



The relationship between depression and ischemic heart disease among middle aged people: a case control study

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Abstract

Background and Objective: Depression is one of the most common psychological problems, which can elevate the risks of cardiovascular complications. This study was performed with the aim of retrospectively reviewing the relationship between these two illnesses in middle-aged people.

Materials and Methods: In this case control study, 200 patients were randomly chosen as the case group from among patients whose diagnosis of ischemic heart disease (IHD) was confirmed by angiography, women younger than 55 and men younger than 45, and another 200 patients without IHD were chosen as control subjects. In order to assess the patients' depression, Beck's Depression Questionnaire was used in both groups. Data was analyzed using SPSS v.16 software .

Results: Results of the Beck's Questionnaire taken from both groups showed a mean score of 13.9 ± 8.48 in the case group and 10 ± 5.93 in the control group ($p < 0.001$). Moreover, the difference between the two groups pertaining to the severity of depression was also found to be statistically significant ($p < 0.001$). Also, more women were found to be clinically depressed compared to men ($p < 0.001$).

Conclusion: Depression is considered an independent risk factor for the development of IHD, moreover, based on the previous studies conducted, risk of developing IHD are higher among those already affected by depression and in middle-aged people which needs further analyses and studies to be conducted in order to better understand this relationship and to better develop treatment strategies.

Key words: Depression, Ischemic heart disease, Middle-aged

1. Introduction

Ischemic heart disease (IHD) or coronary artery disease (CAD) are among the highest in prevalence on the list of causes of death in many nations including Iran which has become one of the most recent issues of concern of world health in the late 20th and early 21st centuries (1). IHD is the cause of ~35% of all deaths in developing countries and an overall 30% of all deaths worldwide (2). Moreover, IHD is the leading cause of death in both genders in the USA and 1 out of every 3 deaths over the age of 35 and 1 out of every 6 deaths in all ages; half of men and a third of women in

their middle ages are currently suffering from different degrees of this disease (3,4).

The burdens imposed by this illness has increased by 29% in the last 20 years, and it is estimated to be in the top 15 ranks of world health by the year 2020 (5,6). Statistical analyses performed in order to better understand the prevalence of IHD among the population of Iran has shown an incidence rate of 36.8%. Even though the imposed burden by IHD in terms of the disability-adjusted life year (DALY) between the years 1990 and 2010 had shown a decrease, still the mortality rate due to IHD is rather

high. Several important risk factors for the development of IHD have been highlighted over the years; among those mentionable are immobility, poor nutrition, cigarette smoking, and several comorbidities identified are hypertension, dyslipidemia and diabetes mellitus (7). Other noteworthy factors are overall lifestyle, psychological backgrounds, and environment and emotional status (3,5)

Depression is among the most common forms of psychological pathologies and is estimated to take the second place in the most common disorders, only to come after cardiovascular illnesses (8). Depression may play a role in the pathogenesis of IHD in healthy individuals and in complicating the matter for those who are already suffering from IHD (9-12). It also affects the general health of the heart (13) and can worsen the prognosis and elongate the treatment period for the patients and distinctly raise costs imposed on the healthcare system (14).

Another recent study shows that depression is one of the most common factors which promotes morbidity and mortality and estimates that it can also affect those suffering from coronary artery disease (15). Moreover, there is the other matter of depression being vastly underdiagnosed by cardiologists and general practitioners (9). This alone can cause many difficulties for the healthcare system and will, in turn, impact the overall treatment achievements (18). Depressions need to be treated like tobacco/cigarette smoking and hypertension as a factor which can worsen an individual's health with the same amount of attention (19). On the other hand, studies conducted in Taiwan and Canada show that treatment with antidepressants in patients suffering from both depression and IHD does not impede depression from affecting the IHD status of the patient, which shows the importance of even earlier diagnosis of depression (20,21). Studies also show that incidence of ischemia of heart is 64% more likely in patients suffering from depression compared to healthy individuals. Also, prevalence of IHD and its consequent morbidity and mortality is two to four-fold in patients suffering from depression (8). In the study conducted by Bounhoure et al, 12-20 percent of patients suffering from cardiac issues such as unstable angina, acute myocardial infarction, coronary artery bypass grafting (CABG), etc. show signs of depression in various degrees, which is three times more than the general public (22). Another study conducted in Germany shows that depression raises the risk for incidence of MI and promotes morbidity and mortality following acute coronary syndromes (23). Another study done by Rozanski et al shows a statistically significant relationship between IHD and depression (24).

