

ORIGINAL ARTICLE

Clinical and Psychological Predictors of Acute Coronary Syndrome Symptom Severity

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Abstract

Introduction: Egypt is a low-income country which accounted for 16% of the MENA region's 1.3 million CVD mortalities in 2015. Traditional Egyptian cultural, social contexts and religious beliefs are different from those in high-income Western countries where most CVD research is conducted, which may have significant impacts on patients' psychological responses to acute illness. Therefore, this study aimed to identify the clinical and psychological predictors early during ACS course of disease.

Method: In this cross-sectional study, the symptoms of 255 acute coronary syndrome patients at three university hospitals in Alexandria, Egypt, were measured using the Arabic Anxiety and Stress Subscales of Depression, Anxiety and Stress Scale (DASS-21) and Arabic Controlled Attitude Scale (CAS-R). Multiple linear regression analysis was used to identify clinical and psychological predictors of symptom severity.

Results: History of diabetes, hypertension, and hyperlipidemia, perceived control, anxiety, and stress scores were independent predictors for all studied symptoms (chest pain, fatigue, and dyspnea). The models described variance of 15% for chest pain, 29% for fatigue, and 16% for dyspnea.

Conclusion: This study revealed that anxiety and stress levels are predictors of increased symptoms severity, whereas history of DM, HTN, and hyperlipidemia, and perceived control level were independent predictors for all symptoms (chest pain, fatigue, and dyspnea).

Keywords: Acute coronary syndrome; Anxiety; Egypt; Predictors; Symptoms severity

INTRODUCTION

Acute coronary syndrome (ACS) is a severe type of coronary heart disease (CHD) with acute symptoms [1]. If existent symptoms are not identified or recognized, or become more intense, patients may be at risk

of delayed diagnosis, poor prognosis, increased hospital stay, and increased morbidity and mortality [2]. ACS is commonly under-diagnosed, and diagnosis is complicated by overlap with other cardiac conditions and associated factors. For

instance, patients with stress and anxiety are more likely to experience angina, shortness of breath, dizziness, nausea, and palpitations, all of which overlap with ACS [3-5]. ACS events can cause acute stress disorders (ASDs) like stress and anxiety responses, which can be considered either “appropriate” or “inappropriate”. They can be considered appropriate when they are transient, and they inspire motivation for action (e.g., help-seeking behavior, particularly consulting healthcare professionals). In ACS patients (ACSPs), a slight increase in stress and anxiety levels may stimulate individuals to quickly seek treatment when faced with acute symptoms [4-8].

However, when stress and anxiety persist or become severe, negative consequences may result in severe chest pain, fatigue, and dyspnea. Persistent stress and anxiety might also result in difficulties in adhering to prescribed treatments and difficulty making recommended lifestyle changes, increased risk for recurrent acute cardiac events, impaired functional ability, and increased risk for in-hospital complications after admission for ACS [9-11]. Notably, the European Society of Cardiology recommended screening for negative emotions as a modifiable risk factor for developing ACS and worsening its prognosis [12]. However, other studies suggested that clinical therapy of ACS does not adequately incorporate assessments of stress and anxiety symptoms [13-14].

A systematic review and meta-analysis by van Oosterhout et al. reported that sex differences in symptom presentation in ACSPs were more instrumental than psychological status [15]. For example, women with ACS have higher odds of presenting with pain between the shoulder blades, nausea or vomiting and shortness of

breath, and lower odds of presenting with chest pain and diaphoresis compared with men with ACS. Age also has a contribution, and working-age younger and middle-aged adults suffer from more severe financial and productivity costs associated with the illness than other age groups [4].

Social support has a role in the ways in which ACS symptoms are perceived. Social support refers to social connections with other individuals, groups, and the larger community. According to the “social support deterioration deterrence model” of Norris, social support acts as a protective “cushion” in stress response, whereby patients who receive social support are less likely to be impacted by stressful events like ACS [3,4,16-18]. The way in which individuals control and cope with negative events in a way that positively influences their nature was defined by Moser et al. as perceived control (PC) [19]. PC was found to be an important factor for health-related quality of life among Japanese ACSPs by Kondo et al., [20] who considered the number of ACS symptoms as a factor that could predict PC levels among such patients.

