

**Exploring the Psychological Factors
Associated with Cardiac Anxiety among Adults**

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requirements for the award of degree of

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By

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CERTIFICATE

This is to entitle that the thesis entitled '*Exploring the Psychological Factors Associated with Cardiac Anxiety among Adults*' is a bonafide record of research work carried out by Ms. Sruthi K S, under my supervision and guidance and that no part of this has been presented before for the award of any degree, diploma, associateship or fellowship of other similar title or recognition.

Place: Kalaburagi

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Prof. Romate John

DECLARATION

I, Sruthi K S, do hereby declare that this thesis entitled *Exploring the Psychological Factors Associated with Cardiac Anxiety among Adults* is a bonafide record of the research work carried out by me under the supervision of Prof. Romate John, Department of Psychology, School of Social & Behavioural Sciences, Central University of Karnataka. I also declare that this thesis or any part of it has not been submitted to any other University for the award of a Ph.D. degree in Psychology. References borrowed from other sources have been duly acknowledged. I also declare that this thesis is free from plagiarism and is within an acceptable limit.

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Date: 01-09-2025

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LIST OF ABBREVIATIONS

Abbreviations	Terms
CVD	Cardiovascular Diseases
ACS	Acute coronary syndrome
MI	Myocardial infarction-
CAQ	Cardiac Anxiety Questionnaire
APA	American Psychological Association
CBT	Cognitive Behavioral Therapy
I-CBT	Internet-based Cognitive Behavioral Therapy
CHD	Coronary Heart Disease
CAD	Coronary Artery Disease
AS	Anxiety Sensitivity
SCA	Sudden Cardiac Arrest

Abstract

Cardiac anxiety refers to a specific pattern of anxiety symptoms, with a focus on the fear of cardiac-related sensations and their expected harmful consequences. It has the potential to be detrimental to one's quality of life and recovery because it is associated with increased attention to cardiac stimuli, catastrophic worries and interpretations, avoidance of cardiac stimuli and physical exercise, and safety-seeking behaviors. Despite its wide-ranging influence, cardiac anxiety is still a poorly researched condition, especially in health-anxious and psychosomatically concerned populations. Hence, it is essential to explore the various factors associated with cardiac anxiety among adults without having any diagnosed cardiac condition. A better understanding of such factors may help in detecting the comorbidity underlying cardiac anxiety and identifying individuals who need psychological help.

The present qualitative study adopted an exploratory design to explore various risk factors, protective factors, consequences, and management strategies of cardiac anxiety among the adult population. The study was conducted among 34 adults from Kerala aged 18-28 years with cardiac anxiety. All of them were individuals with no cardiac diseases or a history of cardiac diseases. The participants were selected through a screening test using the Cardiac Anxiety Questionnaire. A survey form was prepared, including the socio-demographic details, cardiac anxiety questionnaire, and other screening tests for exclusion, and shared through social media and through mutual networking among adults in Kerala. The same survey form was shared among various college students in Kerala. A purposive sampling was used to recruit the participants. Hence, a total of 1004 young adults were identified, and out of that, 775 completed the screening questionnaire. The individuals who scored a high level of cardiac anxiety and who gave consent to participate were recruited to conduct a semi-structured interview. A validated semi-structured interview schedule was

employed to conduct the interviews. Reflexive Thematic analysis has been performed to identify data themes.

The analysis of the data yielded overarching themes, themes, sub-themes and codes. There are four overarching themes identified. The first overarching theme was the unfolding of cardiac anxiety. The themes that emerged under this include a fragile sense of bodily trust, lifestyle patterns that amplify vulnerability, relational worlds that shape anxiety, embodied vulnerabilities, information that harms rather than helps environments and moments that spark fear. The second overarching theme was the dynamics of resilience and support. The key themes that emerged under this overarching theme include psychological resources for resilience, informed and rational health engagement, supportive interpersonal networks, and gender-based perceptions. The third overarching theme that emerged from the analysis is the manifestations of an internal conflict. The themes that emerged from this are psychological toll: living on mental health alerts, functional impairments in life domains, and the effect of anxiety on the body. The final overarching theme was a dual-path journey: adaptation vs. avoidance. The themes that emerged from this include adaptive self-regulatory coping, avoidance of cardio-triggering activities, help-seeking, reassurance and health-risk behaviors as coping.

