

Role of Different Determinants of Psychological Distress in Acute Coronary Syndromes

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Objectives. The aim of this study was to examine the prevalence of psychological distress and of its major determinants in acute coronary patients and in a control group.

Background. The prevalence and major determinants of psychological distress in acute coronary patients are not clear.

Methods. One hundred and thirty cardiac patients (110 men, age 56 ± 9 ; 85 with acute myocardial infarction and 45 with unstable angina) and 102 controls hospitalized for acute trauma (70 men, age 55 ± 9 years) were studied and the level of psychological distress estimated by a Modified Maastricht Questionnaire, self-ratings and ratings by a close relative. Major determinants of psychological distress were assessed by the Life Events Assessment, the Social Support Questionnaire and the Ways of Coping Checklist.

Results. The average level of psychological distress was significantly higher ($p < 0.001$) in coronary patients than in controls in all tests (self-evaluation = 7.1 ± 2.3 vs 4.3 ± 2.4 ; relative-

evaluation = 7.4 ± 2.4 vs 4.2 ± 2.5 ; Modified Maastricht Questionnaire = 91 ± 32 vs 59 ± 30). Cardiac patients reported significantly higher ($p < 0.05$) levels of social isolation (28.9 ± 11.1 vs 23.4 ± 8.8), self-blame (7.2 ± 1.9 vs 5.8 ± 1.6) and avoidance (21.1 ± 3.5 vs 18.9 ± 3) and more painful life events (3.9 ± 3.8 vs 2.6 ± 2.2), than controls. However, not all patients had evidence of distress; indeed, cluster analysis identified a subgroup that comprised 75% of controls and 25% of cardiac patients with no determinants eliciting distress, while the other four subgroups, with one or more determinants of distress, comprised about 75% of patients and only 25% of controls.

Conclusions. These results show that a high level of psychological distress is detectable in about 75% of patients with acute myocardial infarction or unstable angina and is related to one or more major determinants.

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Several behavioral features (1) such as type A behavior pattern (2), anxiety (3), depression (4), anger and hostility (5,6) and, finally, psychological distress (7,8) have been associated with ischemic heart disease. Although epidemiologic studies have found that acute emotional stress may be a trigger of acute myocardial infarction and sudden death (9), chronic psychological distress is also a known risk factor for ischemic heart disease (7,8) and several manifestations of psychological distress have been associated with increased risk in patients with ischemic heart disease (10,11). Psychological distress may be due to different determinants, such as adverse life events, low social support, and defective coping strategies. The ability to cope indicates the adaptation processes that each individual undergoes when confronted by adverse environmental situations and life events (12) and is influenced by "social support," of life events and by the development of individual ways of coping. Social support represents an individual's perception of the quality of their social relationships (13); thus, it is not only

an environmental factor, but also a factor influenced by the individual's personality (14). Psychological distress is the final common pathway resulting from an "inability to cope," an imbalance derived from a real or a perceived disparity between environmental demands and an individual's ability to cope (15).

The aim of this study was to assess the prevalence and intensity of psychological distress and its major determinants (low social support, adverse life events and defective coping strategies) in a consecutive series of patients with unstable angina and acute myocardial infarction and in a control group of patients without ischemic heart disease admitted to hospital because of an acute traumatic event.

Methods

Patients. We studied 130 consecutive patients with unstable angina or acute myocardial infarction (110 men and 20 women, mean age 56 ± 9 years) admitted to our coronary care unit from January 1993 to May 1995 and a matched group of controls. The inclusion criteria for cardiac patients were acute myocardial infarction (85 patients: 55 men, mean age 53.8 ± 7.9) diagnosed by two or more of the following features: typical electrocardiographic changes, compatible clinical history, specific diagnostic enzyme elevations, and unstable angina (45

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patients: 28 men, mean age 57.4 ± 9.9) corresponding to class III of the Braunwald classification. Patients older than 70 years, those with ischemic symptoms during the 6 months preceding the acute coronary event, and those with a history of myocardial infarction during the previous 12 months were excluded as were those with clinical conditions that prevented them providing reliable responses to the questionnaires and interview. The control group comprised 102 subjects aged ≤ 70 years (70 men; mean age 55 ± 9) with no history of angina or any clinical evidence of heart diseases and a normal resting electrocardiogram admitted to the orthopedic ward of our hospital because of an acute event (60 for traumatic bone fracture, 25 for slipped disc, and 17 for traumatic lesions of meniscus or knee ligaments). Both cardiac patients and controls were examined between days 4 and 10 of hospital admission.