AbuRuz concluded that depression could increase complications after ACS events, and PC could moderate this relationship [9]. Therefore, he suggested that assessing depression and enhancing PC levels in ACSPs can decrease complications and improve outcomes. However, these previous studies did not investigate if PC could predict the symptoms severity among ACSPs. This study aimed to identify the clinical and psychological predictors early during ACS course of disease for two main reasons. First, prior studies focused on identifying patients reported symptoms to predict the diagnosis of ACS, [21], and the predictors of readmission after ACS [22]. Second, Egypt is the most populous

of the 20 MENA countries, accounting for 16% of the region's 1.3 million CVD deaths in 2015 (GBD, 2015, 2018). Egypt is a low-income MENA country, and the traditional Egyptian cultural, social contexts and religious beliefs are different from those in high-income Western countries where most CVD and ACS research has been conducted. Prevailing socio-cultural mores and behaviors may have significant impacts on patients' psychological response to acute illness.

This study specifically addresses the research question of "what are the most important predictors of symptoms severity (chest pain, fatigue, and dyspnea) among patients with ACS?"

METHODS

Research design, settings, and participants

A cross-sectional design was used. This study was conducted at CCUs in three university hospitals in Alexandria, Egypt. These hospitals provide services to many patients living in Alexandria and other governorates across the country. The studied population comprised adult patients (aged 18 years and above) who presented with ACS (ST elevated myocardial infarction (STEMI), non-ST elevated myocardial infarction (NSTEMI), and unstable angina). Patients who were unable to read and write in Arabic and/ or who hemodynamically unstable (i.e., having any life-threatening dysthymias) were excluded from this study. The sample size was calculated by G*Power software using the following criteria: type 1 error of 0.05, a power of 0.95, medium effect size, and using the following statistical tests: multiple linear regression analysis. Based on these assumptions, the required number of participants was 172. Consequently, we recruited up to 255 participants, to account for drop-out and increase the representativeness of the studied population.

Instruments

Arabic Anxiety and Stress Subscales of Depression, Anxiety and Stress Scale (DASS-21)

The Arabic version of the anxiety and stress subscales of the Depression, Anxiety and Stress (DAS) scale was adopted from Ali et al. to measure patients' stress and anxiety [23]. Each of the three DASS-21 scales contains seven items, answerable with four-point Likert scales (with responses ranging from (1) *did not apply to me at all*, to (3) *applied to me very much or most of the time*. The scale has high cumulative reliability (0.88) [24].

Symptom severity was measured using a self-reported symptom diary, whereby patients recorded the severity of three symptoms (chest pain, fatigue, and dyspnea) during their hospitalization. Symptom severity was rated using a 10-point numerical analogue scale, with 0 indicating the absence of symptoms, and 10 indicating the worst level of symptoms, categorized into the following ranges: mild (1-3), moderate (4-6), and severe (7-10).

Arabic Controlled Attitude Scale (CAS-R)

PC was measured using the Arabic version of Controlled Attitude Scale (CAS-R), adopted from AbuRuz [25]. It includes eight items answerable with a five-point Likert scale, with responses ranging from (1) *strongly disagree* to (5) *strongly agree*. The Cronbach's alpha of the scale is 0.85. According to previous studies, there are no published mean norms for this tool, so researchers conventionally use the median of their samples as a cut-off point to classify patients as having high or low PC [19,26].

Socio-demographic and general clinical characteristics

Other demographic and clinical variables that might predict the severity of symptoms status (after reviewing the literature) were

collected through patient's chart review: age, sex, residence, marital status, presence of social support, Body Mass Index (BMI), family history of CHD, current history of smoking, history of comorbidities e.g., diabetes mellitus (DM), hypertension (HTN), and heart failure etc.

