



# Discovering the Relationship between Anxiety or Depression and Risk Factors of Coronary Artery Disease

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## Abstract

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**BACKGROUND:** Psychosocial problems, including anxiety or depression, potentially activate several mechanisms that affect coronary artery disease (CAD) cardiovascular risk factors. Their clinical association, however, remains undiscovered.

**AIM:** The objective of this study was to discover the association between the prevalence of anxiety or depression and risk factors of CAD.

**METHODS:** A cross-sectional study was conducted from July to October 2019. Subject population was CAD patients hospitalized in the Cardiac Care Unit at Hasan Sadikin General Hospital Bandung. We included patients with a history of CAD who underwent revascularization and filled the Hospital Anxiety and Depression Scale (HADS) questionnaire before discharge. Patients were classified according to normal (HADS score of 0–7) or abnormal levels of anxiety or depression (HADS score of 8–21). From each patient, we obtained information on risk factors of CAD, including smoking, physical inactivity, dyslipidemia, hypertension, diabetes mellitus (DM), and family history of CAD.

**RESULTS:** Ninety-nine CAD patients (79% male, mean age:  $59 \pm 10.5$  years) were included in the study; 40% were smokers, 60% had physical inactivity, 11% had dyslipidemia, 57% had hypertension, 13% had DM, 7% had a family history of CAD, and 23% subjects had abnormal levels of anxiety or depression. The relationship between anxiety or depression in CAD patients and smoking behavior ( $p = 0.802$ ), family history of CAD ( $p = 0.563$ ), dyslipidemia ( $p = 0.738$ ), hypertension ( $p = 0.283$ ), and DM ( $p = 0.403$ ) was not statistically significant.

**CONCLUSIONS:** The present study showed that the prevalence of anxiety or depression in CAD patients was relatively moderate. We revealed that psychosocial factors are not associated with risk factors of CAD, stressing that psychosocial factors are independent of conventional CAD risk factors in CAD and merit attention for individual management.

## Introduction

Coronary artery disease (CAD) is a significant cause of mortality in Indonesia and has a considerable psychosocial impact on the patient. Psychosocial impacts, including anxiety and depression, were common issues experienced by CAD patients, which might contribute to their compliance with treatment and strongly affect their overall quality of life [1]. During hospitalization for a cardiac event, 20% patients meet diagnostic criteria for 30% experience severe anxiety. After an acute cardiac event, patients who have psychological problems are at higher risk of a subsequent cardiac event and death [2]. Several psychosocial problems have been associated with the development of atherosclerosis, including depression, anxiety disorders, resentment, poor social support, chronic life stressor, and low socioeconomic status. Studies have shown that treatment of psychosocial problems could alleviate cardiac disease symptoms and reduce patients' morbidity and disabilities, ultimately improving their quality of life [1]. Therefore, it is essential to identify CAD patients at risk of anxiety or depression, especially after an acute cardiac event, to give prompt supportive or preventive measures [2].

Plausible mechanisms for the associations between CAD and psychosocial problems have been proposed, such as activation of the sympathetic nervous system, abnormal hypothalamic pituitary adrenal axis, inflammation, platelet activation, and promoting prothrombotic vascular environment [1], [3], [4], [5]. These activations might increase the risk of hypertension, smoking behavior, and diabetes mellitus (DM) as the conventional cardiovascular risk factors in CAD [4]. Controlling psychosocial factors may enhance achieving the cardiovascular risk factor target; however, their clinical association remains undisclosed. The objective of the present study was to discover the association between conventional risk factors of CAD and the prevalence of anxiety or depression in CAD patients.

## Methods

### Study population

A cross-sectional study was conducted from July to October 2019. Subject population was CAD patients

hospitalized in the Cardiac Care Unit at Hasan Sadikin General Hospital Bandung. The study was performed according to the principles of Declaration of Helsinki Version and in accordance with the Medical Research Involving Human Subjects Act and was approved by the institutional Ethics and Research Committees (LB.02.01/X.6.5/339/2021). Informed consents were obtained verbally from participants. We included patients with a history of acute coronary syndrome or post revascularization chronic coronary syndrome who filled the hospital anxiety and depression scale (HADS) questionnaire before discharge. The exclusion criteria were subjects who had a history of definite psychiatric disorders. From each patient, we obtained information on cardiovascular risk factors, including DM, dyslipidemia, hypertension, smoking status, physical activity levels, and family history of cardiovascular diseases.