Another issue which has been less explored in Iran is the matter of IHD and depression among younger ages, otherwise known as early-onset ischemia, which is seen in women younger than 55 and men younger than 45. In a cohort study conducted by Abbasi et al,

younger patients diagnosed with IHD, compared to same-age healthy individuals, have various positive risk factors (25). In a study conducted in France, results show that depression is associated with the incidence of CAD in middle-aged men (26). In another study conducted in the US, results show that signs of depression in IHD patients are associated with higher risk of mortality, especially among younger women, therefore, early detection of still-developing depression gives us more time to provide better care for the patient (3). In according to the importance of cardiovascular diseases, its consequent morbidity and mortality and the burden it imposes upon society and the healthcare system, and also to the high prevalence of depression, we sought to investigate further the matter of relationship between IHD and depression among middle-aged people.

2. Materials and Methods

2.1. Study design

This investigation was designed as a case-control study, with the case group being chosen from among the patients of Mostafa Khomeini general hospital of Tehran, Iran, a total of 200 men and women (younger than 45 and 55 years, respectively) whose IHD was diagnosed/confirmed via angiography and the control group consists of another 200 patients with angina whose coronary artery status was evaluated by either angiography or exercise test and were found to be negative for CAD with special attention towards matching age and gender variables with that of the case group. All patients' consent in order to participate in the study was documented and those unwilling to take part or unable to take part due to severe medical or cognitive impairment were excluded from the experiment.

2.2. Assessments

At first, a questionnaire was designed and the demographic data of the patients were documented along with their chief complaint, history of present and relevant former illnesses, family history of early-onset diseases and tobacco usage along with angiography and/or exercise stress test results. In order to assess for depression, each participant from both the control and case groups took the Beck Depression Inventory (BDI) test (8). This questionnaire consists of 21 multiple choice questions, each adding 0-3 points to the final score depending on the choice selected by the patient. This questionnaire was reviewed for validity and reliability and the cut off points were set as following: those patients who scored a total of 0 to 9 were considered "Normal (no depression)", 10 to 19 as "mild depression", 20 to 29 as "moderate depression", and 30 and above as "severe depression". The results of each patient's BDI

test was then added to their primary information collected earlier.

2.3. Ethical consideration

Signed informed consents were obtained from all participants. The researchers were committed to the ethical guidelines of the Declaration of Helsinki and approval for the study was obtained from the Institutional Review Board at Shahed University.

2.4. Statistical analysis

The acquired data was entered in SPSS software, version 16, (IBM, Chicago, IL, USA) and underwent t test, chi-square and Logistic Regression tests.

3. Results

In the case group, mean age was 44.1±6.06 years and it was 44.4±5.99 years in the control group, with

no statistically significant difference (p=0.697). Meanwhile, 91 men and 109 women were in the case group and 85 men and 115 were in the control group. Difference between gender (p=0.712), education level (p=0.434), occupation (p=0.413) and marital status (p=0.927) were found to be statistically insignificant. No statistically significant difference was found among both groups regarding comorbidity with hyperlipidemia, hypertension and diabetes (p=0.679, p=0.377, p=0.09, respectively). In addition, the difference between these two groups in accordance to BMI score of greater than 30, positive familial history and cigarette smoking was found to be statistically insignificant (p=0.537, p=1, p=0.931, respectively) (Table 1).

Table 1. Baseline and demographic characteristics and BDI score of the two study groups, patients diagnosed with Ischemic Heart Disease (n = 200) versus non-IHD controls (n = 200)

