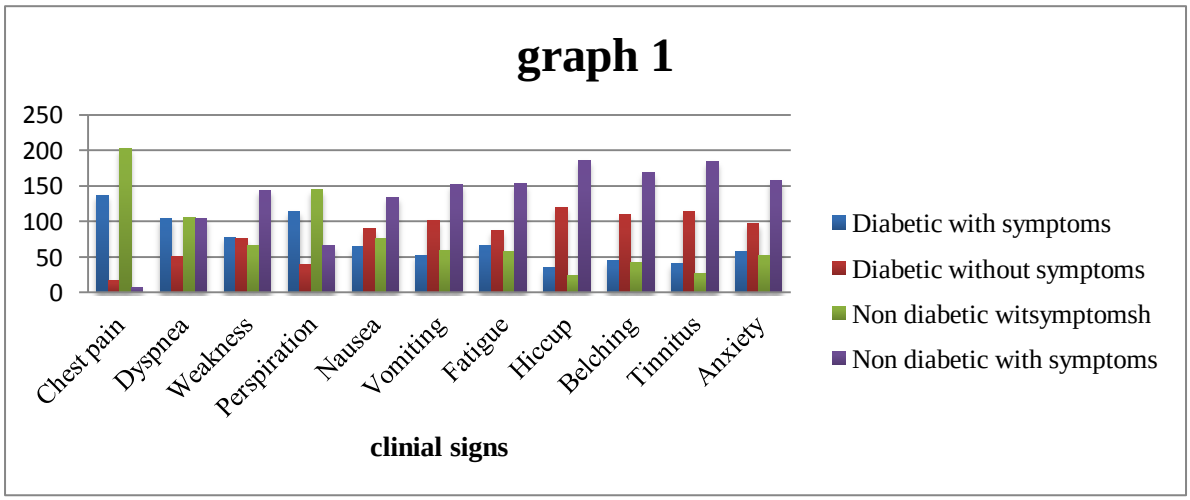
Statistical analysis

Analyzing the data was done using SPSS20 (released 2007; SPSS for Windows, SPSS Inc., Chicago, IL, USA) and descriptive statistics and odds ratio.

Mantel-Haenszel test was used for adjusting the effect of gender and cardiac necrosis area (anterior, posterior, inferior and right ventricular) in diabetic and non-diabetic patients.

3. Results

Among the 366 samples of the study, 231 of them were men (63.11%) and 155 (42.43%) of them were diabetic. The mean age of men was 57.44 (SD=13.25) years old (95CI: 55.72-59.16) and the mean age of women was 60.85(SD=13.25) years old (95CI: 59.20-62.51) (p=0.005). Most of the men (49.4%) and women (39.3%) had normal BMI, 86.58% (n=200) of men and 22.22% (n=30) of women had the history of smoking. 45.9% of men and



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41.8% of women had the history of cardiovascular diseases in their first-degree relatives and in assessing disease records, it was found that; 40.7% of men had hyperlipidemia and 25.45% of them had hypertension. From the other side, it had been reported that 60.7% of women had hyperlipidemia and 49.1% had hypertension (table 1).

Considering results of the present study, it has been determined that; suffering from diabetes increase the chance of clinical symptoms of dyspnea (OR=0.02), weakness (OR=2.17), fatigue (OR=2.00), belching (OR=1.64), tinnitus (OR=2.45), anxiety (OR=1.78) and hic cup (OR=2.17) in MI patients.

From the other side, the chance of chest pain symptoms (OR=0.30) in the patients with AMI with the history of diabetes is less than other patients without history of diabetes (table 2) and graph [1]. By controlling effect of gender, there was no significant relationship between suffering from diabetes and chest pain symptoms, hic cup, bleching and anxiety in the patients with AMI.

From the other side, it has been determined that; in addition to adjusted areas of myocardial necrosis, there was no relationship between suffering from diabetes, hiccup symptoms and belching in patients with AMI.

Also results of the present study showed that suffering from diabetes increases the chance of pain related to AMI in neck (OR=1.63), left

Table 1: Demographic characteristics of the patients of the study.

