

# Association of myocardial infarction with stressful life events and psychiatric symptoms: a population-based survey

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## الترابط بين احتشاء عضلة القلب وبين الأحداث الحياتية المتصّفة بالكرب وبالأعراض النفسية، مسح سكاني

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**الخلاصة:** تترافق العوامل النفسية الاجتماعية، مثل الاكتئاب والعدوانية والانعزال الاجتماعي مع زيادة اختطار الأمراض القلبية التاجية. وقد هدف الباحثون إلى التعرّف على مدى الترابط بين الأعراض النفسية والعوامل النفسية والاجتماعية من جهة وبين احتشاء عضلة القلب من جهة أخرى، فأجروا تحليلاً ثانوياً للمعطيات المستمدة من مسح سكاني شمل الإيرانيين الذين تتراوح أعمارهم بين 18 و65 عاماً باستخدام وسيلة نفسية اجتماعية معيارية. وشملت الدراسة 2158 مستجيباً، عانى 51 منهم من احتشاء عضلة القلب وأوضح التحليل ذو المتغير الوحيد، أن عدد الأحداث الحياتية المتصّفة بالكرب، والشدائد، والشكاوى الجسدية، والاكتئاب، والقلق، والقلق الرهابي والاضطراب النفسي.. كانت كلها مترابطة ترابطاً يُعتدّ به إحصائياً مع احتشاء عضلة القلب ( $P < 0.05$ ). أما في التحوُّف اللوجستي المتعدد المتغيرات فقد ظلت الحساسية بين الأشخاص ( $P = 0.047$ )، والقلق الرهابي ( $P = 0.016$ ) وعدد الأحداث الحياتية المتصّفة بالكرب ( $P = 0.054$ )، والشدائد ( $P = 0.057$ )، والعمر ( $P = 0.001$ ) مترابطة ترابطاً يُعتدّ به إحصائياً مع احتشاء عضلة القلب.

**ABSTRACT** Psychosocial factors such as depression, hostility, social isolation are associated with increased risk of coronary heart disease. We aimed to determine the association of psychiatric symptoms and psychosocial factors with myocardial infarction (MI). We performed a secondary analysis of data from a population-based survey of Iranians aged 18–65 years using standardized psychosocial instruments. Of the 2158 participants, 51 had suffered an MI. In univariate analysis: number of stressful life events, stressfulness, somatization, depression, anxiety, phobic anxiety and psychoticism were significantly associated with MI ( $P < 0.05$ ). In multivariate logistic regression, interpersonal sensitivity ( $P = 0.047$ ), phobic anxiety ( $P = 0.016$ ), number of stressful life events ( $P = 0.054$ ), stressfulness ( $P = 0.057$ ) and age ( $P = 0.001$ ) remained at significantly associated with MI.

## Association de l'infarctus du myocarde aux événements de vie stressants et aux symptômes psychiatriques : une enquête en population générale

**RÉSUMÉ** Les facteurs psychosociaux tels que la dépression, l'hostilité et l'isolement social sont associés à un risque accru de coronaropathie. Nous avons cherché à déterminer l'association entre les symptômes psychiatriques, les facteurs psychosociaux et l'infarctus du myocarde. Nous avons réalisé une analyse secondaire des données issues d'une enquête en population générale auprès d'Iraniens âgés de 18 à 65 ans, au moyen d'instruments psychosociaux standardisés. Parmi les 2158 participants, 51 avaient souffert d'un infarctus du myocarde. Dans une analyse univariée, le nombre d'événements de vie stressants, le degré de stress, la somatisation, la dépression, l'anxiété, l'anxiété phobique et le psychoticisme étaient significativement associés à l'infarctus du myocarde ( $P < 0,05$ ). Dans une analyse de régression logistique multivariée, la sensibilité interpersonnelle ( $P = 0,047$ ), l'anxiété phobique ( $P = 0,016$ ), le nombre d'événements de vie stressants ( $P = 0,054$ ), le degré de stress ( $P = 0,057$ ) et l'âge ( $P = 0,001$ ) étaient aussi fortement associés à l'infarctus du myocarde.

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## Introduction

Psychosocial factors including depression, chronic hostility, social isolation and lack of social support, have been associated with increased risk of coronary heart disease (CHD) [1].

Both mental and clinical stress can increase vascular risk [2]. Adrenergic stimulation during mental stress can cause coronary vasoconstriction and interfere with the myocardial oxygen supply [2]. Furthermore, other studies have shown that mental stress can cause platelet and endothelial dysfunction, metabolic syndrome and induction of ventricular arrhythmias [2].