The study was able to provide an in-depth understanding of multidimensional risk factors, protective factors, and consequences of cardiac anxiety and its self-management strategies among adults. The inferences underscore the importance of early detection and psychological evaluation of individuals who complain of cardiac symptoms but lack objective medical evidence. An interdisciplinary team comprising primary care, cardiology, and psychology, guided by the biopsychosocial model, can enhance patient care and minimize unnecessary medical interventions.

Keywords: *Cardiac anxiety, adults, cardiac risk factors, cardiac protective factors, Perceived health consequences, cardiac management methods.*

Chapter 1

Introduction

Cardiovascular disease (CVD) is one of the major causes of mortality worldwide (WHO, 2025; Jan et al., 2024; Correa-Rodríguez et al., 2020). According to the World Health Organization (2025), in 2022 alone, 19.8 million people died from CVDs, which constitutes approximately 32% of the total deaths that occurred in the same year across the world. It has also been found that 85% of the deaths reported under CVD are due to heart attack and stroke. It is also alarming that more than three-quarters of deaths caused by CVD take place in low- and middle-income countries (WHO, 2025), including India. CVDs have been identified as the primary cause of death and disability in India. In 2017, CVDs constituted 31.8% of all deaths and 14.7% of disability-adjusted life years (DALYs) worldwide (Karla et al., 2023). Since 1990, there has been a consistent increase in CVDs in India, with a 138% increase, leading to India currently having the highest burden of myocardial infarction (MI) and acute coronary syndrome (ACS) (Sreenivas& Sinha, 2020; Dilnawaz& Iqbal, 2021). Within India, the rate of CVD distinctly varies, with the highest in states of Kerala, Punjab, and Tamil Nadu (Sreenivas& Sinha, 2020).

Suffering a cardiovascular event can cause significant psychological issues, predominantly anxiety, and twenty per cent of individuals with CVD, whether chronic or transient, have co-morbid anxiety and/or depression (Pedersen et al., 2017). An MI or heart attack often elevates the rate of anxiety in 20–30% of patients (Celano et al., 2016). Anxiety has been identified as an

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independent risk factor for cardiac deaths and incident coronary heart disease (CHD) (Roest et al., 2010). In such a context, determining anxiety is an essential step to understanding prognosis and delivering optimal care. However, the reasons for specific cardiac anxiety are still unclear, despite the fact that general anxiety symptoms are prevalent in cardiac patients (van Beek et al., 2012).

Cardiac anxiety, often referred to as heart-focused anxiety, is a particularly prevalent kind of health anxiety that is associated with medical (such as CVDs) and psychological (such as panic disorder) disorders involving recurrent cardiopulmonary stress (Eifert, 1992; Eifert et al., 2000a); it is common among individuals with and without CVD (Hohls et al., 2020). Cardiac anxiety is defined as “a fear of cardiac-related events and sensations based on perceived harmful consequences” (Eifert et al., 2000a). This condition is characterised by elevated levels of attention towards cardiac sensations, cardiac activity monitoring, avoidance of behaviors that could trigger cardiac events, and fear and concerns about heart sensations and functioning, such as chest pain, palpitations, and/or chest discomfort (Eifert et al., 2000a). This study has taken this definition as the operational definition for cardiac anxiety. There are numerous medical conditions, such as panic disorder, illness phobias, and cardiac and non-cardiac chest pain (NCCP), which result in psychological distress and chest pain. These medical conditions are significant factors contributing to cardiac anxiety (Roest et al., 2010; Eifert et al., 1996; Hoyer et al., 2008; Dragioti et al., 2010).

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and the International Classification of Diseases (ICD-10) do not include cardiac anxiety as a disease to be diagnosed, but rather as a symptom. Therefore, individuals with

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cardiac anxiety are diagnosed with panic disorder. The Cardiac Anxiety Questionnaire (CAQ), though not a psychiatric diagnosis, is widely used to measure symptoms of cardiac anxiety (Eifert et al., 2000a). This tool has demonstrated strong psychometric properties in individuals with and without CVD when administered in several countries (Eifert et al., 2000a; Marker et al., 2008; Israel et al., 2017; van Beek et al., 2012; Dragioti et al., 2011; Fischer et al., 2012).