Ethical considerations

The study was approved by Alexandria University's Faculty of Nursing Research Ethics Committee (approval number: 2022-9-34) and the selected hospitals prior to commencing data collection. Written approval was obtained from the administrative authorities in each hospital, after providing them with a full explanation of the study's purpose. Confidentiality and the right to refuse to participate in the study for all patients were assured. Informed consent was signed from each patient before their participation, after a full explanation of the study purpose and participant rights, including the right to withdraw without their healthcare services or statutory rights being affected. The consent process included permission to review participants' medical records.

Data collection

Eligible patients were recruited from the selected units after obtaining their consent and checking their hemodynamics at the time of data collection within a week after an episode of ACS. It was planned that if any patients experienced any instability or discomfort, the questionnaire would be suspended, and a cardiologist would be called; however, no such cases arose during the data collection process. Patients were asked to self-report DASS to rate their stress and anxiety levels. After completion the researcher provided patients with a symptom diary to rate their symptoms post-ACS event, and the patients were monitored frequently to

ensure that they completed the diary.

Data analysis

Data was analyzed using SPSS (v. 26.0) and descriptive statistics (means, standard deviations, numbers, and frequency distributions). Participants were divided into groups of low or high anxiety levels (median = 15), and groups low or high stress levels (median = 20). Despite the DASS providing a clear scoring category, this classification was for the total scores of the three subscales, while we used only two subscales of the scale. Participant characteristics were compared between two groups using independent t-test for continuous variables, and chi-square test was used for categorical variables. The study's main research question was answered by multiple linear regression statistical analysis.

RESULTS

Participant characteristics

A total of 255 patients participated in this study, comprising 186 males and 69 females, with a mean age of 52 years old. More than two-thirds of the sample was married, and 70.2% resided in urban cities. Nearly half of them were diagnosed with STEMI (48.2%), and most had a family history of CHD (58.4%). The patient's mean BMI was 28.17, and their mean PC score was 28.17 (Table 1).

Patient symptoms

As shown in Table 2, the mean scores for the ACS-related physical symptoms were 2.70 ± 0.46 for chest pain, 2.84 ± 0.37 for fatigue, and 2.94 ± 0.25 for dyspnea. The mean scores for psychological symptoms during ACS event were 19.84 ± 6.9 for stress, and 14.83 ± 4.6 for anxiety. Severe symptoms were reported by the majority of participants for chest pain (70.6%), fatigue (83.9%), and dyspnea (94.5%) (Figure 1).

Table (1): Sociodemographic and clinical characteristics of the participants (N = 255)

Characteristic	M±SD or N (%)
Age	52.4±6.80
Sex	
Male	186 (72.9)
Female	69 (27.1)
Marital status	
Married	161 (63.1)
Single/divorced/widowed	94 (36.9)
Residence	
Rural	76 (29.8)
Urban	179 (70.2)
Diagnosis	
Unstable angina	54 (21.2)
NSTEMI	78 (30.6)
STEMI	123 (48.2)
Presence of co-morbidities	251 (98.4)
Current smoker	136 (53.3)
Family history of CHD	149 (58.4)
Presence of social support	
Yes	176 (69.0)
No	79 (31.0)
BMI	28.17±6.41
PC score	27.56±2.39

Note. BMI: body mass index; NSTEMI: non-ST elevated myocardial infarction; STEMI: ST elevated myocardial infarction; CHD: coronary heart disease; PC: perceived control; CCU: Coronary care unit; LOS: Length of stay. Values are M±SD or n (%).

