



Investigating The Mediating Role of Depression and Anxiety in The Relationship Between Stress Management and Mental Health in Cardiovascular Patients

Mitra Teymouri¹, Mahtab Moraveji², Zahra Sadat Goli^{3*}, Zahra Karbasian⁴, Behrooz Malleknejad⁵

¹ M.A Student in Clinical Psychology, Department of Psychology, International Kish Campus, Kish, Iran

² Associate Professor, Department of Nursing and Midwifery, Zanjan Branch, Islamic Azad University, Zanjan, Iran

³ Assistant Professor, Department of Psychology, Kashan Branch, Islamic Azad University, Kashan, Iran

⁴ Ph.D Student in Health Psychology, Department of Psychology, International Kish Campus, Kish, Iran

⁵ M.A. in Educational Technologies, Department of Educational Sciences, South Tehran Branch, Islamic Azad University, Tehran, Iran

* Corresponding author email address: Golim.psych@gmail.com

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ABSTRACT

Cardiovascular disease (CVD) remains one of the leading causes of mortality worldwide among both men and women. This study aims to investigate the mediating roles of depression and anxiety in the relationship between stress management and mental health in patients with cardiovascular disease. This descriptive correlational study utilized a structural equation model. The study population comprised cardiovascular patients in Kashan city in 2022. Sixty cardiovascular patients from Shahid Beheshti Hospital in Kashan were selected through convenience sampling. Participants completed the Mental Health Inventory (Keyes, 2002), the Stress Management Scale (Kobin et al., 1990), and the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). Data were analyzed using SPSS version 22 and SmartPLS software, employing Pearson correlation tests and structural equation modeling. Results indicated a negative and significant correlation between stress management and both depression and anxiety. Additionally, a positive and significant correlation was found between stress management and mental health. Anxiety mediated the relationship between stress management and mental health, whereas depression did not. It is recommended that treatment plans for cardiovascular patients should incorporate strategies addressing anxiety, depression, and stress management.

Keywords: Cardiovascular disease, Stress management, Mental health, Anxiety, Depression

1. Introduction

Cardiovascular disease (CVD) is the leading cause of mortality worldwide among both men and women (Norris et al., 2020). Women with CVD tend to be older, have more comorbid conditions such as physical inactivity, obesity, dyslipidemia, anxiety, and depression, and face a higher mortality risk compared to men (1). Mental health conditions are a significant but often overlooked risk factor for premature CVD (2, 3). Increasing evidence highlights the connection between mental health disorders and CVD, as well as conditions like hypertension, type 2 diabetes (T2D), obesity, and dyslipidemia (3). These associations often stem from emotional disorders linked to risky health behaviors (4). Additionally, certain psychiatric medications, such as atypical antipsychotics, may elevate the risk of CVD (3).

Goldman and colleagues (2006) define mental health as the optimal functioning of an individual in daily activities, interpersonal relationships, and the ability to adapt to internal and external changes while effectively handling life's challenges (5). Research by Heidari Sabet et al. (2020) demonstrated that spiritual health, social support, and psychological capital significantly enhance health-promoting behaviors among individuals with CVD (6).

Exposure to acute stress and mental health conditions, particularly when combined with certain medications, can increase the risk of cardiometabolic diseases from childhood (7). Stress is defined as the perception that demands exceed an individual's personal and social resources (8). It encompasses a series of events triggering a brain response (stress perception) and subsequent physiological reactions (stress response) (9). Effective stress management involves recognizing and coping with life's stressors and their impacts (10). Studies have shown that stress management programs can improve both physical and mental health (11).

Psychological factors significantly influence the development and exacerbation of heart disease. These factors include defense mechanisms, coping methods, stress, anxiety, depression, mood and communication disorders, aggression, generalized anxiety disorder, interpersonal hostility, obsessive thoughts and behaviors, and pathological fears (12). Anxiety, one of the most common psychological disorders, is associated with numerous complications and is often chronic and treatment-resistant. Depression, characterized by persistent sadness and a lack of interest in

pleasurable activities, significantly affects behavior, attitude, thinking, and physiological functions (13).