An association has been reported between cynical hostility and cardiovascular mortality after adjusting for demographic, lifestyle, and physiological variables. [3]. Clinical depression has also been shown to be significantly associated with CHD [2]. In a meta-analysis of 11 cohort studies, clinical depression was a stronger predictor of coronary disease (risk ratio = 2.7) than depression mood (risk ratio = 1.5) [2].

In addition, acute stress related to natural disasters has been reported to be a risk factor for acute coronary events [2]. Work-related stress and anger have also been recognized as a vascular risk [2].

In the INTERHEART study, where psychosocial factors were evaluated with 4 simple question about work, home, financial stress and major life events in the past year, psychosocial stressors significantly increased the risk of acute myocardial infarction (MI) [4]. Hostility and time urgency/impatience have been found to be significantly associated with long-term risk of hypertension [5].

To shed light on the relation between recent (in the past 6 months) and earlier (in the 6 months prior to that) stressful life events and psychological distress with MI, we performed a secondary analysis of data collected during

a population-based survey of 2158 people using standardized psychosocial instruments such as SCL-90 and the Paykel stressful life event questionnaire [6–8].

## Methods

### Study design

A population-based cross-sectional study was designed [7]. Sampling method was two-stage random sampling. In the first stage 5 districts out of 8 districts located in the area of the research centre were selected by simple random sampling. In the second stage, 2158 people aged 18–65 years living in the 5 centres were recruited to the study by systematic random sampling. The outcome measure was history MI in the past 6 months.

Informed, verbal consent was obtained from the participants at entry to the survey.

### Questionnaires

We have provided the information with regard to psychometric properties of the translated instruments in the original Farsi paper [7].

Participants were interviewed about recent life events to assess the stressful life events in the past 6 months and in the 6 months prior to that, and the degree of stress they induced.

SCL-90-R was used to evaluate psychiatric symptoms. The 90 items of the SCL-90-R are on a 5-point Likert scale; participants were asked to respond within a 4 weeks time period. The Global Severity Index (GSI) cut-off point equal to 0.7 was used for detection of psychiatric illness using the SCL-90-R questionnaire [9].

A validated questionnaire was used to record demographic variables and past medical history of the study participants. The demographic questionnaire was validated by the researchers. Content validity was confirmed by professional, internal consistency of the items

was confirmed by Cronbach alpha of 0.82. The reliability of the questionnaire was examined by a test–retest process and a correlation coefficient of 0.80 was obtained

### Statistical analysis

Statistical analysis was carried out using SPSS, version 13.

The Pearson chi-squared test, independent sample t-test, and ANOVA were used for univariate analysis to determine the relationship between stressful life events, psychotic symptoms and demographic variables with myocardial infarction.

Logistic regression analysis was carried out to evaluate multivariate associations between MI and stressful life events and psychiatric symptoms, adjusting for demographic and other coronary artery disease (CAD) risk factors.

## Results

Baseline characteristics of the participants are shown in Table 1. Of the 2158 participants, 51 had suffered an MI (2.4%). Those who had suffered an MI were significantly older than those who had not [48.15 (SD 12.53) years versus 32.81 (SD 12.22) years respectively] ( $P < 0.001$ ). Those suffering an MI were also significantly less educated ( $P < 0.001$ ) but sex, marital status and occupation were not significantly associated with MI.

Table 1 also shows the stress factors of MI cases compared with non-MI participants. The number of stressful life events, the degree of stressfulness and the global severity index were all significantly higher in MI cases.

Table 2 shows the psychiatric symptoms measured by the SCL-90-R inventory in participants suffering MI versus those who had no suffered an MI. Those who suffered an MI scored significantly higher than non-MI participants for obsessive–compulsive

**Table 1** Baseline characteristics of the study population

Variable	MI cases ( <i>n</i> = 51) %	Non MI cases ( <i>n</i> = 2107) %	<i>P</i> -level
<b>Age (years) [mean (SD)]</b>	48.15 (12.53)	32.81 (12.22)	0.001
<b>Sex</b>			
Female	56.9	55.5	0.46
Male	43.1	44.5	
<b>Education</b>			
Primary school	72.5	28.4	0.001
Pre-high school	21.6	23.9	
High school	3.9	38.3	
University	2.0	9.3	
<b>Occupation</b>			
Housewife	52.9	40.0	0.44
Worker	7.8	8.6	
Administrative worker	13.7	12.6	
Self employed	21.6	17.0	
<b>Marital status</b>			
Single	5.9	30.8	0.06
Married	86.3	65.9	
Widow	5.9	2.3	
Divorced	2.0	1.0	
<b>No. of stressful life events (0–22) [Mean (SD)]</b>	4.8 (0.50)	4.17 (3.26)	0.005
<b>Stressfulness (0–402) [Mean (SD)]</b>	71.74 (64.43)	57.29 (51.67)	0.004
<b>Global severity index (0–3.57) [Mean (SD)]</b>	0.94 (0.68)	0.73 (0.59)	0.006

MI = myocardial infarction; SD = standard deviation.

symptoms, depression, anxiety, phobic anxiety and psychoticism. Somatization, interpersonal sensitivity, hostility, paranoid ideation and other psychiatric symptoms were not associated with MI.

