# The relationship between acute myocardial infarction and mood disorders.

-Mazin Z Alshibani* (FIBMS-Med).
- Karem N. Hussain*(FIBMS-Psych).
*Dept. of Medicine, College of Medicine, AL-Qadissiah University

## الملخص

يعتبر أحتشاء العضلة القلبية الحاد كعامل خطر مهم لحدوثِ الكآبةِ، والتي تؤثر على المدى البعيد للحالة المرضية ومدى الوفاة مع الأخذ بالاعتبار الحالة الصحية الأولية للمرضى المصابين بأحتشاء العضلة القلبية الحاد. الهدف من البحث لدراسة نسبة حدوث الكآبةِ بين المرضى ضمن الثلاثة أسابيع الأولى بعد حدوثِ أحتشاء العضلة القلبية الحاد ولتَقييم تأثير العوامل السكانية المختلفةِ، والتغييرات الكيماوية الحياتية، ونوع وموقع الأحتشاء وتأثيره على هذه النسبةِ.هذه دراسة مقطعية سجلت 116 مريضَ مصابين بأحتشاء العضلة القلبية الحاد واللذين أُدخلوا إلى وحدة العناية القلبية في مستشفى الديوانية التعليمي أثناء الفترةِ بين الأول مِنْ تموز2007 إلى الحادي والثلاثون مِنْ تشرين الأول 2008. تمت متابعة 80 مريض فقط. حيث تم تشخيص الكآبةِ طبقاً لمعايير المقابلةِ السريرية الهيكليةِ للتشخيصِ والدليل الإحصائي مِنْ الاضطراب العقلي -4- المنقحةِ.كَشَفتْ هذه الدراسةِ بأنّ 22.5 % مِنْ المرضى كَانواَ مصابين بمرض الكآبةِ. تمثل النساء نسبة 88.89 % من مجموعةِ المرضى المصابين بالكآبةِ ، اللذين بعمر 65 سنة أو أكثر 44.44 % ، المصابين بارتفاع ضغط الدم وزيادةِ الدهن في الدم 66.67 % ، مرضى السكري 27.78 % ،اللذين لديهمْ تأريخٌ إيجابيُ لأحتشاء العضلة القلبية 33.33 %. أما المرضى اللذين كانت نسبة (E.F) أقل من 35 % ، المصابين بالفشل أوالقصورالكلوي ،المصابين بأحتشاء العضلة القلبية الأمامي والمصابين بمرض الإعاقة الرئوية المزمن يمثلون نسبة 22.22 % . أما المرضى المصابين بالأحتشاء نوع (NSTEMI) ، اللذين تتجاوز لديهم نسبة (CPK) أكثر من 500 وحده/لتر والمدخنون المستمرون حاليا  يمثلون نسبة 66.67 % ، 55.56 % و16.67 % على التوالي.أثبتت هذه الدراسةِ بأن مرض الكآبةِ بعد أحتشاء العضلة القلبية الحاد كان أكثر شيوعاً في النساءِ وأقل شيوعا في المرضى المصابين بالسكري ، المدخنون المستمرون حاليا وعند المرضى المصابين بمرض الإعاقة الرئوية المزمن.

## Abstract

Acute myocardial infarction (AMI) acts as an important risk factor for occurrence of depression, which affectS long term morbidity and mortality  considering baseline health state in patients with AMI.To estimate frequency of depression among patients within first 3 weeks after occurrence of AMI and to evaluate the effect of different demographic factors, biochemical changes, type and site of M.I on its frequency.

 This is a cross sectional study that enrolled 116 patients with AMI who had been admitted to coronary care unite (CCU) at Al-Diwaniya Teaching Hospital during the period between 1st of July 2007-31st of October 2008. Only 80 patients were followed up the Diagnosis of depression was done according to criteria of structural clinical interview for diagnostic and statistical manual of mental disorder-4-

revision (SCID-DSM-4-R).This study revealed that 22.5% of patients had post-AMI depression. The females constitute 88.89% of depressed group, ≥ 65year old age were 44.44%, patients with hypertension and hyperlipidemia were 66.67%, diabetic patients were 27.78% and patients had positive history of MI were 33.33%. Patients with ejection fraction (E.F) < 35%, renal failure or insufficiency, chronic obstructive pulmonary disease (COPD) and anterior MI were 22.22%. Patients with non ST elevation myocardial infarction (NSTEMI), peak creatine phosphokinase (CPK) ≥500 u/l and current smoker constitute 66.67%, 55.56% and 16.67% respectively.