Study protocol. We set out to compare the level of psychological distress and its major determinants in coronary patients and controls.

Levels of psychological distress. In order to assess global levels of psychological distress two simple tests for self- and relative-evaluation, together with a Modified Maastricht Questionnaire, were used. In the self-evaluation test, cardiac patients and controls were asked to indicate the retrospective estimate of their distress levels in the two weeks preceding admission on an analogic visual scale. Indeed, previous studies have shown that acute myocardial infarction is often preceded by premonitory symptoms in the 1 to 2 weeks before the acute event; thus, it was important to assess the global level of psychological distress in this time-period (16). In the relative-evaluation test the consort, or a first-degree relative, was asked to estimate the patient's and control's level of psychological distress during the same period of time using a similar analogic visual scale. The Modified Maastricht Questionnaire was adapted from the Maastricht Questionnaire of Appels and Mulder that has been specifically designed to assess levels of vital exhaustion (that is, a state characterized by unusual fatigue, increased irritability and feeling dejected and defeated) in the period preceding its administration (7,17). Six items out of the 21 in the original Maastricht Questionnaire were removed to reject extreme and improbable manifestations of psychological distress (i.e., desire to commit suicide) and two were added in order to better explore the anxiety sphere. Such modifications may provide higher slenderness to the test and improve its specificity. The design of our project as a case-control study permitted us to obtain some validation of the Modified Maastricht Questionnaire by also including two different measurements of psychological distress (self- and relative-evaluation).

Major determinants of psychological distress. In order to assess the importance of major determinants, three questionnaires were used, the Social Support Questionnaire, the Ways of Coping Checklist and the Life Events Assessment. The Social Support Questionnaire was used to evaluate each individual's perception of his/her social network as it explores the presence and importance of three elements in the patient's

life, i.e., a particularly important person, family and friends. It comprises 12 items, and its score indicates the perceived degree of social isolation (18). The Ways of Coping Checklist was used to measure the different cognitive and behavioral strategies employed to manage specific stressful situations (19). It comprises 42 items and evaluates five behavioral patterns, i.e., "problem-focused," "seeks social support," "self-blame," "wishful thinking" and "avoidance." Finally, the presence and importance of occasional major life events and chronically recurring aggravations of daily life were assessed according to an ad hoc questionnaire previously designed and validated (20). Each individual was asked to indicate which listed events had occurred during the year prior to admission, the outcome of each event (i.e., joyful or painful) and the relevance of each event from an emotional point of view.

Statistical analysis. Each variable was analyzed in terms of its mean value and its distribution in tertiles among cardiac patients and controls. As the cardiac group was predominantly male, we assessed the results of psychological tests in cardiac patients and controls separately in men and women. As the results of the psychological tests did not show a normal distribution, as determined by the Shapiro-Wilks' W Test, data were compared by nonparametric statistics. Differences between cardiac patients and controls were assessed by Mann-Whitney U Test for continuous variables and by Yates-corrected chi-square for categorical variables. The Spearman Rank Test was used to examine correlations between the scores of the various tests and questionnaires. Differences between multiple groups were assessed by Kruskal-Wallis one-way analysis of variance (ANOVA). Furthermore, the relation between major determinants of psychological distress was assessed by cluster analysis: values of the determinants of psychological distress were standardized according to Z-scores and, after computing the Euclidean distances, were analyzed using the hierarchical Ward's method. The number of clusters was determined by the discontinuity of the graph of the amalgamation schedule, showing the linkage distances across the consecutive steps of the linkage process (21). All analyses were performed using the Statistica for Windows 4.0 software. Values of $p < 0.05$ were considered significant. All data are expressed as mean \pm SD unless stated otherwise.