Historical Development of Cardiac Anxiety Research

While cardiac anxiety has been a subject of clinical research since the late eighteenth century (Schonecke, 1989), cardiac anxiety became a subject of clinical interest only in 1992, when Georg Eifert explained the concept for the first time (Eifert, 1992). Georg Eifert originally developed this concept to describe non-cardiac thoracic anxiety issues (Eifert, 1992). However, the idea of cardiac anxiety is equally applicable to individuals with cardiac disease (Schmitz et al., 2022). Initially, it was described as a psychological condition that affects people without heart diseases; however, subsequent studies revealed that people with a wide range of cardiac diseases also experience cardiac anxiety (Eifert et al., 2000a).

Historically, cardiac anxiety research was mainly concentrated on people whose complaints were neither supported by organic nor medical evidence (Eifert, 1992). In this phase, researchers focused on heart-anxious people who believed that they had heart problems, sought reassurance, and avoided actions that could exacerbate their illness, even after many medical tests challenged their belief that they had any cardiac issues. It is noteworthy that individuals with NCCP report higher levels of cardio-protective activities, disease conviction, and response to cardiac-related stimuli than individuals with coronary artery disease (CAD).

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Furthermore, these patients report higher levels of emotional distress and catastrophic thinking in reaction to cardiac signals, and they have lower pain thresholds for stress tests connected to the heart than individuals with NCCP (Eifert et al., 2001).

Even when the research on cardiac anxiety in individuals with NCCP is undoubtedly deserving of consideration, it is to be noted that many individuals who have cardiac problems also experience cardiac anxiety. It is natural that following a cardiac episode, people will be more concerned about their health. According to clinical observations, many individuals who receive a heart disease diagnosis tend to worry about how their hearts are working, become distressed and overwhelmed by their concerns, become unduly reliant on medical facilities, and avoid activities that could aid in their rehabilitation (Coon, 2004).

Research on cardiac anxiety has been greatly aided by the origin of the CAQ (Eifert et al., 2000a). The possibility to quantify cardiac anxiety emerged with the construction of the CAQ (Eifert et al., 2000a). The CAQ has generally been used to evaluate the efficacy of psychological (Pelland et al., 2011; Spinhoven et al., 2010) and medical (Aicher et al., 2011) interventions, as well as to research cardiac anxiety (Hoyer et al., 2008; van Beek et al., 2012; Fischer et al., 2012). According to Eifert et al. (2000a), the CAQ is based on three overarching domains: avoidance, fear, and heart-focused attention. These domains serve as the basis for objectively measuring cardiac anxiety. Later developments in this domain, especially the studies to validate the CAQ, resulted in the development of an additional domain, reassurance seeking, which is used to measure cardiac function more precisely (Marker et al., 2008).

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Components of Cardiac Anxiety

According to Eifert (1992), physiological, affective-cognitive, and behavioral symptoms are the three primary components of cardiac anxiety, and their interplay creates a vicious cycle that can be difficult to break (Clark, 1986). Eifert et al. (1996) hypothesized that people who experience cardiac anxiety, including those with and without underlying heart disease, may exhibit similar responses.

Physiological Symptoms: Chest pain, palpitations, arrhythmias, hyperventilation, and increased muscle tension, particularly in the intercostal muscles, are the physiological symptoms of cardiac anxiety. Some people confuse these symptoms with the symptoms of a cardiac problem, as many of them are similar to those experienced by persons with heart issues.

Affective-Cognitive Symptoms: People who suffer from cardiac anxiety may have affective-cognitive symptoms such as fear of dying, fear of a heart attack, and misinterpret physical symptoms for organic ones (Eifert, 1991). It is expected that those with cardiac anxiety may react to chest discomfort and other heart-related sensations with more concern and worry. It is predicted that during acute episodes of chest pain or changes in heart function that may be triggered by exercise, people with cardiac anxiety have a high tendency to be scared and worried about getting cardiac issues and cardiac deaths.

Behavioral Symptoms: The behavioral responses to cardiac anxiety might vary and include excessive use of medical facilities, compulsive reassurance seeking from medical professionals and avoidance of work, leisure, and physical activities. Avoiding activities leads to two main issues: a sedentary lifestyle that can harm

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one's heart health and a lower quality of life. Patients may completely ignore rehabilitation, neglecting the services that could finally help their condition, if they have established heart issues and develop cardiac anxiety. Consequently, cardiac anxiety may become harmful to one's health.