This study proves that depression after AMI was more common in females and less common in diabetic patients, current smokers and patients with COPD.


## Introduction

Coronary heart disease (CHD) is the leading cause of death in most industrialized nations and results in significant morbidity, disability, loss of productivity and is the leading cause of health expenditure. The clinical spectrum of CHD ranges from silent (asymptomatic) ischemia to chronic stable angina, unstable angina, AMI, ischemic cardiomyopathy, and sudden cardiac death. The term acute coronary syndrome (ACSs) encompasses the clinical syndromes of unstable angina, NSTEMI and STEMI.The pathophysiology of ACSs appears to relate to activation or rupture of an unstable atherosclerotic plaque, platelet activation and aggregation with resultant vasospasm and intracoronary thrombus formation and resultant reduction in blood flow and oxygen supply to myocardium. If blood flow is not restored and ischemia persist for greater than approximately 20 minuets, necrosis of myocardium supplied by occluded artery begins and may progress to full thickness (trasmural) infarction within several hours unless reperfusion occurs; this is the syndrome of AMI. AMI is one of the most common diagnoses in hospitalized patients in industrialized countries. The mortality rate with AMI is approximately 30% with more than half of these death occurring before the individual reaches the hospital. Although the mortality rate after admission for AMI has declined by 30% over the last two decades. Survival is markedly reduced in elderly patients (over age 75); whose mortality rate is 20% at 1 month and 30% at 1 year after AMI.[1]

Mental illnesses are among the most common conditions affecting health today. Most serious mental illnesses are caused by complex imbalances in the brain's chemical activity, also environmental and organic factors can play a part in triggering or protecting against its onset. Mood disorders are one form of serious mental illness and affect about 10% of the population.[2] Two of the most common mood disorders are depression and bipolar disorder, also known as manic-depressive illness.

Symptoms of depression during hospitalization for acute myocardial infarction occur in approximately 45% of patients[3] and significantly increase the short-term risk for morbidity and mortality, even after established risk factors (like left ventricular ejection fraction, age and history of prior infarction)[4] are controlled. Depression following myocardial infarction also predicts long-term mortality.[5] Behavioral, neuroendocrine and thrombotic mechanisms have been proposed as pathways through which depression affects health after myocardial infarction.[6] Depression has been associated with poor treatment compliance in patients with and without[7] cardiac disease. Variables of quality of life have also been found to be predictive of poor treatment compliance among patients with AMI, even after treatment of depression.[8] Both depression and quality of life have been found to relate to health outcomes in patients with myocardial infarction. In addition, there is significant relationship between depression and quality of life. Depression has been found to affect quality of life similar to other chronic health problems (e.g., advanced coronary artery disease, angina)[9] and traditional measures of cardiac function (e.g., ejection fraction, ischemia).[10] A cross-sectional study after 5 months in patients with AMI showing that depression, physical and mental health are a good measures for quality of life.[11] Depression and anxiety were both associated with poor quality of life and emotional distress 4 months after myocardial infarction.[12] At both 4 months[13] and 12 months[14] after myocardial infarction, depression was one of important predictors for quality of life. In addition to, patients with myocardial infarction and poor quality of life have been found to predict a poorer long-term morbidity and mortality among those with chronic cardiac disease.[15]

Diagnostic criteria for major depressive disorder including five or more of the following symptoms that have been present most of the time for at least 2 weeks (according to SCID-DSM-4-R).[16]
1. Depressed mood
2. Anhedonia
3. Significant weight change or change in the appetite
4. Insomnia or hypersomnia
5. Psychomotor agitation or retardation
6. Fatigue or loss of energy
7. Feeling of worthlessness or excessive guilt
8. Decrease ability to concentrate or indecisiveness
9. Thought of death or suicidal ideation

These symptoms should cause significant distress or impairment in functioning, not due to drugs or medical substances abuse, and not account for mania or hypomania or schizophrenia or delusion or other psychotic disorder.