Emotional states such as anger, hostility, anxiety, and depression are linked to the progression of CVD (Xu et al., 2022). Effective stress management can help patients identify and modify dysfunctional thoughts, reducing anxiety and depression and thereby improving mental health (14, 15). Cognitive-behavioral stress management has been shown to reduce depression and anxiety and increase resilience in cardiovascular patients (16).

Considering the significant role of psychological factors in the mental health of cardiovascular patients, it is crucial for treatment teams to address these issues comprehensively. This study aims to fill the research gap by examining the mediating roles of depression and anxiety in the relationship between stress management and mental health in cardiovascular patients.

2. Methods and Materials

2.1. Study Design and Participants

The current research was descriptive of the correlation type and used the structural equation model. The statistical population of this research included all cardiovascular patients of Kashan city in 2022. From this population, 60 cardiovascular patients referred to Shahid Beheshti Hospital in Kashan, who had a minimum level of education, were selected by available sampling method. To conduct this research, after identifying the target centers and estimating the required sample size, necessary permits were obtained. The researcher then visited Shahid Beheshti Hospital in Kashan to explain the research objectives and ethical considerations, such as confidentiality and voluntary participation. Informed consent was obtained from all participants before they completed the questionnaires.

2.2. Measures

2.2.1. Anxiety and Depression

The Hospital Anxiety and Depression Scale (HADS) was designed by Zigmon and Snaith (1983). This fourteen-item scale measures mood changes, particularly anxiety and depression. Seven questions pertain to anxiety symptoms (questions 1, 4, 5, 8, 9, 12, and 13) and seven questions

address depression symptoms (questions 2, 3, 6, 7, 10, 11, and 14). The questionnaire is scored on a four-point scale (0 to 3), with scores of 11 or higher indicating clinical significance. Kaviani (2009) reported a validity alpha of 0.70 for the depression subscale and 0.85 for the anxiety subscale, with reliability coefficients of 0.77 and 0.81, respectively (17).

2.2.2. Mental Health

The current research used the Keyes Mental Health Standard Questionnaire (2002) to measure mental health. This questionnaire includes 14 questions divided into three components: emotional well-being, psychological well-being, and social well-being. Responses are measured on a six-point Likert scale (1 = never to 6 = every day), with possible scores ranging from 14 to 84. Scores between 14 and 28 indicate low mental health, scores between 28 and 56 indicate average mental health, and scores above 56 indicate high mental health. Ghalami and Shoa (2019) reported a Cronbach's alpha of 0.88 for this questionnaire (18).

2.2.3. Stress Management

The standard Stress Management Strategies Scale was created by Kobin et al. (1990, as cited by Akbari, 2013). This 33-item scale uses a five-point Likert scale (1 = completely disagree to 5 = completely agree) and includes dimensions such as optimism, time management, recreational activities, exercise, body rest, and patience. Akbari (2012) reported high validity and reliability for this scale, with Cronbach's alpha values indicating high reliability for each dimension (8, 19).

2.3. Data Analysis

Data were analyzed using SPSS version 22 and SmartPLS software, utilizing Pearson correlation tests and path analysis models.

3. Findings and Results

The findings of the present study indicated that from the sample group of cardiovascular patients, there were 29 women (48.3%) and 31 men (51.7%), with an average age of 43.71 years. Additionally, 63.3% of the participants had an education level below a diploma.

Table 1

Mean and Standard Deviation of Research Variables

Variable	Average	Standard Deviation
Emotional well-being	6.76	2.72
Mental well-being	12.58	5.19
Social well-being	10.63	4.18
Total mental health score	29.98	10.86
Depression	12.83	5.08
Anxiety	13.33	5.01
Create a sense of optimism	7.68	2.81
Time Management	8.06	3.20
Recreational activities	8.76	3.26
Sport	7.96	3.83
Body rest	8.63	2.92
The patient stone of placing others	7.65	2.38
Diet	7.70	2.87
Total stress management score	56.40	16.91

According to Table 2, the correlation between anxiety and mental health is negative and significant ($r = -0.60$). The correlation between anxiety and stress management is negative and significant ($r = -0.48$). The correlation between depression and mental health is negative and significant ($r = -0.65$). The correlation between depression and stress

management is negative and significant ($r = -0.58$). Also, the correlation between stress management and mental health is positive and significant ($r = 0.75$).