Results

The main general features of cardiac patients and controls are summarized in Table 1. The two groups were similar in age, education and social class but there was a higher prevalence of men in the cardiac group ($p = 0.006$). The demographic features of the relatives who evaluated levels of psychological distress were also similar in the two groups. Overall, 39/45 patients with unstable angina had de novo unstable angina and 6 had had a previous myocardial infarction (>12 months before). A total of 44/85 patients with acute myocardial infarction had an anterior infarction, 5/85 had had a myocardial infarction previously (>12 months before), and acute myocardial infarction was the very first clinical manifestation

Table 1. General Features of Cardiac Patients and Controls

	Patients	Controls	p Value
Number	130	102	
Age	56 ± 9	55 ± 9	0.39
Sex (M/F)	110/20	70/32	0.006
Manual workers	62 (48%)	48 (47%)	0.22
Education ≥ high school	47 (36%)	36 (35%)	0.99
Relatives (n)	130	102	
Age	49 ± 9	50 ± 10	0.42
Sex (M/F)	48/82	43/59	0.44
Days of tests administration (from admission)	6.1 ± 2.0	5.8 ± 1.8	0.24
Risk factors			
Hypercholesterolemia	33 (25%)	14 (14%)	0.04
Hypertension	32 (25%)	16 (16%)	0.13
Diabetes	17 (13%)	6 (6%)	0.11
Current smokers	44 (34%)	19 (19%)	0.01

Housewives women were classified as manual workers.

of ischemic heart disease in 80/85 patients. There were no significant differences in the results of all psychological tests between patients with acute myocardial infarction and those with unstable angina (data not shown).

Global levels of psychological distress. *Modified Maastricht Questionnaire.* The average scores in the Modified Maastricht Questionnaire were higher in cardiac patients than in controls (91 ± 32 vs 59 ± 30, p < 0.001). The distribution in tertiles of coronary patients was significantly different from that of controls (p < 0.001, Fig. 1A): 29% of patients and 9% of controls were in the highest tertile and, conversely, 22% of patients and 64% of controls were in the lowest tertile (p < 0.001).

Self- and relative-evaluation. The average levels of psychological distress reported by cardiac patients were significantly higher than those reported by controls. The mean scores in the self-evaluation test were 7.1 ± 2.3 for cardiac patients and 4.3 ± 2.4 for controls (p < 0.001). Mean scores in the relative-evaluation test were 7.4 ± 2.4 for cardiac patients and 4.2 ± 2.5 for controls (p < 0.001). The distribution in tertiles of cardiac patients was significantly different from that of controls for both tests: in the self-evaluation test 49% of patients and 12% of controls were in the highest tertile and 17% of patients and 59% of controls were in the lowest tertile (p < 0.001) (Fig. 1B); in the relative-evaluation test, 61% of patients and 10% of controls were in the highest tertile and 18% of patients and 58% of controls were in the lowest tertile (p < 0.001) (Fig. 1C). Of the 38 cardiac patients in the upper tertile of the Modified Maastricht Questionnaire, 35 (27% of the total) were also in the upper tertiles in the self- and the relative-evaluation tests. Of the 9 controls in the upper tertile of the Modified Maastricht Questionnaire, 6 (6% of the total) were also in the upper tertiles in the self- and the relative-evaluation tests.

Major determinants of psychological distress. *Social Support Questionnaire.* Patients had the perception of a higher social isolation than controls (28.9 ± 11.1 vs 23.4 ± 8.8, p < 0.001).

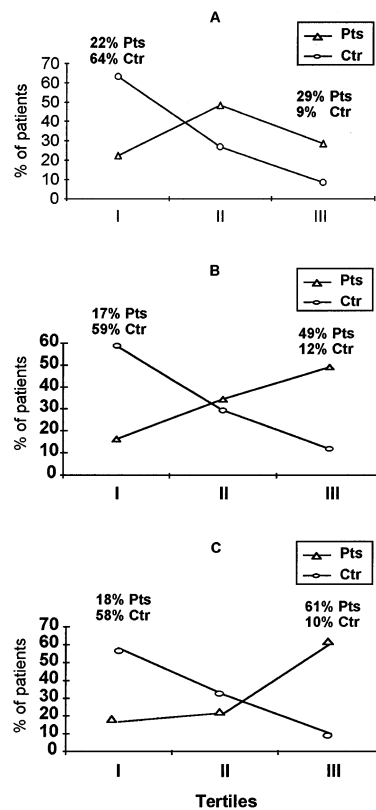


Figure 1. Tertiles distribution of cardiac patients and controls in Modified Maastricht Questionnaire (A), self- (B) and relative-evaluation (C) tests. Pts = cardiac patients; Ctr = controls. The lower tertile comprises predominantly controls, while the higher tertile comprises predominantly cardiac patients.