## Patients and Methods

**Participants:** We conducted this study at Al-Diwaniya Teaching Hospital. Over a period of 16 months, 116 patients with AMI were admitted to the CCU, which is define by the presence of at least two of the followings: typical ischemic chest pain lasting ≥20 minutes, presence of typical ECG changes of MI, peak CPK ≥1.5 times normal (N=30-135 u/l in female and 50-170 u/l in male). Consents were taken from all except patients with; 1) comorbid noncardiac illness likely to lead to death within 6 months, 2) medical conditions precluding reliable verbal communication, 3) in-hospital death, 4) transfer to other hospitals within the first 48 hours of hospitalization (patients requiring pacemaker were immediately transferred because these services are not available at this hospital) and 5) symptoms of dementia determined during clinical examination. 36 patients were excluded due to many causes including death (N=8), refusal to be participate in this study (N=21), and partial followed up (N=7). Finally, only 80 patients included and followed up in this study.

**Procedure and Materials:**The cardiac risk factors examined included hypertension (defined as systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥ 90 mm Hg, history of hypertension, or receiving antihypertensive medications), hyperlipidemia (total cholesterol ≥240 mg/dl, history of increased cholesterol, or receiving lipid-lowering medication at the time of admission), previous myocardial infarction (determined by a review of patient's history or from electrocardiographic evidence), left ventricular ejection fraction (<35% versus ≥35%), peak CPK (≥500 versus <500 u/l) and current tobacco use. Demographic variables were collected and then organized as follows: age (≥65 versus <65 years) and gender. Comorbid conditions examined included renal insufficiency or failure, chronic obstructive pulmonary disease (COPD) and diabetes mellitus. The severity of Myocardial infarction, comorbid conditions and cardiac risk factors status were evaluated during hospitalization and reviewed after 3 weeks looking for depression criteria. At the 1$^{st}$ 3-weeks of follow-up evaluation for patients were interviewed. The depressed group comprised individuals having depression. Analyses comparing the depressed and nondepressed groups according to demographics, coronary disease risk factors, indices of the severity of acute myocardial infarction and cardiac function were done.

## Results

This is a cross sectional study had enrolled 80 patients with AMI whose age range between 30-75 year old (53.45±10.47year old).

Table 1 shows patients distribution according to different demographic and clinical characteristics, 52.5% of the whole sample were ≥65 year old age, female patients constitute 67.5% (female: male ratio is 2.8:1), patients with hypertension were 62.5%, hyperlipidemia were 61.25%, diabetes mellitus were 58.75%, history of old MI were 23.75%, patients who had positive family history of MI were 40%, patients with E.F ≥35% were 75% of whole sample. Patients with anterior MI, NSTEMI, patients who had a level of CPK ≥500u/l, current smokers, COPD and renal failure or insufficiency were 25%, 66.25%, 55%, 50%, 48.75% and 13.75% of the whole sample respectively.

Table 2 shows demographic and clinical characteristics of patients with or without depression when followed up within 1$^{st}$ 3 weeks after hospitalization. The study revealed that depression comprised 22.5% of the whole sample. Patients with age ≥65 year were 44.44%. Females were 88.89% of depressed group (*p<0.05*). 66.67% of depressed patients are hypertensive and hyperlipidemic. Diabetic patients were 27.78% (*p<0.005*). Those with positive history of old MI, STEMI were 33.33%; patients with positive family history of MI were 38.89%, anterior MI were22.22%, patients with E.F ≥35% were 77.78%, peak CPK ≥500u/l were 55.56%. Current smoker were 16.67% (*p<0.005*), COPD were 22.22% (*p<0.025*), and patients with renal failure or insufficiency were 22.22% of depressed group.

