



Multidimensional Pathways Linking Chronic Stress to Cardiovascular Pathogenesis: A Biopsychosocial Integration

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Abstract. *In this fast-paced era, which generates stress associated with chronic diseases, “heart disease” is considered the disease of our time. This issue is approached from multiple perspectives. With the emergence of the field of health psychology, one of its branches has addressed the sensitive topic of “cardiac psychology.” Although it is still in its early stages, it has examined primary and secondary prevention methods, as well as ways of integrating strategies to overcome barriers that contribute to the exacerbation of the disease. Among the pathogenic factors contributing to the onset of heart and arterial diseases is psychological stress.*

Keywords: *psychological stress, multidimensional pathways, chronic stress, cardiovascular pathogenesis, biopsychosocial integration*

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Received: 10 May 2025; Accepted: 19 December 2025; Published online: 28 May 2026

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Xroniki stressi ürək-damar patogenezi ilə əlaqələndirən çoxölçülü yollar: Biopsixosial inteqrasiya

Debbagh Buchra^{1*} , Əli Houiche² , Abdenour Khechai²

Xülasə. *Xroniki xəstəliklərlə əlaqəli stress yaradan bu sürətli dövrdə “ürək xəstəliyi” bizim xəstəliyimiz hesab olunur zaman. Bu məsələyə bir çox baxımdan yanaşılır. Sağlamlıq psixologiyası sahəsinin yaranması ilə onun qollarından biri “ürək psixologiyası” kimi həssas mövzuya toxunmuşdur. Hələ erkən mərhələdə olsa da, xəstəliyin kəskinləşməsinə səbəb olan maneələri aradan qaldırmaq üçün ilkin və ikinci dərəcəli profilaktika metodlarını, eləcə də strategiyaların inteqrasiya yollarını araşdırmışdır.*

Ürək və arterial xəstəliklərin başlanmasına səbəb olan patogen amillər arasında psixoloji stress də var.

Açar sözlər: *psixoloji stress, çoxölçülü yollar, xroniki stress, ürək-damar patogenezi, biopsixosial inteqrasiya*

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Daxil oldu: 10 May 2025; Qəbul edildi: 19 Dekabr 2026; Onlayn dərc edilib: 28 May 2026

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Introduction

In this simple article, we will ask the following question:

Is psychological stress one of the pathogenic factors for heart disease?

Study objectives:

This research aims to achieve the following objectives:

- To determine whether stress causes heart disease.
- To reveal the effects of psychological stress on heart disease.
- To reveal the factors that cause heart disease, including psychological stress.

Importance of the study:

The importance of this study lies in highlighting the impact of stress on the likelihood of developing heart disease, as it is considered one of the most urgent factors in the development of the disease. It is one of the pathological factors that contribute to the onset and development of heart and coronary artery disease, and if it continues, it causes factors that exacerbate heart disease.

Research methodology:

Since this research falls within the scope of theoretical research, it attempts to discuss and analyze the nature of the research problem and its objectives, and then draw conclusions from theoretical heritage and previous studies that clarify the role played by psychological pressures that contribute to pathogenic factors.

Theoretical (analytical) framework:

The cardiovascular system consists of the heart, blood vessels, and blood, which function as transport systems in the body. Blood carries oxygen from the lungs to the tissues and carries carbon dioxide from the tissues to the lungs, where it is expelled with exhalation. Blood also carries nutrients from the digestive system to every cell, enabling them to extract the substances necessary for growth and energy, and waste products from the cells to the kidneys, which in turn dispose of them in the urine. It also carries hormones from the endocrine glands to other organs in the body and transports heat to the skin surface to regulate body temperature.

The heart functions like a pump, pumping blood around the body. The left side of the heart, which consists of the left ventricle, takes oxygen-rich blood from the lungs and pumps it through the aorta.

Research

The heart performs its multiple functions by repeating a series of organized phases of contraction and relaxation called the cardiac cycle. The cardiac cycle consists of two phases: systole and diastole. Several factors affect the rate of contractions and relaxations that occur in the heart, such as emotional stress or exposure to pressure. The heart rate increases and blood circulates through the different parts of the body at a very fast rate, completing the cardiac cycle in a shorter period of time. Most of the acceleration occurs at the expense of the rest or relaxation period. Continuously, the heart rate can reduce the strength of the heart, which in turn reduces the amount of blood pumped by the heart.