Ways of Coping Checklist. The results were analyzed separately for each of the five areas explored. Significant differences were observed in the self-blame area for external events (7.2 ± 1.9 and 5.8 ± 1.6 in cardiac patients and controls, respectively; p < 0.001) and in the avoidance area (21.1 ± 3.5 vs 18.9 ± 3 in cardiac patients and controls, respectively; p < 0.001). No significant differences were found in the problem-focused (40.7 ± 5.1 vs 40 ± 4.9, p = NS), seeks social support (15.2 ± 3.3 vs 15.7 ± 3.1, p = NS), and wishful thinking areas (19.6 ± 3.7 vs 18.9 ± 4.1, p = NS).

The Life Events Assessment. The responses to this questionnaire were evaluated according both to the number of stressful events and to the intensity of either joyful or painful feelings associated with them. Cardiac patients reported a higher number of painful events than controls (3.9 ± 3.8 vs 2.6 ± 2.2; p < 0.05) and experienced them in a more negative fashion (10.3 ± 9.9 vs 6.0 ± 5.7; p < 0.01). No differences were found in the number of joyful events or in the intensity of feeling associated with them (data not shown).

Influence of sex and age (Table 2). Male cardiac patients reported higher global levels of psychological distress, lower levels of social support, a higher number of adverse life events and higher levels of self-blame and avoidance on the Ways of Coping Checklist, as compared with male controls, thus con-

Table 2. Results of the Psychological Tests in Cardiac Patients and Controls According to Sex and Age

	Men		p Value	Women		p Value
	Patients (n = 110)	Controls (n = 70)		Patients (n = 20)	Controls (n = 32)	
Self-evaluation	7.2 ± 2.5	4.6 ± 2.5	< 0.001	6.4 ± 2.0	3.5 ± 2.0	< 0.001
Relative-evaluation	7.4 ± 2.4	4.6 ± 2.5	< 0.001	6.8 ± 2.7	3.8 ± 2.2	< 0.001
MMQ	88.6 ± 32.6	62.0 ± 31.1	< 0.001	99.7 ± 34.9	52.8 ± 27.3	< 0.001
Life events	4.0 ± 3.6	2.8 ± 2.4	< 0.05	4.1 ± 3.7	2.8 ± 2.5	< 0.05
SSQ	28.0 ± 11.0*	23.9 ± 9.6	< 0.005	33.1 ± 11.3	22.2 ± 6.9	0.001
Self-blame	7.1 ± 1.9	5.5 ± 1.6	0.001	7.6 ± 1.7	6.1 ± 1.5	0.001
Avoidance	21.6 ± 3.6	19.3 ± 3.0	0.001	20.8 ± 3.3	18.4 ± 3.3	0.001
	Age < 56 yrs		p Value	Age ≥ 56 yrs		p Value
	Patients (n = 64)	Controls (n = 44)		Patients (n = 66)	Controls (n = 58)	
Self-evaluation	7.6 ± 2.3†	4.6 ± 2.7	< 0.001	6.4 ± 2.4	4 ± 2.3	< 0.001
Relative-evaluation	7.8 ± 2†	4.5 ± 2.7	< 0.001	6.5 ± 2.2	4.2 ± 2.1	< 0.001
MMQ	92.7 ± 36.3	59.8 ± 31.9	< 0.001	87.6 ± 29	57.8 ± 28.7	< 0.001
Life events	3.8 ± 3.6	2.5 ± 2.0	< 0.05	3.7 ± 3.4	2.4 ± 2.1	< 0.05
SSQ	28.8 ± 10.1	25.1 ± 12.3	< 0.05	28.4 ± 12.4	22 ± 4.5	< 0.005
Self-blame	7.9 ± 2.0	6.0 ± 1.8	< 0.001	6.4 ± 1.8	5.2 ± 1.5	< 0.001
Avoidance	21.7 ± 3.4	19.2 ± 3.1	< 0.001	20.7 ± 3.7	18.4 ± 3.0	< 0.001

*p < 0.05 vs women. †p < 0.05 vs age ≥ 56 yrs. MMQ = Modified Maastricht Questionnaire; SSQ = Support Questionnaire.