To model the mediating role of depression and anxiety in the relationship between stress management and mental health in cardiovascular patients, variance-oriented

structural equation modeling was used. The results of the structural equation model are presented in Figure 1 and Figure 2. These figures illustrate the relationships between the variables and the coefficients of each. The numbers on the lines are the standardized beta coefficients resulting from

the regression equation between variables, known as path coefficients. The numbers inside the blue circles are the coefficients of determination, indicating the amount of explanation of the dependent variable by the independent variables.

Table 2

Correlation between Managing Stress, Anxiety, Depression, and Mental Health

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Anxiety	1													
2. Depression	0.58*	1												
3. Emotional well-being	-0.52*	-0.52*	1											
4. Mental well-being	-0.62*	-0.56*	0.87*	1										
5. Social well-being	-0.58*	-0.54*	0.65*	0.54*	1									
6. Mental health	-0.65*	-0.60*	0.83*	0.88*	0.60*	1								
7. Optimism	-0.45*	-0.32*	0.59*	0.63*	0.59*	0.70*	1							
8. Time	-0.48*	-0.42*	0.50*	0.62*	0.66*	0.58*	0.50*	1						
9. Entertainment	-0.50*	-0.43*	0.67*	0.65*	0.62*	0.60*	0.57*	0.48*	1					
10. Sport	-0.35*	-0.36*	0.65*	0.64*	0.59*	0.50*	0.48*	0.43*	0.36*	1				
11. Physical rest	-0.64*	-0.43*	0.72*	0.71*	0.68*	0.69*	0.60*	0.52*	0.43*	0.35*	1			
12. Patience of others	-0.47*	-0.34*	0.49*	0.35*	0.35*	0.24*	0.27*	0.24*	0.15*	0.24*	0.15*	1		
13. Diet	-0.37*	-0.33*	0.39*	0.65*	0.58*	0.57*	0.58*	0.57*	0.49*	0.48*	0.34*	0.33*	1	
14. Stress management	-0.53*	-0.48*	0.79*	0.87*	0.83*	0.83*	0.73*	0.75*	0.68*	0.69*	0.62*	0.58*	0.48*	1

*p<0.01

The coefficients estimated in Table 3 indicate the effectiveness of the model. In the first column, the value of the standard effect coefficient, the t test value, the R² value, the significance level, and the path result are reported. For instance, the effect of stress management on anxiety is significant at the 95% confidence level, with a p-value of

0.000 and a t test value of 4.879, resulting in a significant effect coefficient of -0.503. Similarly, stress management significantly affects depression, anxiety affects mental health, and stress management affects mental health. However, the effect of depression on mental health is not significant.

Table 3

Estimation of Regression Coefficients in Direct and Indirect Relationships of the Research Model

Main Hypothesis of the Research	Coefficients and Value of t Test	Direct Impact	R ²	Significance Level	Result of the Hypothesis
Stress management → Anxiety	Standard coefficients	-0.503	0.253	0.000	Confirmed
	Test amount t	4.879			
Stress management → Depression	Standard coefficients	-0.611	0.373	0.000	Confirmed
	Test amount t	8.786			
Anxiety → Mental health	Standard coefficients	-0.254	0.669	0.015	Confirmed
	Test amount t	2.434			
Depression → Mental health	Standard coefficients	-0.190	0.669	0.137	Rejected
	Test amount t	1.488			
Stress management → Mental health	Standard coefficients	0.512	0.669	0.002	Confirmed
	Test amount t	3.071			
Stress management → Anxiety → Mental health	Standard coefficients	0.127	0.669	0.019	Confirmed
	Test amount t	2.344			
Stress management → Depression → Mental health	Standard coefficients	0.116	0.669	0.145	Rejected
	Test amount t	1.459			