Prevalence of Cardiac Anxiety

The prevalence of cardiac anxiety among the general adult population is not explicitly explored in the previous studies (Fischer et al., 2012; Wolf & Hopko, 2008); therefore, it is largely unknown. However, the prevalence of cardiac anxiety varies across different cardiac populations. Clinically significant cardiac anxiety was reported in 31–48% of cardiac patients, based on scale cut-off scores validated in cardiac patients (Lebel et al., 2020). It has been found that, even when their test results are normal, 18% of survivors of sudden cardiac arrest (SCA) stated that they constantly worry about their heart (Rosman et al., 2015). A recent study found that individuals with heart failure (HF) had higher levels of cardiac anxiety, and nearly one-third of heart patients, that is, 32.4% of the studied population, reported having higher scores on the CAQ questionnaire (Pokrajac-Bulian et al., 2022).

Studies by other researchers on individuals with heart disease have also shown comparable results. A study by Wedegärtner et al. (2020) found that 48.6% of individuals with chronic heart disease had cardiac anxiety before a cardioverter defibrillator was placed. This study establishes that cardiac anxiety is very common among cardiac patients before a device is implanted. A study conducted by Bunz et al. (2016) found that 49% of individuals with heart disease have elevated cardiac anxiety, and this particular type of anxiety is much more prevalent in individuals diagnosed with HF than general anxiety. Another research reported

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that 48.6% of cardiac patients had high cardiac anxiety compared to the normal adult population (Fischer et al., 2012). Bunz et al. (2016) found that 42.4% of older adult patients had higher cardiac anxiety compared to the elderly adults without cardiac diseases.

The exploration of the academic literature discussing the historical background of cardiac anxiety revealed varying dimensions of cardiac anxiety. It opened a scope for an extensive review of existing studies, theories and empirical evidence that may indicate the potential research gaps in the domain of cardiac anxiety. Therefore, a thorough review of theoretical and empirical literature was conducted and presented in the second chapter of this study.

Organization of the Thesis

The thesis is organised into six chapters, including an introduction and conclusion. The introductory chapter offered a general introduction to the study by beginning with a discussion of the concept of cardiac anxiety and its different research dimensions with references to relevant studies. The chapter then offers a comprehensive overview of the historical development of cardiac anxiety research. It then introduces the key components of cardiac anxiety, followed by the prevalence of cardiac anxiety. The chapter also briefly presents the organization of the thesis and offers a detailed overview of the significance of the study. The chapter concludes with the statement of the problem.

The second chapter of the thesis presents a review of the literature of the relevant studies carried out for this study. The first part of the chapter explores the major theories of cardiac anxiety. The review identified that there are only two theories that explicitly explain cardiac anxiety and cardiophobia, which is an

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extreme form of cardiac anxiety (Eifert et al., 2000). The theories identified are the Pragmatic Behavioral Model (Eifert, 1992) and Interoceptive Conditioning Theory (Zvolensky et al., 2008). The chapter conducted an empirical review to understand how to distinguish cardiac anxiety from other forms of anxiety, such as general anxiety, health anxiety, trait anxiety, and anxiety sensitivity (AS). The chapter then examined the status of existing literature on cardiac anxiety among the general population, cardiac anxiety among the cardiac disease population, and cardiac anxiety among the NCCP population. The chapter also presented the key findings derived from two systematic reviews conducted by the researcher of this study on the contributing factors of cardiac anxiety, the consequences of cardiac anxiety and the interventions for managing cardiac anxiety. The review also presented the insights gained from these systematic reviews, including major variables used, research design, method, results obtained, and their implications. The chapter then presented the potential research gaps identified based on the review of theoretical and empirical literature. The two systematic reviews conducted by the researcher significantly contributed to this review to identify specific knowledge gaps in the existing literature. The chapter concluded with a detailed discussion of the research gaps identified. This chapter facilitated this study by conceiving the aim and objectives of the study and adopting a suitable research method.