Characteristic	Case	Control	P-value
Age	44.1±6.06	44.4±5.99	0.697 [#]
Gender			
Male	91 (45.5%)	85 (42.5%)	0.712 [*]
Female	109 (54.5%)	115 (57.5%)	
Marital Status			
Married	179 (89.5%)	178 (89%)	0.927 [*]
Single	17 (8.5%)	16 (8%)	
Divorced	4 (2%)	6 (3%)	
Education			
Primary/secondary school	52 (26%)	52 (26%)	0.434 [*]
High school diploma	72 (36%)	69 (34.5%)	
College	8 (4%)	10 (5%)	
Bachelor and higher	68 (34%)	69 (34.5%)	
Occupation			
Housewife	81 (40.5%)	95 (47.5%)	0.413 [*]
Self-employment	68 (34%)	69 (34.5%)	
White collar	46 (23%)	35 (17.5%)	
Student	2 (1%)	0 (0%)	
Retired	3 (1.5%)	1 (0.5%)	
Symptoms			
Chest Pain	87 (43.5%)	94 (47%)	0.635 [*]
Exertional Dyspnea	34 (17%)	38 (19%)	
Chest Pain and Exertional Dyspnea	77 (38.5%)	65 (32.5%)	
Other (ex. Epigastric pain)	2 (1%)	3 (1.5%)	
Risk Factors of IHD			
Dyslipidemia	76 (38%)	72 (36%)	0.679 [*]
Clinical Hypertension	53 (26.5%)	61 (30.5%)	0.377 [*]
Systolic Blood Pressure	121±18.8	122.3±15.1	0.179 [#]
Diastolic Blood Pressure	74.9±12.1	77.2±12.6	0.061 [#]
BMI>30	50 (25%)	57 (28.5%)	0.537 [*]
Diabetes Mellitus	35 (17.5%)	26 (13%)	0.09 [*]
Fasting Blood Glucose	100.2±25.7	98.4±26.7	0.502 [#]
Positive Familial History	63 (31.5%)	63 (31.5%)	1 [*]
Tobacco/Cigarette smoking	62 (31%)	60 (30%)	0.931 [*]
Angiography outcome			
Single Vessel Disease	63 (31.5%)	-	-
2 Vessel Disease	91 (45.5%)	-	-
3 Vessel Disease	46 (23%)	-	-
BDI score			
Normal (BDI: 0-9)	68 (34%)	102 (51%)	<0.0001 [*]
Borderline (BDI: 10-14)	39(19.5%)	59 (29.5%)	<0.0001 [*]
Mild (BDI: 15-20)	58 (29%)	34 (17%)	<0.0001 [*]
Moderate (BDI:21-30)	27 (13.5%)	3 (1.5%)	<0.0001 [*]
Severe Depression (BDI:31-63)	8 (4%)	2 (1%)	<0.0001 [*]

IHD: Ischemic Heart Disease, BMI: Body Mass Index, BDI: Beck Depression Index

*: Chi square statistics, #: Independent t test

No statistically significant difference was found among symptoms of both groups ($p=0.635$). According to the patients' coronary artery angiography, in the case group, 63 patients (%31.5) had blockage in a single artery (otherwise known as Single Vessel Disease), 91 (%45.5) had two vessels blocked (2VD) and another 46 patients (%23) had three coronary arteries blocked. In the control group, the result of either coronary artery angiography or exercise stress test were found to be negative for any kind of IHD (Table 1).

Assessment of depression level in both groups via BDI reported that mean depression score in the case group was found to be 13.9 ± 8.48 , and 10 ± 5.93 in the control group. The difference between the two groups regarding this matter was found to be statistically significant ($P<0.001$). Moreover, the severity of depression was also found to be statistically different between the two groups ($P<0.001$). Also, evaluating

depression in both sexes show that more women were suffering from depression compared to men, and this difference was found to be statistically significant ($P<0.001$) (Table 1).

Relationship between depression index and other risk factors were also assessed, and the result was statistically insignificant differences ($P>0.05$) (Table 2).

In assessing the relationship between depression and angiography results, no relationship was found between the severity of depression and the number of blocked coronary arteries ($P=0.731$). In order to better assess the relationship between depression and an early onset ischemia, since various basic and confounding variables were "normalized", the statistical model of Logistic Regression was applied; the result was that the Odds Rate (OR) between depression and IHD was found to be 3.58 (CI %95 2-5.28).

Table 2. Comparison of the BDI score in participants with or without risk factors of IHD.