Figure 1

Model with Standard Coefficients

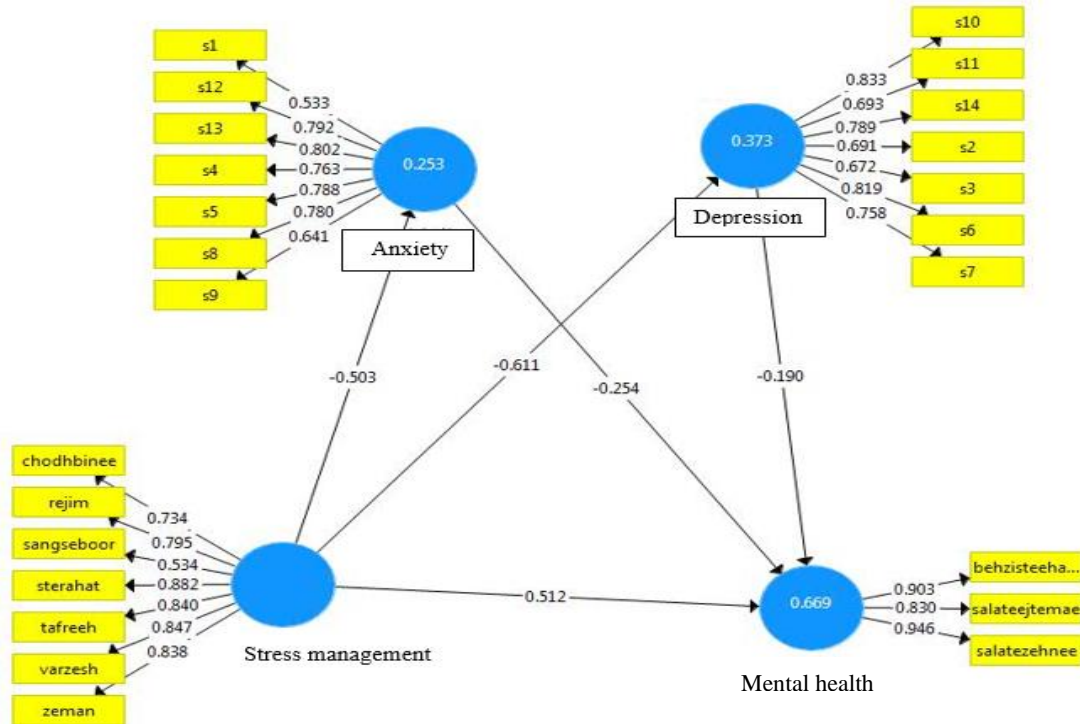
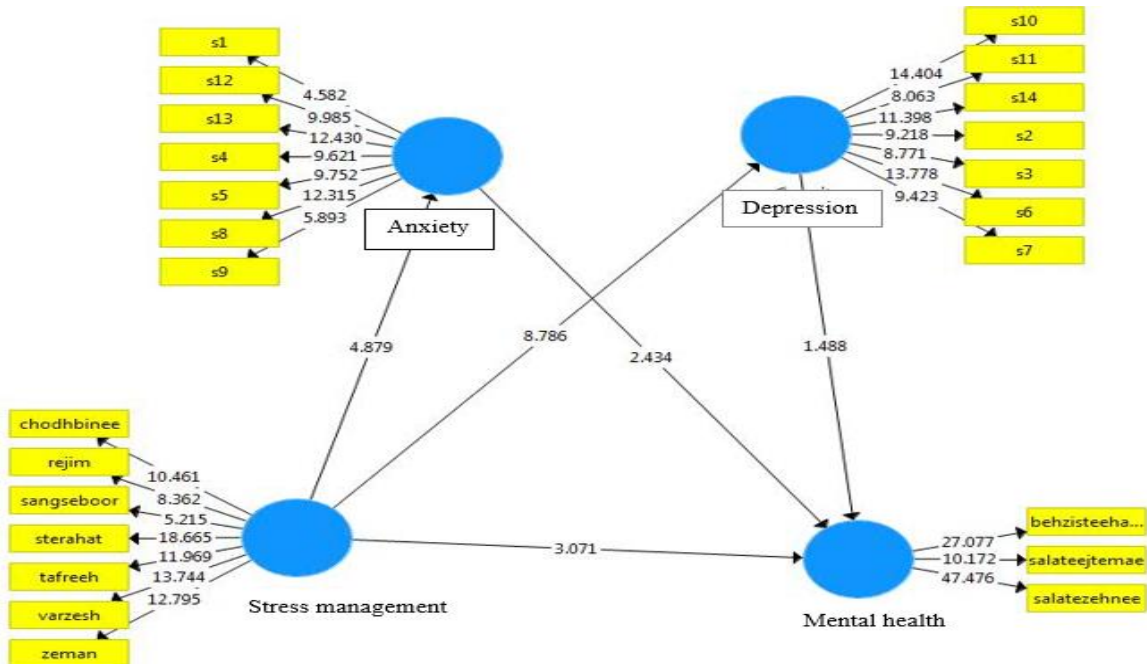