The third chapter of the study focused on explaining the research method employed to execute the study scientifically. The chapter designed the research method for this study based on the insights gained from the review of literature and according to the objectives of the study. The chapter outlined the research design, method, specific procedures and approaches used in this research,

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which aims to understand and explore various factors associated with cardiac anxiety among adults. The chapter then described the rationale for adopting a qualitative exploratory research design, integrating a semi-structured questionnaire followed by a thematic analysis. The chapter opened with the statement of the aim, objectives, and research questions. It then described in detail the research design, researcher characteristics and reflexivity, sampling techniques, and data collection procedures. The chapter described in detail the recruitment of eligible participants for the main phase through a screening test using the CAQ (Eifert et al., 2000) and the subsequent recruitment of 34 individuals who scored high in cardiac anxiety for the semi-structured interview to explore various risk factors, protective factors, consequences, and self-management strategies of cardiac anxiety. The chapter concluded with descriptions of data analysis and ethical protocols.

The fourth chapter of the study presented the reflexive thematic analysis of the data collected through semi-structured interviews and the inferences derived from it. The chapter opened with the presentation of the socio-demographic details of the participants. The chapter then presented the overarching themes, themes, sub-themes, and codes, and offered a detailed explanation of the overarching themes, themes, sub-themes, and codes supported with participants' verbatim.

The fifth chapter of the study constitutes the discussion of the major inferences drawn from the study. This chapter establishes the findings and observations derived from this study with reference to existing theories and scientific evidence identified through the review of literature. The discussion chapter facilitated the contextualisation of the inferences derived from this study to be used in scholarly works in the domain of cardiac anxiety in the future.

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The study concluded with a concluding chapter that presented a synthesized summary of the study, highlighted the significant findings, acknowledged the limitations of this study, stated the implications, and provided recommendations for future studies.

Significance of the Study

This study becomes significant on various grounds. Previous research has indicated that distinct forms of depression and anxiety might be linked to varying outcomes in terms of elevated cardiac event incidence and mortality (de Jonge et al., 2006; de Miranda Azevedo et al., 2014; Smolderen et al., 2009; Martens et al., 2010; Tully et al., 2015). Thus, concentrating on a particular construct or cardiac anxiety may help in separating various roles of anxiety. As this study focuses on cardiac anxiety as a distinct entity and in relation to individuals without any heart diseases or history of heart disease, it has theoretical and clinical significance.

Even though a wide range of people who suffer chest pain and distress have cardiac anxiety, this domain is frequently overlooked and misdiagnosed. It is true with the patients in cardiology and the emergency room who have or do not have heart issues (Eifert et al., 2000). It shows that unrecognised cardiac anxiety can lead to unnecessary medical investigations, delayed psychological intervention, and poorer overall health outcomes. Therefore, a study like this, investigating the much-overlooked cardiac anxiety among those without any cardiac problems, can offer meaningful insights to avoid unnecessary medical investigations.

Increased focus on cardiac anxiety will contribute to an improved understanding of this relatively prevalent psychological condition. It is critical because studies indicate that high levels of cardiac anxiety raise the likelihood that

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people, irrespective of their particular condition, may get agitated and anxious about heart-related symptoms and chest pain. Because of this, people may tend to continuously seek reassurance from medical specialists in an effort to lessen their worry, avoid activities thought to trigger symptoms, and obsessively check their heart and pulse. Furthermore, cardiac anxiety has an impact on psychiatric, cardiac, and quality of life outcomes, and it may be manageable. Cardiac anxiety may therefore be a helpful construct to identify those who are at risk and to direct treatment (van Beek et al., 2012). Therefore, this study, which aims to explore the influence of cardiac anxiety on psychiatric, cardiac, and quality-of-life outcomes, is significant. The inferences of the current study can also inform management strategies.

People without physical illness and extreme cardiac anxiety, due to repeated anxiety and worry, frequently search for costly cycles of reassurance, such as unnecessary visits to the doctor and medical testing (Aikens et al., 1999). Physically healthy people with cardiac anxiety, concerned about their symptoms, have depression, anxiety, obsessive-compulsive concerns, anger, and hostility, and show more physical symptoms than both cardiac and surgical inpatients and nonpatients. It is noteworthy that healthy individuals with cardiac anxiety are equally concerned about increased heartbeat and chest pain as inpatients with acute and established heart disease. Furthermore, this group of persons displayed heightened heart disease conviction, heart awareness, and cardioprotective activities than both surgical patients and nonpatients, but higher levels of cardiac anxiety than cardiac inpatients (Eifert et al., 1996). In this context, this study

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becomes significant as it addresses cardiac anxiety as a distinct construct, thereby informing early identification and intervention strategies.