The relationship of psychiatric illness using the GSI cut-off point of 0.7 for SCL-90-R with MI is shown in Table 3. The likelihood of psychiatric illness in those with MI versus those

without was significantly higher for all primary symptom dimensions except hostility.

Table 4 presents the relationship between MI and experiencing

**Table 2** Psychiatric symptoms measured by SCL-90-R inventory in participants suffering MI versus without MI

Symptom	MI cases ( <i>n</i> = 51) Mean (SD)	Non MI cases ( <i>n</i> = 2107) Mean (SD)	<i>P</i> -level
Somatization	14.92 (10.08)	9.52 (8.36)	0.01
Obsessive compulsive	9.76 (7.62)	7.99 (6.79)	0.06
Interpersonal sensitivity	7.21 (6.39)	6.76 (6.11)	0.60
Depression	13.78 (10.76)	10.79 (9.80)	0.03
Anxiety	9.50 (8.59)	7.07 (6.76)	0.013
Hostility	4.52 (4.17)	4.21 (4.16)	0.59
Phobic anxiety	4.68 (4.3)	2.74 (1.36)	0.01
Paranoid ideation	7.25 (5.03)	6.39 (5.07)	0.23
Psychoticism	6.66 (6.11)	4.96 (3.57)	0.03
Other <sup>a</sup>	6.88 (5.21)	6.09 (5.02)	0.22

<sup>a</sup>Other includes disturbance in appetite and sleep patterns.

MI = myocardial infarction; SD = standard deviation.

**Table 3 Likelihood of psychiatric illness (GSI cut-off point = 0.7 for SCL-90-R) in those suffering MI (51 participants) versus those without MI (2107 participants)**

Psychiatric caseness	Likelihood ratio	P-value
Somatization	75.19	0.001
Obsessive-compulsive	48.77	0.008
Interpersonal sensitivity	33.10	0.001
Depression	69.70	0.001
Anxiety	45.70	0.001
Hostility	21.90	0.23
Phobic anxiety	26.82	0.001
Paranoid ideation	42.78	0.001
Psychoticism	35.63	0.001
Other	31.64	0.11

MI = myocardial infarction.

stressful life events. Four events in the past 6 months and 3 other events in the 6 months prior to that were significantly associated with MI. All of the other items that were in the Paykel questionnaire were not found to be significantly associated.

In a logistic regression analysis to determine the factors significantly associated with MI while controlling for confounding of the variables, the following variables remained significantly associated with MI: interpersonal sensitivity ( $P = 0.047$ ), phobic anxiety ( $P = 0.016$ ), stressful life events count ( $P = 0.054$ ), degree of stressfulness ( $P = 0.057$ ) and age ( $P = 0.001$ ) (Table 5).

## Discussion

In our study, the number of stressful life events in the past 6 months and in the 6 months prior to that, degrees of stressfulness, interpersonal sensitivity and phobic anxiety were statistically significant associated with myocardial infarction in the past 6 months.

Previous research has shown the increased risk of vascular effects, CHD and acute MI with mental stress and psychiatric stressors [1,2,4]. In the INTERHEART study, psychosocial factors were evaluated using a series of simple questions and the status of stress and depression were self-reported. In our study, however, we evaluated the stress status and psychiatric symptoms

using standardized, detailed stressful life events and the SCL-90-R inventory. In these 2 questionnaires, definitions and measurements of psychosocial factors are more precise and validated. These instruments are known to be more useful for population based studies [7]. A recent study demonstrated the particular usefulness and application of the SCL-90-R inventory in CAD, both acute events and chronic CAD [10].

The role of clinical depression in the development of CAD has been reported recently [2,11]; in our investigation we found a statistically significant association between depression and MI in the univariate analysis, with a likelihood ratio of relation between MI and depression of 69.70 ( $P = 0.001$ ). Temporal relationship between CAD and clinical depression has been reported previously where clinical depression appeared to be an independent risk factor for developing CAD rather than a co-morbid condition [11].