Figure 2

Model with T-Values



In PLS modeling, the average variance extracted (AVE) is used to evaluate the measurement model. AVE values above 0.5 indicate that the construct explains at least 50% of the variance of its indicators, signifying acceptable convergent validity.

Composite reliability, or the Dillon-Goldstein criterion, evaluates the reliability of each indicator separately. Values

greater than 0.7 indicate acceptable reliability, making it a better measure than Cronbach's alpha for internal consistency.

Cronbach's alpha assesses the internal consistency of the model, with values above 0.7 being acceptable and values below 0.6 considered unfavorable.

Table 4

General Model Quality Criteria

Local Variables	Convergent Validity Index (AVE > 0.5)	Composite Reliability Index (CR > 0.7)	Cronbach's Alpha (Alpha > 0.7)
Anxiety	0.540	0.890	0.855
Depression	0.567	0.901	0.872
Mental health	0.800	0.923	0.873
Stress management	0.623	0.919	0.894

According to Table 4, the values of convergent validity index, composite reliability index, and Cronbach's alpha indicate a suitable fit for the model.

Divergent validity measures the degree to which a construct is more strongly related to its indicators than to

other constructs. Fornell and Larcker (1981) state that AVE values should be greater than the shared variance between constructs to indicate acceptable divergent validity.

Table 5

Matrix of Divergent Validity Assessment by Fornell and Larcker Method

Structure	Anxiety	Depression	Mental health	Stress management
Anxiety	0.753			
Depression	0.58*	0.753		
Mental health	-0.62*	-0.54*	0.894	
Stress management	-0.53*	-0.48*	0.79*	0.789

*p<0.01

In Table 5, the main diagonal values are the AVE values of the first-order latent variables, and the values below the diagonal are the correlations between variables. The diagonal values are higher, indicating appropriate divergent validity and a good fit for the measurement models.

The predictive ability of the model was evaluated using the Stone Geisser test (Q²). A positive Q² indicates high predictability of the model.

Table 6

Q² Values in the Structural Fit of the Structural Equation Model

Dependent Variable	SSO	SSE	Q ² (1-SSE/SSO)
Anxiety	420.0	372.547	0.113
Depression	420.0	344.731	0.179
Mental health	180.0	96.269	0.465
Stress management	420.0	420.0	

The values in Table 6 show that the Q² coefficient is above zero for the relevant variables, indicating an

appropriate fit and predictive power of the independent variables.

The general fit of the model, which includes both measurement and structural parts, is evaluated using the GOF standard. Values of 0.01, 0.25, and 0.36 represent weak, moderate, and strong overall fit, respectively.