Risk Factors of IHD		Mean \pm SD of BDI	P-value
Dyslipidemia	+	15.25 \pm 8.52	0.071*
	-	13.1 \pm 8.19	
Hypertension	+	13.35 \pm 5.58	0.708*
	-	13.75 \pm 9.19	
Diabetes Mellitus	+	15.85 \pm 8.98	0.077*
	-	13.4 \pm 8.16	
Familial History	+	12.85 \pm 6.32	0.253*
	-	14.3 \pm 9.22	
Tobacco/Cigarette smoking	+	17.3 \pm 11.1	0.24*
	-	13.1 \pm 8.22	
BMI	<20	16.05 \pm 5.67	0.86 §
	20<BMI<30	13.65 \pm 9.19	
	>30	14.45 \pm 6.76	
Presence of risk factor	-	12.5 \pm 9.91	0.283 §
	one risk factor	13.85 \pm 8.6	
	two or more	12.68 \pm 7.6	

IHD: Ischemic Heart Disease, BMI: Body Mass Index, BDI: Beck Depression Index, SD: Standard Deviation

*: Chi square statistics, \S : Analysis of Variance (ANOVA) test

4. Discussion

This study evaluated 400 patients with complaints of either classic chest pain, dyspnea and other known IHD-causing risk factors, 200 of these patients were found to have a positive status of cardiac artery blockade through coronary angiography and the other 200 through either angiography or exercise stress test were found to be negative for IHD. The study subjects were chosen from men aged 45 or lower and women aged 55 or lower. Overall, 132 patients were suffering degrees of depression (from mild to severe) according to their BDI score, from which 93 patients (46.5%) belonged to the case group while 39 (19.5%) belonged to the control group. The difference found amongst the two groups regarding the number of depressed patients was statistically significant. Also, more

women were found to be depressed than men. In a cross sectional study conducted by Moradyan et al on 300 patients with IHD showed that 38% were found to be clinically depressed (15). In the study conducted by Shah et al in 2014, the groups' age was similar to our study and showed that 27% of IHD patients were suffering from moderate and severe depression which was significantly higher in women (27). Moreover, our study's results are similar to another study conducted in Poland by Piwoński et al in 2014. In this study, depression was present in 46.3% of IHD patients, while the figure for depression in healthy individuals was found to be 21.2% (28).

No statistical relationship was found between depression and any of the other risk factors for

development of IHD. In another study conducted by Vural et al in Turkey in 2009, results were similar to ours; the only statistically significant difference between the two case and control groups was their status for diabetes (29). Another more recent study conducted in Turkey by Ozturk et al in 2015 and the study conducted by Moradyan et al have results similar to our study (15,30). This lack of significance may be due to the fact that depression may be an independent risk factor for the development of IHD. Additionally, depression was found to have no relation with other risk factors for IHD. The result of our study was similar to a study conducted in Korea in 2015 by Cho et al in which additional factors such as echocardiography was also assessed which had no statistically significant relationship with depression (31).

Based on our study, it is safe to say that depression affects IHD directly but does not affect other risk factors for the development of IHD. Also, we linked depression to early-onset ischemia which was statistically significant in both genders. Odds ratio was found to be 3.58 in our study which confirms that the probability of a depressed patient developing IHD is 3.58 times more than a healthy individual not suffering from depression. Various similar studies were conducted to assess the relationship between depression and IHD, but less attention has been on assessment about early-onset ischemia. In the study conducted by Park et al in 2011 in South Korea (32) showed an OR of 1.39. Cho et al in 2015 in South Korea (31) showed an OR of 1.138. Piwoński et al in 2014 in Poland (28) showed an OR of 2.03 in women and 2.14 in men. Frasure-Smith et al in 2008 in Canada (19) showed an OR of 2.55, Rutledge et al in 2006 in California (33) showed an OR of 1.05, Huang et al in 2013 in Taiwan (20) showed an OR of 1.49, Majed et al in 2012 in France (26) showed an OR of 1.43 which showed that risk of IHD development due to depression is higher than other regions of the world. Moreover, in the study conducted by Shah et al in 2014 in US, middle-aged individuals suffering from depression have an odds rate of 1.07 to develop CAD which is rather different from our results (27). Altogether, depression is an independent risk factor for the development of IHD and based on our results, the risk of developing IHD for depressed middle-aged patients is higher in Iran than compared to other regions which needs further investigation and study in order to better devise a treatment and management plan.

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