Table-1: Patients` distribution according to differentdemographic and clinical  characteristics

| Factor | N (80) | % |
|---|---|---|
| *Age* <br> *≥65* <br> *<65* | 42 <br> 38 | 52. 5 <br> 47. 5 |
| *Gender* <br> *Female* <br> *Male* | 54 <br> 26 | 67.5 <br> 32.5 |
| *Hypertension* <br> *Present* <br> *Absent* | 50 <br> 30 | 62. 5 <br> 37. 5 |
| *Hyperlipidemia* <br> *Present* <br> *Absent* | 49 <br> 31 | 61. 25 <br> 38. 75 |
| *Diabetes* <br> *Present* <br> *Absent* | 47 <br> 33 | 58.75 <br> 41.25 |
| *History of MI* <br> *Present* <br> *Absent* | 19 <br> 61 | 23.75 <br> 76. 25 |
| *Family history of MI* <br> *Present* <br> *Absent* | 32 <br> 48 | 40 <br> 60 |
| *Ejection fraction* <br> *<35%* <br> *≥35%* | 20 <br> 60 | 25 <br> 75 |
| *MI location* <br> *Anterior* <br> *Other* | 20 <br> 60 | 25 <br> 75 |
| *MI type* <br> *STEMI* <br> *NSTEMI* | 27 <br> 53 | 33.75 <br> 66.25 |
| *Peak CPK* <br> *≥500 u/l* <br> *<500 u/ l* | 44 <br> 36 | 55 <br> 45 |
| *Current smoker* <br> *Yes* <br> *No* | 40 <br> 40 | 50 <br> 50 |
| *COPD* <br> *Present* <br> *Absent* | 39 <br> 41 | 48.75 <br> 51.25 |
| *Renal insufficiency* <br> *Present* <br> *Absent* | 11 <br> 69 | 13. 75 <br> 86. 25 |

**Table-2:Demographic and clinical characteristics of ( 80 ) patients with or without depression following hospitalization due to acute myocardial infarction**

| | Depressed patients | Nondepressed patients | Analysis |
|---|---|---|---|

| Factor | N=18 | % | N=62 | % | Chi-square =$X^2$ | p-value |
|---|---|---|---|---|---|---|
| Age | | | | | 0.6 | 0.25<p<0.5 |
| ≥65 | 8 | 44.44 | 34 | 54.83 | | |
| <65 | 10 | 55.56 | 28 | 45.17 | | |
| Gender | | | | | 4.8 | 0.025<p<0.05 |
| Female | 16 | 88.89 | 38 | 61.29 | | |
| Male | 2 | 11.11 | 24 | 38.71 | | |
| Hypertension | | | | | 0.06 | 0.75<p<0.9 |
| Present | 12 | 66.67 | 38 | 61.29 | | |
| Absent | 6 | 33.33 | 24 | 38.71 | | |
| Hyperlipidemia | | | | | 0.28 | 0.5<p<0.75 |
| Present | 12 | 66.67 | 37 | 59.68 | | |
| Absent | 6 | 33.33 | 25 | 40,32 | | |
| Diabetes | | | | | 9.19 | 0.001<p<0.005 |
| Present | 5 | 27.78 | 42 | 67.74 | | |
| Absent | 13 | 72.22 | 20 | 32.26 | | |
| History of MI | | | | | 1.17 | 0.25<p<0.5 |
| Present | 6 | 33.33 | 13 | 20.97 | | |
| Absent | 12 | 66.67 | 49 | 79.03 | | |
| Family history of MI | | | | | 0.02 | 0.75<p<0.9 |
| Present | 7 | 38.89 | 25 | 40.32 | | |
| Absent | 11 | 61.11 | 37 | 59.68 | | |
| Ejection fraction | | | | | 0.09 | 0.75<p<0.9 |
| <35% | 4 | 22.22 | 16 | 25.8 | | |
| ≥35% | 14 | 77.78 | 46 | 74.2 | | |
| MI location | | | | | 0.09 | 0.75<p<0.9 |
| Anterior | 4 | 22.22 | 16 | 25.8 | | |
| Other | 14 | 77.78 | 46 | 74.2 | | |
| MI type | | | | | 0.001 | 0.95<p<0.97 |
| STEMI | 6 | 33.33 | 21 | 33.08 | | |
| NSTEMI | 12 | 66.67 | 41 | 66.12 | | |
| Peak CPK | | | | | 0.002 | 0.95<p<0.975 |
| ≥500 | 10 | 55.56 | 34 | 54.83 | | |
| <500 | 8 | 44.44 | 28 | 45.17 | | |
| Current smoker | | | | | 10.23 | 0.001<p<0.005 |
| Yes | 3 | 16.67 | 37 | 59.68 | | |
| No | 15 | 83.33 | 25 | 40.32 | | |
| COPD | | | | | 5.25 | 0.01<p<0.025 |
| Present | 4 | 22.22 | 35 | 56.45 | | |
| Absent | 14 | 77.78 | 27 | 43.55 | | |
| Renal insufficiency | | | | | 1.4 | 0.1<p<0.25 |
| Present | 4 | 22.22 | 7 | 11.3 | | |
| Absent | 14 | 77.78 | 55 | 88.7 | | |