The common values (Q^2) and R^2 values for the research variables indicate the model's predictive relevance and explanatory power. Specifically, the Q^2 value for anxiety is 0.527, with an R^2 value of 0.113, suggesting moderate predictive relevance and low explanatory power. Depression has a Q^2 value of 0.580 and an R^2 value of 0.179, indicating a slightly higher predictive relevance and explanatory power than anxiety. Mental health exhibits a Q^2 value of 0.494 and an R^2 value of 0.465, demonstrating substantial predictive relevance and high explanatory power within the model. The overall goodness-of-fit (GOF) for the model is calculated as 0.367, which falls within an acceptable range, indicating a moderate fit of the structural model to the data.

4. Discussion and Conclusion

The aim of the present study was to investigate the mediating role of depression and anxiety in the relationship between stress management and mental health in cardiovascular patients. The results indicated a significant relationship between anxiety, stress management, and mental health in cardiovascular patients, with anxiety playing a mediating role in the relationship between stress management and mental health. This finding aligns with the prior research (11, 14, 15, 19).

Stress is understood as the result of the interaction between an individual's cognition and their environment. The interpretation of events and the judgment of situations play crucial roles. Stress occurs when a situation is perceived as threatening, challenging, or dangerous. Effective stress management enhances individuals' ability to reduce stress and adapt to stressful situations. Given that heart disease itself is a significant stressor, it disrupts patients' emotional and physiological states, leading to increased vulnerability to anxiety and depression. Stress management can mitigate these effects by helping individuals re-evaluate their self-perceptions and coping mechanisms (14).

Psychological symptoms are critical factors for individuals with cardiovascular disease and should be a focus during treatment. These symptoms often peak during the disease and exacerbate related problems. Since

cardiovascular diseases can be fatal and affect the biological, psychological, and social dimensions of individuals, it is essential to address general health and specifically the issues of depression and anxiety in these patients (16). Severe emotional stress such as anger, fear, or sadness can trigger cardiac arrhythmias due to the heart's sensitivity and low tolerance for such stress. Consequently, high levels of depression and anxiety increase the risk of cardiovascular events in patients. Conversely, individuals who effectively manage and control stress tend to have better mental health. Stress management skills, including creating optimism, time management, recreational activities, physical exercise, body rest, dietary regulation, and patience, can reduce emotional problems related to depression, anxiety, and stress, thereby enhancing mental health in cardiovascular patients (20).

The findings of the present study suggest that stress management acts as a protective factor against mental distress such as anxiety, thereby maintaining the mental health of cardiovascular patients. However, the results showed that depression did not play a mediating role in the relationship between stress management and mental health in these patients, aligning with the prior findings (8, 11, 16, 19). This absence of correlation suggests that socio-economic factors and other background variables may influence this relationship, warranting further studies.

Like other studies, the current research faced certain limitations. The sample was specific to cardiovascular patients referred to Shahid Beheshti Hospital in Kashan, potentially limiting the generalizability of the results to other populations. Additionally, the data were collected using self-report questionnaires, which may have introduced biases or ambiguities in responses. Future research should consider a systemic approach to treatment and empowerment programs for cardiovascular patients, incorporating family, psychological, and healthcare factors to facilitate the healing process comprehensively.

Authors' Contributions

M.T. conceptualized the study, designed the research methodology, and supervised the overall project implementation. M.M. was responsible for data collection, assisted in participant recruitment, and contributed to the literature review. Z.S.G. performed the data analysis using SPSS and SmartPLS software, interpreted the results, and

participated in drafting the manuscript. Z.K. supported the structural equation modeling, helped with data interpretation, and contributed to the development of the research tools. B.M., the corresponding author, led the drafting and revising of the manuscript, coordinated the research team, and ensured the integrity of the study. All authors participated in discussing the findings, critically reviewed the manuscript for important intellectual content, and approved the final version for publication.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study placed a high emphasis on ethical considerations. Informed consent obtained from all participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki.

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