In our study the number of stressful life events in the past 6 months and in the 6 months before that was significantly associated with MI ( $P = 0.005$ ). This finding does not concur with that of Moller et al. reported in 2005 [12], who found that sudden, short-term work-related stressful events in a Swedish population were associated with myocardial infarction. However,

**Table 4 Association of stressful life events in the past 6 months and prior to the 6 months, and MI**

Event	MI cases (n = 51) No. (%)	Non MI cases (n = 2107) No. (%)	P-value <sup>a</sup>
<b>In the past 6 months</b>			
Retirement	13 (25.49)	146 (6.92)	0.031
Bombardment (city attacked)	4 (7.84)	53 (2.51)	0.001
Emigration (outside)	4 (7.84)	205 (9.72)	0.001
<b>Prior to the 6 months</b>			
Change in financial state	8 (15.68)	138 (6.0)	0.009
Child leaving home	7 (13.72)	48 (2.27)	0.009
Detention/arrest	13 (25.49)	140 (6.64)	0.033
Spouse left home after an argument	10 (19.60)	111 (5.26)	0.038

<sup>a</sup>Pearson  $\chi^2$  test or Fisher exact test.

MI = myocardial infarction.



**Table 5 Factors significantly associated with myocardial infarction using logistic regression analysis**

Parameter	Wald test	P-value	Odds ratio	95% confidence interval
Interpersonal sensitivity	3.93	0.047	2.56	1.02–6.66
Phobic anxiety	5.75	0.016	2.29	1.16–4.52
Number of stressful life events	3.71	0.054	10.00	1.04–100
Degree of stressfulness	3.63	0.057	2.43	1.01–6.06
Age	18.74	0.001	1.07	1.04–1.11

they found no evidence that an accumulation of stressful life events over a period of 12 months increased the risk of myocardial infarction. In our investigation, we evaluated a different number of stressful life events before and after 6 months using a standardized instrument with a wide range of life events so we can demonstrate the broader aspects of the problem. In addition, the degree of stressfulness of life events in the past 6 months and in the 6 months before that were statistically significantly different between MI cases and non cases (71.74 versus 57.29 respectively,  $P = 0.004$ ). Earlier studies have concluded that work-related life events, particularly those with any work load, were significantly associated with the risk of MI [12,13]. We found that change in financial state, spouse leaving home, son or daughter leaving home and detention/arrest in the past 6 months, and retirement, emigration and bombardment (of the city) in the 6 months before that were significantly associated with MI.

When we used the GSI cut-off point equal to 0.70 for detection of psychiatric illness in the SCL-90-R questionnaire, we found phobic anxiety and interpersonal sensitivity were significantly associated with MI.

This was a cross-sectional study and can only assess associations and has limitations in terms of temporality and determining cause–effect relationship. These limitations might be overcome in a prospective concurrent cohort study, considering conventional and novel risk factors of CAD [14–19]. In spite of the limitations, the advantages of present research are: i) it was population based with random selection which allows the results to be generalized to the reference population; ii) standardized and well-known instruments were used for detection of the events and symptoms.

In conclusion, our study showed that psychosocial factors including number of stressful life events, degree of stressfulness, interpersonal sensitivity

and phobic anxiety were significantly associated with MI.

Psychotic symptoms at the community level have been recognized with different patterns and severity. Socio-economic status and social stressors are related to the prevalence and severity of psychotic symptoms. The prevalence and severity of psychotic symptoms in our study population, which was a dense urban community with low socioeconomic status, was very high. There is a need therefore to address this high level of psychiatric symptoms and consequent clinical psychiatric and psychosomatic disorders in order to reduce the risk of associated MI.

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### **The First Global Conference on Healthy Lifestyles and Noncommunicable Diseases Control**

The First Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease Control was held in Moscow, Russian Federation from 28 to 29 April 2011. This conference is a key milestone in the international campaign to curb the impacts of cancers, cardiovascular diseases, diabetes and chronic lung diseases.

Convened by the Russian Federation and the World Health Organization (WHO), the Conference aimed to help Member States develop and strengthen policies and programmes on healthy lifestyles and noncommunicable disease prevention. These efforts are based on the *Global strategy for the prevention and control of NCDs* and its action plan.

The Moscow event will feed into the 19-20 September, 2011, United Nations General Assembly High-level Meeting on the Prevention and Control of Noncommunicable Diseases.

Information about noncommunicable diseases in the Eastern Mediterranean Region of WHO can be found at <http://www.emro.who.int/ncd/>.