Variables		Non-diabetic N=211(%)	Diabetic N=155(%)
Age	*M±SD (yr)	57.94±0.90	59.74±0.85
		32-94	33-83
Gender	Male	161(76.30)	70(45.2)
	Female	50(23.70)	85(54.80)
Marital status	Single	15(7.10)	4(2.60)
	Married	173(82.00)	137(88.40)
	Widow Or Widower	19(9.00)	14(9.00)
	Divorced	4(1.90)	(0.00)
Education level	Illiterate	98(46.40)	81(52.30)
	Guide School	61(28.90)	45(29.00)
	Diploma	41(19.40)	26(16.80)
	Ba And Higher	11(5.20)	3(1.90)
BMI	Thin(18.5>)	10(4.70)	1(0.60)
	Normal (18.5-25)	94(44.50)	70(45.20)
	Excess Weight (25-30)	71(33.60)	54(34.80)
	Fat (30<)	36(17.10)	30(19.40)
Type of AMI	Stemi	88(41.70)	85(54.80)
	Nstemi	123(58.30)	70(45.20)
The site of myocardial lesion	Anterior	71(33.64)	36(23.22)
	Posterior	32(15.16)	31(20.00)
	Inferior	47(22.27)	64(41.29)
	Right	18(8.53)	47(30.32)
Risk factors	Blood Pressure	74(35.07)	75(48.38)
	Blood Lipid	75(35.54)	94(60.64)
	Depression	8(3.80)	10(6.50)
	Tobacco	108(51.20)	49(31.60)
	Family History	71(33.60)	46(29.70)

*Mean±Standard Deviation (year)

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shoulder (OR=2.02) and left arm (OR=1.77) (table 3).

4. Discussion

Results of this study showed that suffering from diabetes increases the chance of dyspnea, weakness, fatigue, belching, tinnitus, anxiety and hiccup. Also Sharif Nia et.la in their study achieved similar results regarding tinnitus symptoms; in addition they reported dyspnea symptoms in diabetic patients [6].

Although Funk (2001) did not show any significant relationship between MI symptoms and diabetes [12], Culic (2002) reported that; diabetic patients often experience symptoms of dyspnea, weakness, fatigue, coughing and nausea which can be due to neuropathy and dysfunction of autonomic nerve fibers [13]. Deniz (2009) states that; diabetes is one of the factors of tinnitus which is along with helix neuronal atrophy and demyelination of cranial eighth nerve, so that 70% of diabetic patients in his study reported tinnitus which is in consistent with the present study [14].

There are many studies which pointed out to the relation of internal ear diseases with smoking and using tobacco [15-17].

High age of the patients specially being along with hyperlipidemia and diabetes can be an explanation for tinnitus in these patients [18].

Results showed that; the chance of chest pain in non-diabetic patients is less than diabetic patients. Tofighian et al. (2007) showed that; there is no significant statistical difference in the mean of pain intensity in the two diabetic and non-diabetic groups which are not in consistent with the results of the present study [19].

Richman et al. (1999) also showed in their study that there is no difference in the two

Table 2: Odd ratios and 95% confidence intervals of symptoms in diabetic versus non diabetic with AMI

Clinical manifestations	Diabetes (n)	Yes (155)	No (211)	OR	CI 95%
Chest pain	Yes	137	203	0.30	0.12-0.70
	No	18	8		
Dyspnea	Yes	104	106	2.02	1.31-3.10
	No	51	105		
Weakness	Yes	78	67	2.17	1.41-3.34
	No	77	144		
Sweating	Yes	115	145	1.30	0.82-2.07
	No	40	66		
Nausea	Yes	65	77	1.25	0.82-1.92
	No	90	134		
Vomiting	Yes	53	59	1.33	0.85-2.09
	No	102	152		
Fatigue	Yes	67	58	2.00	1.29-3.11
	No	88	153		
Hiccup	Yes	35	25	2.17	1.23-3.80
	No	120	186		
Bleching	Yes	45	42	1.64	1.04-2.67
	No	110	169		
Tinnitus	Yes	41	27	2.45	1.43-4.20
	No	114	184		
Anxiety	Yes	58	53	1.78	1.13-2.79
	No	97	158		

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groups regarding chest pain and lack of pain was also observed in 8% of diabetic and non-diabetic patients (p=0.3) [20].