Psychological stress is one of the psychological manifestations and one of the main characteristics of our societies. The word “stress” has become widely used in the fields of engineering and physics to refer to an external force that affects and changes the shape and structure of an object. This concept has been borrowed by psychology to refer to a wide range of emotional experiences that correspond to physiological, cognitive, and behavioral changes resulting from stressful events. Among the pioneers in the study of stress was Canon, who gave the term stress a physiological and psychological meaning in 1928.

Selye introduced the word stress into medicine and explained its effect on biological balance, while Lazarus (1966) focused on the cognitive assessment of stressful situations. Gordon (1993) saw stress as a psychological, emotional, and physiological response of the body to any demand perceived as a threat to the individual's happiness. Similarly, Schafer (2000) considers stress to be the arousal of the mind and body in response to a demand imposed on them, which shows that stress is always present and is a characteristic of life (Hussein & Hussein, 2006, p. 18).

We will address psychological pressure through an examination of language and terminology, highlighting the importance of the foundations and interpretive models that can be used to compile knowledge specific to this concept, in addition to mentioning the most important definitions of this term by specialists.

The Concise Dictionary indicates that the linguistic origin of the word “stress” is: to press, squeeze, squeeze, intensity, tightness. The word “stress” is derived from the Latin verb “stringere,” which means pressure or intensity, from which the French verb “êtreindre” is derived, meaning to wrap one's arms and body around someone, leading to suffocation due to anxiety (Hussein & Al-Najaz, 2003, p. 208).

Lazarus (1996) defines it as follows: Stress is those unhappy situations and events that an individual experiences, which cause that individual to be in a psychological state characterized by extreme tension, as well as the emotional and behavioral responses when an individual is exposed to unpleasant situations or events (Wajih & Shaat, 2005, pp. 34–35).

There are several types of psychological stress, and there are many classifications that explain stress, including the following:

Selye's classification: (Selye)

He pointed out that there are different types of stress, including:

- Bad stress: increases the demands on the individual and is also called pain, such as losing a job or a loved one.
- Good psychological stress: This can have a positive effect and is essential in motivating work and cognition (Samir Al-Sheikhani, 2003, p. 14).

- Excessive psychological stress: This results from the accumulation of negative events of low psychological stress that exceed the individual's resources and ability to cope.
- Low psychological stress: This occurs when the individual feels boredom and a lack of challenge and excitement (Al-Shaykhani, 2003, p. 14).

Murray:

Murray distinguished between the following types of stress:

A. Beta stress: Refers to the meaning of environmental issues.

B. Alpha stress: Refers to the characteristics of environmental issues as they exist in reality.

Classification based on the resulting effects:

Hans Selye distinguished between two types of stress:

A. Positive stress: This type of stress is a motivator that drives the individual toward better performance and helps foster creativity and self-confidence.

B. Negative stress: This is the destructive type that causes functional impairment in the organism's adaptation, affecting its physical and psychological state, which leads to cognitive and psychological dysfunction.

Classification based on source criteria:

McGrath classified it into:

A. Stress resulting from the physical environment.

B. Stress resulting from the social environment.

C. Stress resulting from the individual's personal system.

Causes of psychological stress:

The causes of stress can generally be classified into internal causes or sources related to organ function or internal psychological factors such as an individual's personality type. Individuals can be classified into two personality types, one of which is more susceptible to stress due to their desire to accomplish as many tasks as possible in the shortest amount of time and their exaggerated ambitions, as if they are racing against time. They are characterized by competitiveness, verbal aggression, motivation, seriousness, and an inability to relax. They get angry quickly and are known as type (a). Type (b) is known for taking time to deal with things and simply taking time to deal with and face issues (Hamdi, 2002, p. 173).

There are also health problems and psychological causes.

External causes or sources of psychological stress include family problems, work problems, financial, economic, or social problems, chemical causes, natural changes, and political problems.

▪ Elements of psychological pressure:

Stimulus: Reaction: Response:

-Environment.

-Stimulus.

-Frustration.