**\*p-value less than 0.05 consider significant statistically**

## <span style="color:red">Discussion</span>

**Atherosclerosis remains the major cause of death and premature disability in developed society by playing an important role in causation of CHD, cerebrovascular disease and peripheral vascular disease. Rupture of atherosclerotic plaque leading to reduction lumen of coronary artery and lack of oxygen supply to the myocardium due to**

inadequate perfusion and may ending with AMI (complete arterial closure manifested as STEMI which need treatment with thrompolytic agent vs. partial closure manifested as NSTEMI).

Advanced age, male sex and a family history of premature atherosclerosis are considered nonmodifiable risk factors for atherosclerosis. Many other risk factors (including hyperlipidemia, hypertension, diabetes mellitus, smoking, obesity, physical inactivity, hyperhomocysteinemia, infection, inflammation with elevated level of C-reactive protein[17], decrease of dietary antioxidants, decrease fibrinolytic activity and mental stress with certain personality but there is no strong evidence to support this popular belief[18]) are modifiable and associated with increase the risk of CHD and treatment with modulation of these factors may decrease the risk of atherosclerosis.

In addition , there are several nonatherosclerotic processed that may also affect the coronary arteries and produce acute coronary insufficiency (e.g. acute embolization with different sources, aortic aneurysm, chest wall trauma, mediastinal radiation may result in coronary artery fibrosis, dissection of coronary artery during catheterization and several form of arteritis).

Depressed Patients following AMI represent significantly poorer physical and psychological health at time of hospitalization. Even after controlling the quality of life, anxiety and demographic variables, depression was significantly associated with reduced psychological health, social function and chronic drugs using for ischemic heart diseases. This study revealed that depression following AMI was more common in middle age, hypertensive, hyperlipidemic patients, patients who has no history of MI, no positive family history of MI, E.F ≥35% and CPK ≥500u/l. Patients with anterior MI, STEMI and renal failure are less likely to have depression after MI, but from statistical point of view, all previously mentioned results have no significance in this study and this result supported by Albert et al /2003. [19]

An important result revealed that female patients vs. male are more likely to experience depression after AMI with important significance making female gender act as important risk factor. Different psychological and social aspects which are more commonly affected in females, increasing the liability for depression even if she has no comorbidity, in addition to; hormonal changes which occurred especially in postmenopausal period may play a role. A study by Skerington et al [20] had done resulting in predominance of female gender in depression following ischemic heart disease.

Diabetic patients (unrelated to type of therapy) are less likely to have depression after AMI and diabetes mellitus act as an important protective factor against depression. Williams et al, in Indian cohort prospective study [21], stated that there is decrease in the frequency of depression after cardiovascular events in patients with diabetes mellitus.

Current smokers and patients with COPD are less likely to have a chance for post-myocardial infarction depression; both clinical characteristics play an important role in protection against depression and those patients may have good psychological satisfaction. Wheeler et al, with large prospective study reporting significant reduction in liability for depression following AMI in current smoker patients with smoking period more than 2 year.[22]

## References

1.  Awtry EH, Loscalzo J. Coronary heart disease. In: Andreoli TE, Carpenter CCJ, Griggs RC, Loscalzo J, eds. Cecil essentials of medicine. Philadelphia: W.B. Saunders company. 2006.