Table (2): Patients' physical and psychological symptoms

Symptoms	Mean (SD)
ACS-related physical symptoms	
Chest pain	2.70 (.46)
Fatigue	2.84 (.37)
Dyspnea	2.94 (.25)
Psychological symptoms during ACS event	
Stress	19.84 (6.9)
Anxiety	14.83 (4.6)

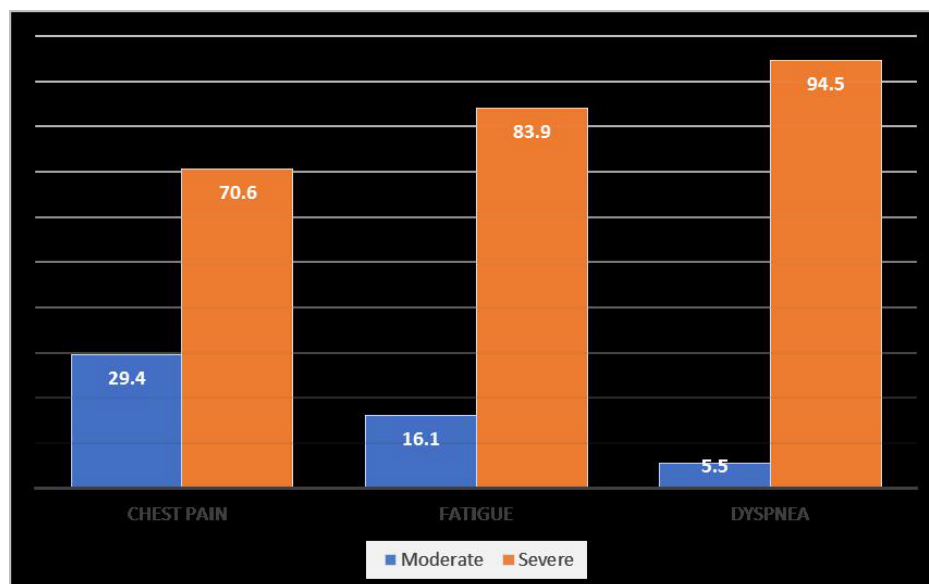


Figure (1): Symptoms severity

As shown in Table 3, all participants experienced negative emotions in the form of stress and anxiety, including 109 with low anxiety level (42.7%), and 146 with high anxiety level (57.3%). Participants differed

significantly in family history of CHD between groups with low ($p = .006$) and high ($p = .003$) anxiety levels; and PC level differed significantly between groups with low ($p = .004$) and high ($p = .000$) stress levels.

Table (3): Comparison of main study variables with categorical demographic/clinical variables

Variable		Anxiety level		t, χ^2 , P	Stress level		t, χ^2 , P
		Low (n = 109)	High (n = 146)		Low (n = 112)	High (n = 143)	
Gender	Male	80 (73.4%)	106 (72.6%)	0.20	85 (75.9%)	101 (70.6%)	0.882
	Female	29 (26.6%)	40 (27.4%)	0.888	27 (24.1%)	42 (29.4%)	0.348
Presence of co-morbidities	Yes	107(98.2%)	144 (98.6%)	0.087	112 (100%)	139 (97.2%)	3.183
	No	2 (1.8%)	2 (1.4%)	0.768	0 (0.00%)	4 (2.8%)	0.074
History of smoking	Yes	55 (50.5%)	81(55.5%)	0.632	60 (53.6%)	76 (53.1%)	0.005
	No	54 (49.5%)	65 (44.5%)	0.427	52 (46.4%)	67 (46.9%)	0.946
Family history of CHD	Yes	57 (52.3%)	92 (63.1%)	2.953	60 (53.6%)	89 (62.2%)	1.94
	No	52 (47.7%)	54 (36.9%)	0.006*	52 (46.4%)	54 (37.8%)	0.003*
Presence of social support	Yes	76 (69.7%)	100 (68.5%)	0.044	93 (83.1%)	83 (58.1%)	18.35
	No	33 (30.3%)	46 (31.5%)	0.83	19 (16.9%)	60 (41.9%)	0.000*
PC level		27.97±2.02	27.18±2.55	-2.65 0.004*	27.35±2.54	27.65±2.22	-0.979 0.05*

Note. t: t-test; χ^2 : chi-square; P, *P < .05.

Symptoms status predictors

As shown in Table 4, history of DM, HTN, and hyperlipidemia; PC level; and anxiety and stress scores were found to be independent predictors for all symptoms (chest pain, fatigue, and dyspnea). The presence of social support was found to be an independent predictor for chest pain (when social support

is available, the severity of chest pain decreases). Female sex was an independent predictor for both chest pain and fatigue, whereby females experienced more pain levels than male patients. Previous AMI was an independent predictor for only chest pain. The models described 15% of chest pain, 29% of fatigue, and 16% of dyspnea variance.