-Organization.

-Anxiety.

-Individual. (Okasha, 1994, pp. 86–87).

Psychological stress is characterized by symptoms including physiological symptoms such as constipation, stomach ulcers, and heart disease.

Psychological symptoms include irritability, nervousness, feelings of helplessness, fear of the future, and cognitive symptoms such as forgetfulness (Bahauddin, 2008, pp. 34–35).

Behavioral symptoms include a tendency to argue and impatience.

1. Theories related to the topic:

Theories that address the concept of psychological stress:

First: Biological theories:

- Walter Cannon's theory (1926): Fight or Flight Theory:

This theory is attributed to physiologist Walter Cannon, who attempted to explain physiological responses to stress in a study on how humans and animals respond to external threats and stressful situations. He found that there are a number of sequential activities that stimulate the adrenal glands and the sympathetic nervous system, increasing the amount of adrenaline in the blood, leading to rapid breathing, increased blood acidity, and the release of stored fat, which prepares the body to face or escape danger. Physiological changes such as stomach upset, increased heart rate, and slurred speech also occur.

Kanon was the first to use the term psychological stress, describing humans and animals as being under stress by linking stress to his laboratory experiments on escape and flight responses, observing the response of the adrenal gland and sympathetic nervous system in situations of cold or need for oxygen.

It has also been called the emergency response, as he believes that this response causes the organism to either face and confront the stressful situation or avoid and flee from it. Cannon points out that organisms can resist stress when exposed to it at low levels, but that severe or prolonged stress can cause the biological systems that living organisms use to cope with stress to break down. Cannon thus described the way in which the various organs of a living organism automatically maintain a state of equilibrium in order to survive.

- Hans Selye's theory (1956): (General Adaptation Syndrome) (Syndrome Theory/GAS General Adaptation):

Selye's theory is one of the biological theories that relied on biological and physiological reactions in its interpretation. Selye is considered the first pioneer to introduce the concept of stress into practical life and develop a model of psychological stress and its relationship to disease, as he believes that disease is an expression of psychological and social events. He pointed out that stress plays an important role in causing a high rate of exhaustion and agitation that affects the body, so that any physical injury, unpleasant emotional disturbance, or fatigue and pain is related to that stress.

Selye asserts that stress is an important factor affecting health because it weakens human functions, as the unpleasant physical and emotional changes resulting from stress lead to a set of symptoms called general adaptation syndrome.

It has been shown that continuous exposure to psychological stress causes disorders in various parts of the body, leading to the appearance of these symptoms, which have been called the general adaptation syndrome.

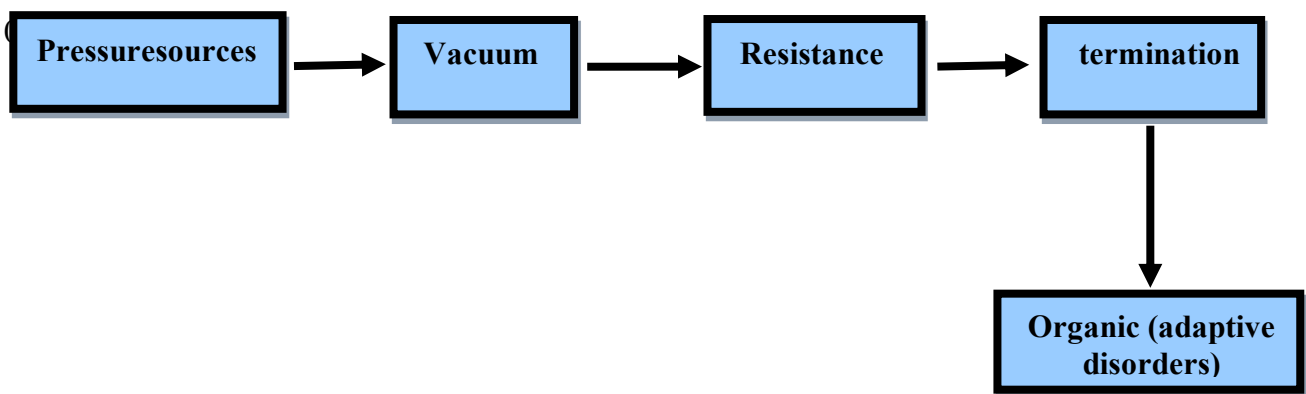
This syndrome occurs in stages, which are:

-**Alarm Stage:** In this first stage, the body undergoes changes and responses characterized by the initial degree of exposure to stress. As a result of these changes, the body's resistance decreases, especially if the psychological stress is severe at this stage, leading to the death of the individual.