firming the general results. Similar results were found in female cardiac patients compared with female controls. No significant differences were observed between global levels of psychological distress in men and woman, whether patients or controls, but female patients reported a significantly greater degree of social isolation than men (33.1 ± 11.3 vs 28.0 ± 11.0 ; $p < 0.05$). Cardiac patients aged <56 years reported significantly greater levels of psychological distress as assessed by self- and relative-evaluation tests (not by Modified Maastricht Questionnaire) than older patients (7.6 ± 2.3 vs 6.4 ± 2.4 ; $p < 0.05$ and 7.8 ± 2 vs 6.5 ± 2.2 ; $p < 0.05$, respectively).

Correlations and clustering of scores. A statistically significant correlation was found between the self- and relative-evaluation tests ($r = 0.78$ for cardiac patients and $r = 0.89$ for controls, $p < 0.001$ for both) and also between these tests and the Modified Maastricht Questionnaire in patients and con-

trols ($r = 0.57$ for self-evaluation and $r = 0.55$ for relative-evaluation for cardiac patients; $r = 0.68$ and $r = 0.66$, respectively, for controls; $p < 0.001$ for all). The results of the Modified Maastricht Questionnaire, and the self- and relative-evaluation tests were weakly correlated with the results of the questionnaires estimating the various determinants of psychological distress (i.e., the Social Support Questionnaire, Life Events Assessment, and the self-blame and avoidance areas in the Ways of Coping Checklist) in cardiac patients and controls. Overall, cluster analysis (including major features found to be associated with psychological distress, i.e., adverse life events, self-blame and avoidance in the Ways of Coping Checklist, and low social support, identified 5 subgroups (Table 3). Most controls clustered in the first subgroup, which was characterized by lower levels of all the determinants of psychological distress and lower global levels of distress, as assessed by the

Table 3. Results of Cluster Analysis in Cardiac Patients and Controls

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	p Value (ANOVA)
Number	97	26	46	37	26	
Number of cardiac patients (%)	25 (26)	18 (69)	39 (85)	28 (76)	19 (73)	< 0.001
Number of controls (%)	72 (74)	8 (31)	7 (15)	9 (24)	7 (27)	< 0.001
Age	56 ± 9	54 ± 10	56 ± 10	54 ± 9	50 ± 7	0.05
MMQ	61 ± 30*	85 ± 33	87 ± 33	89 ± 34	101 ± 36	< 0.001
Self-evaluation	4.8 ± 2.7**	6.6 ± 2.5	6.1 ± 2.9	6.5 ± 2.7	7.1 ± 2.4	0.003
Relative-evaluation	5.0 ± 2.9**	7.0 ± 2.5	6.4 ± 2.7	6.6 ± 2.7	6.8 ± 2.9	0.003
Life events	2.8 ± 1.8*	4.5 ± 2.3	3.7 ± 2.2	3.6 ± 2.7	5.6 ± 3.8	< 0.001
Self-blame	5.3 ± 1.1*	7.2 ± 1.4	8.6 ± 1.2	6.0 ± 0.9	8.7 ± 1.3	< 0.001
Avoidance	17.8 ± 2*	26.5 ± 3.2	20.1 ± 1.9	20.5 ± 1.7	23.7 ± 3.5	< 0.001
Social Support	20.5 ± 4.2*	22.7 ± 7.1	25.2 ± 6.6	32.6 ± 5.6	49.7 ± 10	< 0.001

MMQ = Modified Maastricht Questionnaire. *p < 0.001 vs all other groups; **p < 0.05 vs all other groups. ANOVA = one-way analysis of variance.