Table (4): Stepwise linear regression analysis for symptoms status predictors

Predictors	Standardized β	T	Model statistics
Chest pain			
Gender: Female	.200*	2.32	$R^2 = 15.2\%$, $F_{(10,244)} = 4.36$, $P = .000$
History of DM	.190*	2.56	
History of heart failure	.216*	2.85	
History of hyperlipidemia	.225**	3.49	
Previous AMI	.161*	2.22	
PC level	-.173*	2.15	
Presence of social support	-.196**	-2.78	
Anxiety score	.201*	2.42	
Stress score	.198*	2.14	
Fatigue			
Gender: Female	-.200*	2.32	$R^2 = 28.9\%$, $F_{(10,244)} = 9.93$, $P = .000$
History of DM	.259**	3.52	
History of HTN	.174**	2.82	
History of hyperlipidemia	.114*	1.93	
PC level	-.293**	-4.82	
Anxiety score	.364**	5.43	
Stress score	.246*	3.54	
Dyspnea			
History of DM	.177 *	2.25	$R^2 = 16\%$, $F_{(10,244)} = 5.74$, $P = .000$
History of HTN	.133*	2.02	
History of hyperlipidemia	.225**	2.22	
PC level	-.195**	-2.99	
Anxiety score	.318**	4.44	
Stress score	.231*	4.01	

Note. * $P < 0.05$, ** $P < 0.01$.

DISCUSSION

The purpose of this study was to identify the clinical and psychological predictors and ACS symptoms severity in Egypt. The main findings of this study showed that anxiety score, stress score, history of DM, HTN, and hyperlipidemia, and PC level were independent predictors for all symptoms,

chest pain, fatigue, and dyspnea. The results of this study are consistent with previous literature in regard to symptom severity in ACSPs [27,28]. Our findings also affirm the position that stress and anxiety are associated with symptom severity in ACSPs [6,8].

Anxiety and stress each affect symptom severity in ACSPs through different potential

mechanisms. Physiologically, both stress and anxiety stimulate the sympathetic nervous system, impair platelet functioning, motivate inflammatory processes, and lead to hypercholesterolemia [29]. Anxiety increases the mortality rate by increasing the risk from ventricular arrhythmias and consequently sudden cardiac death [30]. Behaviorally, anxious and stressed patients will neglect their self-care and dietary regimen, and fail to follow the prescribed medications [6-11]. Previous studies which did not show a significant relation between stress and anxiety and symptom severity had fundamental limitations, including the fact that stress and anxiety measures included confounding somatic symptoms such as fatigue and shortness of breath [5,7,16,31].

Gender is another predictor for symptom severity among ACSPs. The female sex in this study was an independent predictor for both chest pain and fatigue symptoms, whereby females experienced more pain levels than male patients, as reflected in increased stress and anxiety scores among female patients. Limited functional and mental capabilities among female ACSPs could contribute to increased symptom severity [6,8,15].

Social support includes the visible and objective material or emotional support that individuals obtain from their social network relationships and the emotional experience of feeling respected, supported, and understood in society. Many studies have shown that perceived social support is more natural and effective for individuals, and can better predict their mental health levels. In our study, social support was found to be one of the predictors of symptom severity. Previous studies showed that patients who did not receive social support had higher levels of stress and anxiety than patients who did [32-35], and the current study's findings support

a positive relationship between social support and symptoms severity. Stress and anxiety are commonly prevalent in contexts wherein patients have poor social support and isolation, rather than being attributable mainly to biomedical causes *per se* [4,35,36].

PC was found to be an important factor for the health-related quality of life of ACSPs. The results of the current study showed that PC level was independent predictor for symptoms severity, and previous studies reported that patients with high PC may develop low levels of stress and anxiety, which in turn leads to decreased symptoms severity [9,20,31]. Based on these findings, it is highly recommended that ACSPs be screened and treated for stress and anxiety.