- **Resistance Stage:** This stage occurs as a result of continuous exposure to the stressful event. The physical signs associated with the alarm reactions disappear, resistance increases, and the body

appears to return to its normal state as a result of the excessive activity of the pituitary gland. This stage includes physical symptoms caused by continuous exposure to stimuli and stressful situations to which the organism has acquired the ability to adapt. This stage is important in the development of adaptation symptoms, or what are known as psychosomatic symptoms, such as (asthma, blood pressure disorders). These symptoms occur when a person's ability to cope with situations through adaptive responses fails, and continuous exposure leads to internal imbalance, causing further hormonal secretions that cause organic disorders. Consequently, the individual exposed to stress moves into the exhaustion stage.

- **Exhaustion Stage:** This is called the stress or exhaustion stage. If an individual is exposed to multiple stresses for a longer period of time, they will reach a point where they are unable to continue resisting and enter a stage of exhaustion, becoming completely unable to adapt. At this stage, hormonal drives collapse, the body's resistance decreases, and many organs become affected, with the patient rapidly approaching death.



Illustrative diagram of the stages of general adaptation to stress in Seligman's theory. (Shaver & Mary 1993, p. 176).

Second: Environmental theories:

-Henry Murray's theory (1931):

Murray considers the concepts of need and stress to be fundamental to understanding personality and interpreting behavior, given that the concept of need represents the determinants of the essence of behavior within the individual, and the concept of stress represents the influential and essential determinants of behavior in the environment. Stress is defined as a characteristic or property of an environmental object or person that facilitates or hinders an individual's efforts to achieve a specific goal. In this regard, he distinguishes between two types of stress.

1. Beta Stress: Refers to the significance of environmental objects and people as perceived and interpreted by the individual's behavior.

2. Alpha Stress: Refers to the characteristics of environmental subjects and people and their significance as they are in reality.

Murray explains that an individual's behavior is related to the first type, Beta, and emphasizes that an individual, through experience, comes to associate certain subjects with specific needs, a concept he calls "need integration." When interaction occurs between the motivating situation, stress, and active need, this is expressed by the concept of "Theme."

Murray asserts that we can conclude from this theory that an individual has a need based on certain manifestations that are evident in the person's behavior toward their selection and response to a specific type of stimulus accompanied by a particular emotion, whereby the need is satisfied and the

individual feels comfortable, and feels distressed if the need is not satisfied. Among these needs are achievement, aggression, independence, opposition, control, and contempt.

- Richard Lazarus' theory (1966): Person-Environment Fit Theory:

Richard Lazarus is considered the pioneer of this theory, which is also known as the theory of cognitive assessment in stress, or what is called primary assessment, which refers to the assessment of cognitive processes to meet the requirements of individual growth.

Cognitive assessment is a fundamental concept in this theory, which depends on the role of the individual, since the assessment of a threat is not merely a simplified perception of its constituent elements, but rather a link between the individual's environment and personal experiences with stress, thereby enabling the individual to interpret the situation.

The individual's assessment depends on several factors, including:

- Personal factors.
- External factors related to the social environment.
- Factors related to the situation itself.

He believes that stress is the result of an individual's assessment of whether or not their resources are sufficient to meet the demands placed on them by their environment. Pressure is therefore determined by the degree of compatibility between the person and the environment. When an individual's resources are sufficient and appropriate to deal with a difficult situation, they feel little pressure. When an individual realizes that their resources may not be sufficient to deal with an event or situation except with great difficulty and effort, they feel a moderate amount of pressure. When the individual realizes that their resources will not be sufficient to meet the demands of the environment, they feel exposed to enormous pressure. Therefore, pressure results from the process of assessing events (whether they are harmful or challenging) and examining possible responses to those events.