2.  Moffic, hs, paykel, ES (1995) : Mood disorder in medical patients. Brit. J. psych. 146,346-353.

3.  Schleifer SJ, Macari-Hinson MM, Coyle DA, Slater WR, Kahn M, Gorlin R, Zucker HD: The nature and course of depression following myocardial infarction. Arch Intern Med 1989; 149:1785–1789

4.  George, F.Salmon,2004 psychological aspect of myocardial infarction, psychosomatic medicine 11, Oscar, W.Hill,208

5.  Bush DE, Ziegelstein RC, Tayback M, Richter DP, Stevens SS, Zahalsky H, Fauerbach JA: Depression is associated with higher 4-month mortality in older patients following myocardial infarction. Am J Cardiol 2001; 88:337–341

6.  Idler E: Self-assessed health and mortality: a review of studies, in International Review of Health Psychology, vol 1. Edited by Maes S, Leventhal H, Johnson M. New York, Wiley, 1992

7.  Wells KB, Stewart RS, Hays RD, Burnam MA, Rogers W, Daniels M, Berry S, Greenfield S, Ware JE: The functioning and well-being of depressed patients: results from the Medical Outcomes Study. JAMA 1989; 262:914–919

8.  Ruo B, Rumsfeld JS, Hlatk MA, Liu H, Browner WS, Whooley MA: Depressive symptoms and health-related quality of life: the Heart and Soul Study. JAMA 2003; 290:215–221

9.  Cronin-Stubbs D, Mendes deLeon CF, Beckett LA, Field TS, Glynn RJ, Evans DA: Six-year effect of depressive symptoms on the course of physical disability in community-living older adults. Arch Int Med 2000; 160:3074–3080

10. Brink E, Karlson BW, Hallberg LR-M: Health experiences of first-time myocardial infarction: factors influencing women's and men's health-related quality of life after five months. Psychol Health Med 2002; 7:5–16

11. Beck CA, Joseph L, Belisle P, Pilote L; QOLAMI Investigators (Quality of life in acute myocardial infarction): Predictors of

quality of life 6 months and 1 year after acute myocardial infarction. Am Heart J 2001; 142:271–279

12. Mayou RA, Gill D, Thompson DR, Day A, Hicks N, Volmink J: Depression and anxiety as predictors of outcome after myocardial infarction. Psychosom Med 2000; 62:212–219

13. Lane D, Carroll D, Ring C, Beevers DG, Lip GY: Effects of depression and anxiety on mortality and quality-of-life 4 months after myocardial infarction. J Psychosom Res 2000 Oct; 49(4):229–238

14. Lane D, Carroll D, Ring C, Beevers DG, Lip GY: Mortality and quality of life 12 months after myocardial infarction: effects of depression and anxiety. Psychosom Med 2001; 63:221–230

15. Sullivan MD, LaCroix AZ, Baum C, Grothaus LC, Katon WJ: Functional status in coronary artery disease: a one-year prospective study of the role of anxiety and depression. Am J Med 1997; 103:348–356

16. Spitzer RL, Williams JBW, Gibbon M, First MB: Structured Clinical Interview for DSM-4-R—Non-Patient Version (SCID-NP). New York, New York State Psychiatric Institute, Biometrics Research, 1989

17. Burke AP, Tracy RP, Kolodgie F, Malcom GT, Zieske A, Kutys R, et al. Elevated C-reactive protein values and atherosclerosis in sudden coronary death ; association with different pathologies. Circulation. 2002; 105; 2019-23.

18. Davidson et al, Davidson's principles and practice of medicine 20th Edition; 2006;  580.

19. Albert, J., Silverman, MD (2003) psychological factors affecting ischemic heart disease comprehensive textbook of psychatry,25:10, 1189.

20. Skerington, et al (2004) psychological aspect of pain in ischemic heart disease, oxford text book of psychiatry, 2nd edition 459.

21. Williams et al (2005): in India, depressive criteria in patients of coronary care unit.

22. Wheeler et al (2006): In Sweden, Denmark, and British.