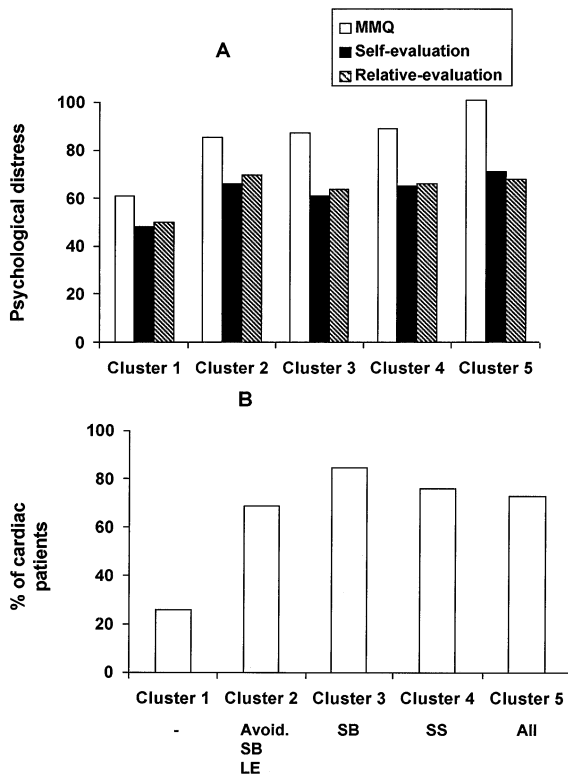


Figure 2. (A) Mean values of psychological distress (as assessed by the Modified Maastricht Questionnaire, self- and relative-evaluation tests) in the five subgroups identified by cluster analysis in the whole study population, including both cardiac patients and controls. In the graph values of self- and relative-evaluation have been multiplied by 10. MMQ = Modified Maastricht Questionnaire. (B) Percentage of cardiac patients in the five clusters. Under each cluster the determinants of psychological distress prevalent in that subgroup are reported. Avoid = avoidance, SB = self blame, LE = life events, SS = social support. The first cluster had lower values of psychological distress and lower values of all determinants of distress, and a lower prevalence of cardiac patients. The other four clusters had similar prevalence of cardiac patients, although higher values of psychological distress were observed in the cluster with a higher level of all determinants of distress (cluster 5).

Modified Maastricht Questionnaire, and by self- and relative-evaluation. The prevalence of patients did not differ significantly in the other four subgroups: subgroup 2-4 had similar levels of global psychological distress and were characterized by high levels of avoidance and self-blame and by a higher number of adverse life events (subgroup 2), high levels of self-blame (subgroup 3), and a perception of lower levels of social support (subgroup 4). Finally, subgroup 5 had a higher level of global psychological distress compared to the other subgroups and was characterized by higher levels of self-blame and avoidance, lower levels of social support and more frequent adverse life events. Although the number of determinants of psychological distress was greater in this subgroup, the prevalence of patients with acute ischemic syndromes was not greater than that found in subgroups 2-4 (Figure 2). However, patients in subgroup 5 were younger than those in the other subgroups ($p = 0.05$).

Discussion

The application of self- and relative-evaluation tests, together with the Modified Maastricht Questionnaire, demonstrated consistently that patients admitted for acute myocardial infarction or unstable angina have significantly higher levels of psychological distress than controls admitted because of acute trauma. Moreover, the tertile distribution of patients with acute ischemic syndromes was significantly different from that of controls in all tests. Only about 20% of cardiac patients, compared to about 60% of controls, were in the lower tertile of all three tests; conversely, about 50% of patients, compared to about 10% of controls, were in the upper tertile of the self- and the relative-evaluation tests (29% compared to 9% in the Modified Maastricht Questionnaire). Elevated levels of psychological distress resulted from a variable combination of major determinants. Thus, psychological distress appears to be a common pathogenetic component of acute ischemic syndromes, although not a sufficient or a necessary one.

Level of distress. The close correlation between the Modified Maastricht Questionnaire and the self- and relative-evaluation tests observed in our study suggests that the level of psychological distress perceived by cardiac patients, controls and their relatives is closely reflected by the responses to the Modified Maastricht Questionnaire. The close correlation between the results of the self- and relative-evaluation tests indicates the general agreement between individuals and their relatives in the assessment of distress levels. The possibility that an "inability to cope" resulting in psychological distress could represent a risk factor for ischemic heart disease has been considered previously (22,23). Appels et al. (7) found that "vital exhaustion," a state characterized by unusual fatigue, increased irritability and feelings of dejection and defeat, is associated with an increased risk of myocardial infarction and cardiac death. Thus, our study confirms and expands upon previous observations by showing that high levels of psychological distress are detectable by all tests in over a quarter of patients with acute ischemic syndromes, although about 20% of cardiac patients had levels of distress in the lower tertile.