Lazarus emphasized the importance of individual differences in responding to pressure. as the intensity of stress depends on the individual's perception of the stressful situation or their response to a situation they perceive as threatening, which leads to arousal of their actions and behavioral stress responses to deal with the stressful situation and the extent of psychological changes that occur.

In Lazarus' theory, appraisal is the overall understanding of stress, including coping strategies, cognitive-neural activity, emotional and physiological responses, and behavioral outcomes. Lazarus believes that individuals are exposed to two types of stressors:

A. Environmental demands: These are external events (family, social, and economic) that individuals face in their lives and require them to adapt, such as family crises, illness, death, and others.

B. Personal demands: These include an individual's ambitions, goals, values, and the activities they strive to achieve in their life, such as achieving a high level of education.

C. Assessing stressful situations: Lazarus emphasized the importance of recognizing and assessing the situation as stressful by the individual themselves.

D. Responding to stress: This is the final stage in the process of an individual being exposed to and understanding stress, in which the individual attempts to choose one of the available alternatives for responding, such as a cognitive or behavioral effort aimed at eliminating the impact of the stressful situation. Responding to stressful situations means that the individual is under its influence.

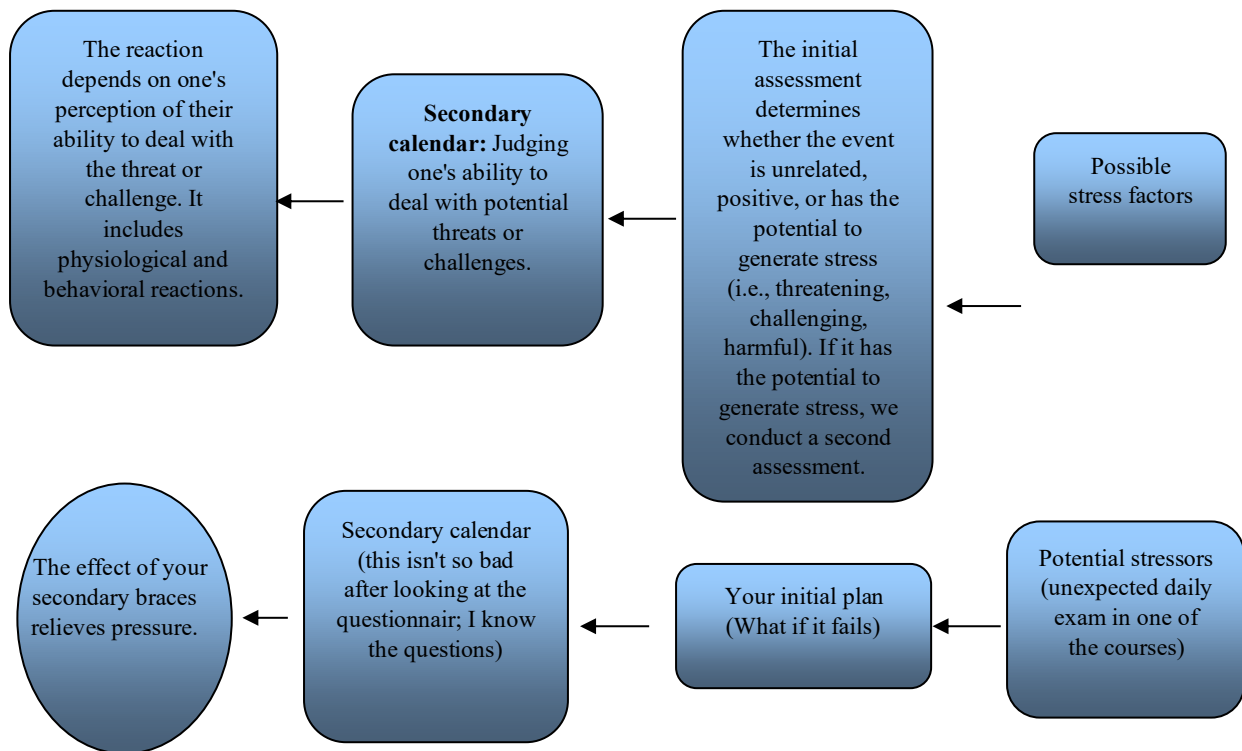
Lazarus pointed to the existence of two balanced processes:

A. Initial assessment: This is when an individual makes a specific judgment about the type of stress and the degree of threat it poses. The individual may assess the situation as negative or positive, severe or mild. The initial assessment is influenced by situational factors, including the nature of the harm or threat, whether the event is familiar or new or previously unknown, the likelihood of its occurrence, and the clarity or ambiguity in predicting the outcome.