Method of determining pain in the conducted studies is different with the present study. In the above studies; chest pain intensity is measured through numerical scale, while in the present study, presence or absence of the pain and the chance ratio were measured. By adjusted gender effect, the thesis of relationship of chest pain and suffering from diabetes with controlling gender effect was not confirmed; MI symptoms are ignored specially in women. Higher age of the women and lack of known diagnosis symptoms cause them to refer to the hospital later [5].

Another reason is that; women do not experience some of the known symptoms of MI in compare with men and because of this, it is hard for them to believe MI [21].

Diabetes, hypertension, and peripheral neuropathy are more in women, also men and women are different in nerve receptors and pain pathways and their understanding of unpleasant stimuli is different too. Men and women may have little differences in locations of their atherosclerotic lesions [22] that all of them can explain difference of the symptoms of chest pain among men and women to some extent.

Diabetes increases the chance of pain related to AMI in neck, jaw, throat, tooth, left shoulder, right shoulder, left arm and the left part of chest. Different studies indicate that; diabetes may influence symptoms and the location of

Tabl3 3: Relationship between AMI location and diabetes

Pain location \ Diabetes (n)		Yes (155) Number	No (211) Number	OR	CI 95%
Jaw	yes	34	38	1.27	0.76-2.14
	no	121	173		
Neck	yes	53	51	1.63	1.03-2.57
	no	102	160		
Throat	yes	33	39	1.19	0.71-2.00
	no	122	172		
Tooth	yes	24	23	1.49	0.81-2.76
	no	131	188		
Left shoulder	yes	85	79	2.02	1.33-3.09
	no	70	132		
Right shoulder	yes	46	45	1.55	0.96-2.50
	no	109	166		
Left arm	yes	89	91	1.77	1.17-2.70
	no	66	120		
Right arm	yes	47	54	1.26	0.79-2.00
	no	108	157		
Left side of the chest	yes	98	122	1.25	0.81-1.92
	no	57	89		
Right side of the chest	yes	56	72	1.09	0.70-1.68
	no	99	139		
Sternum	yes	109	140	1.20	0.76-1.88
	yes	46	71		
Left scapular	no	72	90	1.16	0.76-1.77
	yes	83	121		
Epigastria	no	62	64	1.53	0.99-2.36
	yes	93	147		

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pain in MI [23-26].

There are no similar results in the available studies regarding results related to this characteristic. Culic [2002) in his study showed that diabetic patients report pain in chest, left arm, left shoulder, epigastria pain and the pain of the whole body less than others, but they are often complaining about non-pain symptoms or the associated signs such as; weakness, fatigue, nausea, dyspnea and cough [13].

Study of Tofighian et al. showed that; pain location and radiation in diabetic patients is mostly in the back and left shoulder, neck and shoulders, left hand and back; but there is no statistical significant difference between the two groups regarding location and radiation of pain [19].

Lopz et al. in their study showed that; pain radiation can be seen in more than half of the patients in the two diabetic and non-diabetic groups of the patients suffering from MI and there is no difference in pain radiation of the two groups [27].

Richman et al. stated that; there is no significant statistical difference in the pain location of the two groups of diabetic and non-diabetic patients with MI [2].

Results of the said studies are in contrast with the present study which seems is because of the difference in the method of the study, sample size and statistical methods in these studies.

Considering the achieved results from this study, it can be said that; likely diabetic patients suffering from MI have different clinical manifestations in compare with non-diabetic patients and these patients need more clinical examinations and diagnostic tests and more accurate evaluations.

5. Conclusions

Since investigating pain is among nurses' important activities and nurses have a very important and unique role in taking care of the patient and considering the importance of correct evaluation in treatment of angina and preventing its dangerous complications, nurses can be effective through getting accurate knowledge of pain patterns and the way of investigating them in providing nursing cares for the patients.

Care givers should be informed of unusual symptoms of artery coronary disease in diabetic patients for correct diagnosis and immediate treatment.

Since pain is a subjective phenomenon and is influenced by different factors, people mental status and their anxiety may influence samples' attitude regarding the perceived pain and it is among the limitations of the study.

It is recommended to conduct some studies regarding other factors influencing AMI symptoms such as; musculoskeletal diseases, nervous system diseases and lifestyle.

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