Strengths and limitations

This study identified clinical and psychological predictors of symptoms severity among ACSPs, and the findings alert clinicians to the importance of these factors. The outcomes of this study call for more attention to managing ACS symptoms with a more holistic approach, to improve quality of care and disease prognosis. On the other hand, clinical depression was not assessed in this study, because it entails more extensive assessment (during the index of admission, and at 30 days after discharge). Our methods excluded the depression assessment component of the DAS scale, as it was not practically feasible to include this aspect due to the short duration of follow-up. Hence, our findings should be replicated with a larger study, with a longer follow-up period, monitoring clinical depression, in order to guide future screening for depression in ACSPs.

CONCLUSIONS

This study revealed that anxiety and stress levels might be predictors of increase symptoms severity, whereas history of DM, HTN, and hyperlipidemia, and PC level were

independent predictors for all symptoms, chest pain, fatigue, and dyspnea. More attention should be directed by nurse clinicians toward patients' experiences of negative emotions, clinical conditions, and PC levels. It is recommended to integrate the assessment of psychological status and PC level into the daily routine practice. Future research is needed using qualitative methods to understand the perceptions of patients about predictors of ACS symptom severity.

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Ethics approval statement: This study has been contacted according to the Declaration of Helsinki 1964. The study was approved by the Research Ethics Committee of the Faculty of Nursing, Alexandria University.

Patient consent statement: Each participant signed informed consent before participating in this study.

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Clinical trial registration:

Not applicable

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المؤشرات السريرية والنفسية وشدة أعراض متلازمة الشريان التاجي الحادة

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الملخص

خلفية الدراسة والأهداف : تُعدّ مصر دولة منخفضة الدخل، حيث شكّلت 16% من وفيات أمراض القلب والأوعية الدموية في منطقة الشرق الأوسط وشمال أفريقيا، والبالغة 1.3 مليون حالة، عام 2015. وتختلف السياقات الثقافية والاجتماعية والمعتقدات الدينية المصرية التقليدية عن تلك السائدة في الدول الغربية ذات الدخل المرتفع، حيث تُجرى معظم أبحاث أمراض القلب والأوعية الدموية، مما قد يُؤثّر بشكل كبير على الاستجابات النفسية للمرضى للمرض الحاد. لذلك، هدفت هذه الدراسة إلى تحديد العوامل السريرية والنفسية المُتنبئة في مرحلة مُبكرة من مسار مرض متلازمة الشريان التاجي الحادة.

منهجية الدراسة : في هذه الدراسة المقطعية، قيسَت أعراض 255 مريضًا بمتلازمة الشريان التاجي الحادة في ثلاثة مستشفيات جامعية بالإسكندرية، مصر، باستخدام المقاييس الفرعية للقلق والتوتر للاكتئاب والقلق والتوتر (DASS-21) ومقياس المواقف العربية المُتحكّم بها (CAS-R). واستُخدم تحليل الانحدار الخطي المتعدد لتحديد العوامل السريرية والنفسية المُتنبئة لشدة الأعراض.

النتائج: كان تاريخ الإصابة بمرض السكري، وارتفاع ضغط الدم، وفرط شحميات الدم، ودرجات التحكم المُدركة، والقلق، والتوتر، مُنبئات مستقلة لجميع الأعراض المدروسة (ألم الصدر، والتعب، وضيق التنفس). وقد أظهرت النماذج تباينًا بنسبة 15% لألم الصدر، و29% للتعب، و16% لضيق التنفس.

الاستنتاجات : كشفت هذه الدراسة أن مستويات القلق والتوتر تُنبئ بزيادة شدة الأعراض، بينما كان تاريخ الإصابة بمرض السكري، وارتفاع ضغط الدم، وفرط شحميات الدم، ودرجة التحكم المُدركة، مُنبئات مستقلة لجميع الأعراض (ألم الصدر، والتعب، وضيق التنفس).

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