B. Secondary assessment: This refers to the individual's ability to identify sources for dealing with the stressful situation, the theory of choice, and evaluation, as the assessment is made using available coping methods and the results of choosing any of them and their likelihood of success.

Despite the importance of the initial assessment, the secondary assessment takes on greater importance for Lazarus.

Lazarus and Folkman (1984) developed a model for responding to stressful factors and events.



A diagram illustrating this is the Lazarus-Weil model of an individual's response to stressors. (Martine & Oosborne, 1993, p. 140).

-Spielberger's theory (1972):

Spielberger's theory of anxiety is a necessary introduction to understanding his theory of stress, as he linked anxiety, stress, and threat:

-Anxiety: An emotional process that refers to a sequence of cognitive and behavioral responses that occur as a reaction to some form of stress.

-Stress: This term refers to changes in environmental conditions that are characterized by a degree of objective danger.

Threat refers to the subjective assessment and interpretation of a particular situation. If Simmel was interested in identifying the specific nature of stressful situations that lead to different levels of anxiety, However, he does not equate the two concepts (stress and anxiety) because psychological

stress and anxiety clarify the differences between the characteristics of anxiety as an emotional reaction and the stimuli that cause these stresses.

Anxiety, as an emotional process, refers to a sequence of cognitive and behavioral responses that occur as a reaction to some form of stress. This process is triggered by an external stressor. Spilberg distinguishes between the concepts of stress and threat, which are two different concepts. The word stress refers to differences in environmental conditions and circumstances that are characterized by a degree of objective danger, while the word threat refers to the subjective assessment and interpretation of a particular situation as dangerous or frightening, i.e., the anticipation of danger or subjective perception of danger. In the reference framework of his theory, Spielberger focused on determining the nature of the surrounding environmental conditions that are stressful, distinguishing between the states of anxiety resulting from them (the environment) and identifying the relationship between them and the defense mechanisms that help avoid those stressful aspects. In this regard, the individual assesses the stressful circumstances that have caused anxiety and then uses appropriate defense mechanisms to relieve the stress (repression, denial, projection) or resorts to avoidance behavior that allows escape from the stressful situation.

Spilberger's theory was particularly valuable in understanding the nature of anxiety and was used by many scientists and researchers. Spilberger himself conducted many studies in which he verified the validity of the assumptions and premises of his theory.

-Moss & Schaefer theory (1986):

This theory presents a model of the basic factors that influence an individual's response to stress, as coping and adapting to stress involves behavioral and cognitive efforts made by the individual when dealing with a stressful situation.

Moss and Schaefer defined an individual's response to a stressful situation in three stages:

- Stage 01: The individual's personal and demographic factors: These include the individual's gender, age, socioeconomic status, cognitive and emotional maturity, self-esteem and self-confidence, and previous experiences in coping with events. They also include factors related to stressful experiences, such as: The type of stressful event, whether it is a natural disaster such as an earthquake or hurricane, or a man-made disaster such as war. It also includes biological factors such as death and illness, as well as the extent to which the individual is exposed to the stressful event, their ability to cope with it, and their control over the likelihood of its occurrence. It also includes factors related to the social and physical environment, such as relationships between individuals and their families, the cohesion of society, and the cooperation of individuals in coping with the stressful event and bearing its consequences.

- Stage 02: Recognizing and adapting to the stressful event, which includes:

A. The individual's recognition of the stressful event: Here, recognition occurs after the stressful situation (event) has occurred, and may happen gradually. It may be vague at first, but then its features, dimensions, and possible outcomes become clear, which may make it easier for the individual to adapt to it in an appropriate manner.

B. Taking actions to adapt to the stressful event: This involves the individual forming strong and intimate personal relationships with individuals who can provide assistance in coping with the stressful event, such as family members, friends, or others, while trying to maintain balance and control their negative feelings resulting from the stressful event, which may help them regain their self-confidence and increase their ability to control the stressful situation.