Determinants of distress. Our study demonstrates that adverse life events, inadequate levels of social support and a defective ability to cope are associated significantly with high levels of distress as assessed by the Modified Maastricht Questionnaire and self- and relative-evaluation tests. The levels of these determinants was significantly different in cardiac patients compared to controls. However, only a weak correlation was observed between the level of psychological distress and the combination of the individual determinants (i.e., social support, adverse life events, inability to cope), probably due to the reciprocal interaction of such factors and to the variable individual effect of each component. The results of the Social Support Questionnaire suggest that the perception of social isolation is an important component of distress. A higher incidence of adverse life events has previously been reported in patients with ischemic heart disease (8,24) compared to controls, but no consideration was given to the ability

to cope and social support, which may modulate the levels of psychological distress. Previous studies have also reported an association between ischemic heart disease and working conditions and familial components of social support (8,24-26), but none has assessed the presence of specific coping strategies in patients with ischemic heart disease compared to controls. Denollet et al. found (22) that patients with high levels of negative affect and social inhibition have an increased long-term mortality (23). Our results confirm and expand upon these findings by showing that patients with acute coronary syndromes have a greater tendency for self-blame and for refusing to acknowledge stressful situations than controls.

An important question is how these various factors may interact in order to increase the global level of psychological distress in cardiac patients. The results of cluster analysis show that the prevalence of controls was higher only in subgroup 1 (i.e., with low levels of all determinants of psychological distress and a low level of distress), while the other subgroups had a similar prevalence of cardiac patients and controls. The individuals included in subgroup 5 (with increased tendency to self blame, a higher number of adverse life events and lower levels of perceived social support) appear similar to those with the so-called "Type-D" personality profile, with high negative affect and high levels of social inhibition, which has been associated with increased long-term mortality in patients with ischemic heart disease (23). This subgroup, with multiple components of psychological distress, did not have a higher prevalence of patients compared to the other 3 subgroups with a lower number of components. This observation suggests that the level of psychological distress is related to the presence of various major determinants, but the presence of multiple determinants is not associated with an increased risk of acute coronary syndromes. However, as patients in subgroup 5 were younger than those in the other subgroups, multiple determinants may often be needed to increase levels of distress and, hence, the risk of acute ischemic syndromes in younger individuals.

Psychological distress as a precipitating determinant of acute coronary syndromes. The absence of significant differences between the mean scores in the Modified Maastricht Questionnaire and the self- and relative-evaluation tests in patients with either myocardial infarction or unstable angina is compatible with the clinical impression that a history of psychological distress in the weeks preceding hospitalization is common in both groups of patients. The mechanism by which distress may contribute to the development of acute myocardial infarction and unstable angina in some patients, but not in others, is not clear and cannot be inferred from our data. In some patients, psychological distress may act chronically through pathological modifications of the cardiovascular system (27,28) such as changes in lipid profile (29) and elevation of arterial blood pressure (30). In others, it may help precipitate acute events by altering hemostatic or platelet functions (31,32) and/or the immuno-neuro-endocrine response (32-35). Patients with symptoms of either major or minor depression reported lower values of heart rate variability indices, which

have been associated with increased mortality from ischemic heart disease, suggesting that psychological factors may influence cardiac function through neurovegetative mechanisms (36). Finally, mental stress, induced by neurovegetative activation, may directly cause myocardial ischemia (37), and the presence of mental-stress induced ischemia has been associated with a worse prognosis (38).

Study limitations. The main problem in assessing levels of psychological distress after an acute event is that it is based upon the retrospective recall of distress by the patients who may then associate their cardiac event with distress. This may bias the results of the Maastricht Questionnaire, although it was designed specifically to assess levels of psychological distress in the period preceding its administration. In order to avoid this problem we carried out different evaluations of the global level of psychological distress, including one completed by relatives, the results of which were closely correlated. We also studied, as controls, patients admitted to hospital because of an acute traumatic event, which could also be perceived as stressful. Finally, we also included an objective measurement (i.e., adverse life events), which is less likely to be influenced by a retrospective bias.

Conclusions. Our results show that patients hospitalized for acute coronary syndromes had, on average, significantly higher levels of psychological distress than controls hospitalized for acute trauma. This difference was not distributed uniformly as about 25% of cardiac patients were in the lowest tertile of psychological distress. These patients had usually no major determinants of psychological distress; conversely high levels of psychological distress were related to the presence of one or more of these determinants.

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