### HADS questionnaire

HADS has been known to be one of the most adapted and utilized scales for screening anxiety and depression. HADS has been considered a reliable self-assessment instrument for depression and anxiety detections for hospitalized patients and outpatients in developed countries [6], [7]. HADS scoring is simple, easy to use, and not time-consuming and, thus, might be suitable for screening. The HADS questionnaire was adopted to the Indonesian language for Indonesian respondents. The questionnaire consists of subscales of anxiety and depression (seven questions for each). Each questions comprised items rated on four-point Likert scales (0, 1, 2, 3). Scores for each question of depression and anxiety were summed individually and patients were classified according to normal (HADS score of 0–7) or abnormal levels of anxiety and/or depression (HADS score of 8–21).

### Statistical analysis

Descriptive analysis included the frequency of subjects' clinical characteristics, median, and interquartile range of HADS score. The relationship between risk factors of CAD and anxiety or depression was analyzed by Chi-square. Data analysis was performed using SPSS 20.0. A  $p < 0.05$  was considered statistically significant.

## Results

The present study included 99 CAD patients (79% male, mean age:  $59 \pm 10.5$  years). Table 1 presents that 40% were smokers, 60% had low physical activity, 11% had dyslipidemia, 57% had hypertension, 13% had DM, and 7% had a family history of CAD.

**Table 1: Patient characteristics**

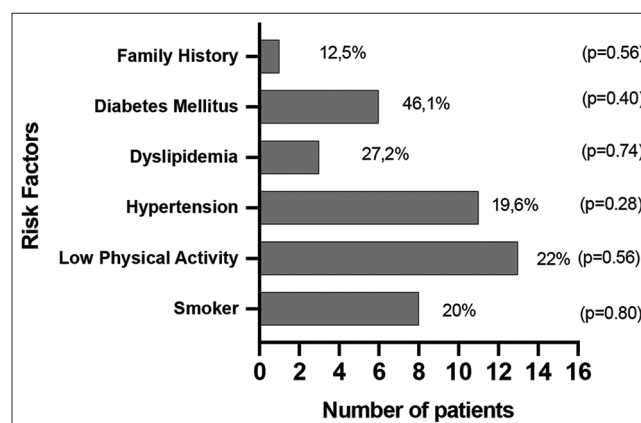
Characteristics	Mean $\pm$ SD or frequency (percentage)
Age	$59 \pm 10.5$ years
Male Gender	78 (79%)
Smoker	40 (40%)
Low physical activity	59 (60%)
Hypertension	56 (57%)
Dyslipidemia	11 (11%)
Diabetes mellitus	13 (13%)
Family history	7 (7%)

Table 2 shows that of all subjects, 21 (21%) and 4 (4%) had abnormal anxiety and depression levels, respectively.

**Table 2: Scores of anxiety and depression subscales**

HADS	Median (IQR)	Normal (%)	Abnormal (%)
Anxiety	5 (0.7)	78 (79)	21 (21)
Depression	2 (0.4)	95 (96)	4 (4)

Of these subjects, two patients had both abnormal levels of anxiety and depression; therefore, in this study, 23 patients (23%) had abnormal anxiety or depression levels. The median (1<sup>st</sup> and 3<sup>rd</sup> quartile) scores of HADS score were 5 (0.7) and 2 (0.4) in terms of anxiety and depression, respectively. The relationship between anxiety or depression in CAD patients and smoking ( $p = 0.802$ ), family history of CAD ( $p = 0.563$ ), dyslipidemia ( $p = 0.738$ ), hypertension ( $p = 0.283$ ), and DM ( $p = 0.403$ ) were not statistically significant (Figure 1).



**Figure 1:** The clinical association between anxiety or depression in CAD patients and risk factors of CAD. Numbers beside the graph indicate the percentage number of patients with high HADS Scores in each risk factor

## Discussion

Physiological coping mechanisms during psychological challenges involve the hypothalamic-pituitary-adrenal axis, higher sympathetic responses, and dysregulation of cardiovascular, metabolic, and immune systems. These coping mechanisms act in concert to protect the body from stressors. Unfortunately, adverse metabolic consequences can ensue if the individual fails to adapt to a repeated or

continuous build-up of stressors. Chronic stressors could potentiate risk factors for cardiovascular disease (such as increased blood pressure and reduced insulin sensitivity) or influence alteration in behaviors (such as medical non-compliance, smoking, or sedentary lifestyle) that lead to coronary atherosclerosis [5].