C. Employing adaptive skills or strategies: This occurs by focusing on and understanding the stressful event and discovering the appropriate way to deal with it, with the aim of restoring the individual's balance.

This may be by confronting the stressful event, mitigating its effects, or eliminating the event and the negative emotions associated with it. Moss and Schiffer point out that individuals may rely on one or more strategies in dealing with stressful events.

- **Stage 03:** The results of the stressful event and its impact on the individual: This stage is the outcome of the interaction of the previous elements. It expresses the extent to which the individual is able to cope with the stressful event or situation. This coping may be successful, as the individual can benefit from the experiences gained during the event in continuing their life, or it may fail, resulting in symptoms of psychological and physical distress.

2. Previous studies:

- 1- Christcnfeld, Glen, and Shrira (1999) studied all death certificates in the United States over the last ten years, focusing in particular on three groups: New York City residents who died in the city, non-residents who were traveling outside the city, and visitors. They found that the mortality rate among New York City residents was 155% higher than expected, and among visitors it was 134% higher, while the mortality rate among New York residents who died outside the city was only 80% higher than expected.
- 2- Mohamed Mansour, in an article dated December 23, 2020, stated that heart disease is the leading cause of death in Egypt, followed by cancer.
- 3- A global study involving Egyptian researchers confirms the continuous increase in the number of heart disease cases and deaths in 204 countries.
- 4- The study was published in the *European Heart Journal*, in which 7,268 people who considered themselves to be suffering from psychological stress and tension due to their circumstances, ranging from mild to very severe, were followed up to see if they would develop heart disease later on. The results showed that the risk of cardiovascular disease or death was twice as high in people who did not experience psychological stress in their lives.
- 5- The study showed that social support from family and friends has a significant effect in reducing the harmful effects of psychological stress on heart health, while the other risk factors mentioned had no clear effect on the relationship between psychological stress and the resulting heart disease.
- 6- The study (Banger et al) (1981) showed that people with heart disease often tend to feel insecure and anxious, and appear fearful and prone to feelings of helplessness and loss of self-confidence, which restricts their activities and social relationships and leads them to evaluate different life situations as stressful (Grand, 1993, p. 393).
- 7- Researcher Thomas (1928) concluded that heart patients live in a state of constant anxiety and under the constant threat of heart attacks and blood clots, and that 50% of individuals suffer from severe stress (Al-Zrad, 1987).
- 8- Roberman (1984) published (Roberman) (1984) published the results of a summary of hospital studies after patients suffered heart attacks, and the researcher showed that there are two predictable variables that contribute to the mortality rate three years after the attack, namely isolation and social isolation, which lead to an increase in the degree of sensory perception of high-intensity psychological stress (Servant et al., 1995, p. 4).
- 9- Therefore, psychological stress and heart disease are generally interrelated. On the one hand, studies have shown that psychological stress itself is a factor in the development of heart disease. and on the other hand, heart disease itself leads to high stress due to the serious threat it poses and the adjustments it requires, especially when treatment requires surgery (Youssef, 1991).
Stress is one of the pathogenic factors that contribute to the onset of cardiovascular diseases. Therefore, understanding this branch of health psychology enriches the psychological literature and aids in the study and application of psychological principles to participate and engage in the prevention and treatment of heart disease, as well as how heart patients deal with their illness and treatment.

Conclusion

Adapting to chronic diseases is not an easy process, as it requires fundamental changes in lifestyle, which may be difficult for individuals to achieve at times.

We studied the psychological pressures associated with heart disease according to the psychosocial model, which considers the patient in three main aspects, whereby psychological pressures play an important role in the onset and development of heart and coronary artery diseases.

Recommendations:

1. The theoretical psychological aspect related to cardiac psychology should be enriched for both patients and specialists and doctors alike.
2. Efforts should be made to reduce the emergence of pathogenic factors of psychological stress and to seek preventive factors that work to prevent this chronic disease and reduce health complications.
3. Health education programs should be implemented before the onset of the disease.
4. Therapeutic education programs should be implemented after the onset of the disease and psychological stress.

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