Components of metabolic syndrome (obesity, hyperglycemia, hypertension, and dyslipidemia) have been associated with several indices of chronic psychological stress, including anxiety and depression. The risk of developing metabolic syndrome or diabetes increases in patients with chronic depressive symptoms. Considerable evidence stipulates that anxiety or depression has both behavioral and pathophysiological effects on the development of CAD. In terms of behavior, depression is associated with an unhealthy lifestyle, smoking, and poor patient compliance. Direct pathophysiological impacts of anxiety or depression toward the development of CAD involve several mechanisms, including increased glucocorticoid levels, significant impairments in platelet function, reduced heart rate variability, increased sympathetic stimulation, and dysregulation of vagal control [5], [8]. These mechanisms might correlate with hypertension, smoking behavior, sedentary lifestyle, or reduced insulin sensitivity, suggesting a direct or indirect association between depression and anxiety in CAD patients with these risk factors for CAD.

The present study showed relatively low scores for HADS in most CAD patients, and one in four CAD patients had anxiety or depression, according to HADS. Dixon *et al.* demonstrated that in post-acute myocardial infarction patients assessed using HADS, 13.6% showed moderate and severe anxiety, and 7.3% showed moderate or severe depression at 3 months [9]. The low scores of anxiety and depression in CAD patients might indicate that most of them were coping well; they probably accepted the disease and improved their lifestyles through the cardiac rehabilitation program.

The present study showed that anxiety or depression in CAD patients was not associated with risk factors of CAD. These findings suggested that anxiety or depression in CAD patients is more likely related to psychosocial factors than conventional CAD risk factors. Murphy *et al.* and Deo *et al.* showed that several factors consistently associated with increased anxiety and depression risk were history of depression, low socioeconomic status, poor illness cognition, younger age, and smoking. In contrast, obesity, diabetes, and unpartnered were less significant risk factors [2], [10]. Although smoking was identified as an important risk factor in the previous study, our study failed to show a similar result which might be caused by the higher number of smokers and lower prevalence of anxiety or depression in the present study [2].

ESC Guideline on Cardiovascular Disease Prevention in Clinical Practice 2021 stated that psychosocial stress is one of the risk modifiers of

CAD. Thus, it is associated with the development and progression of CAD independently of conventional CAD risk factors. Due to the importance of physical stress symptoms among CAD patients, several guidelines and scientific statements recommend screening CAD patients for psychological stress, including anxiety or depression [11]. The previous studies reported favorable effects of screening for depression in patients with recent acute coronary syndrome and subsequent management of psychosocial stress could improve long-term cardiac outcomes, stressing the importance of early detection of anxiety, or depression in CAD patients [12].

There are study limitations that should be noted. First, this was a cross-sectional study; therefore, it might not guarantee to be representative in analyzing behavior over a period of time. However, this study design was preferred to analyze multiple variables at a specific time. As we aimed to investigate numerous conventional CAD risk factors and anxiety or depression in CAD patients, this study design was deemed appropriate to analyze assumptions as the beginning to explore further research. Since we used a cross-sectional method, we cannot conclude whether anxiety or depression is risk factors for CAD or whether CAD causes anxiety or depression. Second, a small number of patients with anxiety or depression in CAD patients might bias its association with the risk factors of CAD. However, small subjects with anxiety or depression showed that most CAD patients had probably coped well. Conventional CAD risk factors, which, at first, were thought to be related to anxiety or depression in CAD, apparently had no association, stressing that psychosocial factors are independent of conventional CAD risk factors and merit attention for individual management.

## Conclusions

The present study showed that the prevalence of anxiety or depression in CAD patients is relatively moderate, almost 25%. We revealed that psychosocial factors are not associated with cardiovascular risk factors. However, as the psychosocial factor is known as a risk modifier of CAD independent of conventional risk factors, early detection, and management of anxiety or depression in CAD patients are essential to improve long-term cardiac outcomes.

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