In busy medical environments like emergency rooms and clinics for primary care, the direct identification of cardiac anxiety may be helpful in customising clinical evaluations. In general, regardless of a patient's medical condition, early detection of cardiophobia and high cardiac anxiety may make it easier to refer and treat them appropriately (Eifert et al., 2000). A more timely and accurate diagnosis and treatment of cardiac anxiety may improve patients' quality of life, lower functional impairment levels, and lower healthcare costs (Eifert et al., 2000). It may also reduce the financial expenses on the healthcare system (Tremblay et al., 2018). Such target interventions can minimise suffering, healthcare use, and healthcare costs because they have the most significant correlation with healthcare-seeking behavior (Mourad et al., 2016). By identifying their symptoms, the intervention will also assist those who are heart-anxious but do not have heart disease in ending the cycle of elevated attention and worry, cardiac anxiety, reassurance-seeking, and renewed anxiety.

For those who frequently appear in emergency rooms and cardiology settings without organic pathology, knowledge of cardiac anxiety symptoms may help to clarify these kinds of problems and make it easier to refer patients for additional psychological evaluation or treatment (Bouman & Visser, 1995). To improve the quality of life outcomes for those who are impacted, psychological interventions should focus on recognising and treating this unhealthy cycle of avoidance and hypervigilance driven due to fear (Rosman et al., 2015). In order to establish particular strategies to minimise, maintain, or worsen factors such as avoiding

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cardiac stimulation and physical exercise, it can be helpful to diagnose high cardiac anxiety symptoms and their distinct subtypes. Anxiety-related avoidance behavior may be addressed by cognitive behavioral therapy (CBT), which could potentially improve cardiac outcomes (van Beek et al., 2012).

More knowledge on the factors that lead to cardiac anxiety is necessary to direct future research on the importance of cardiac anxiety in relation to cardiac prognosis, as well as to direct the design of nursing interventions to lessen cardiac anxiety (van Beek et al., 2014). A multi-dimensional perspective of cardiac anxiety can deepen the understanding of its etiology by highlighting its complexity and suggesting that it is influenced by various interacting factors rather than a single mechanism. Further understanding of these determinants could aid in identifying individuals in need of psychological support and diagnosing the comorbidity that underlies cardiac anxiety (Pokrajac-Bulian et al., 2022; Wedegärtner et al., 2020). Since this study explores the determinants of cardiac anxiety, it will significantly contribute to developing coping strategies to deal with it.

Additionally, it is critical to address the management of cardiac anxiety since psychological treatments or management techniques can promote the use of more adaptive health behaviors (Spitzer et al., 2022) and management methods (Büssing et al., 2010). Additionally, it can consistently lower medical expenses and end human suffering from a variety of illnesses (Chiles et al., 1999). If someone had no concern about their disease, they probably would disregard proactive steps (e.g., exercising or monitoring diet) that could slow the emergence of symptoms or stop them from getting worse (Coons, 2004). To identify underlying processes or confirm bidirectional interactions, a more thorough examination of changes in

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psychological features and their impact on changes in health behaviors may be beneficial (Pokrajac-Bulian et al., 2022). The present study intends to identify the psychological impact of perceived heart disease in understanding the association among cardiac anxiety, perceived symptoms, and behavioral adjustments (Rashid et al., 2025).

The employment of the qualitative research method is significant in this study as it can address specific unresolved questions that are not covered in quantitative analysis. In-depth qualitative inquiry can identify diverse experiences of cardiac anxiety and improve our knowledge of key factors constituting cardiac anxiety among adults and their psychological and physiological consequences. It will also reveal diverse management strategies employed by the adults to manage cardiac anxiety. This approach will also explore a wide range of psychological factors associated with cardiac anxiety. In this study, psychological factors refer to the individual characteristics and processes that encompass the cognitive, affective, and behavioral parameters related to cardiac anxiety.

Studying the adult population, especially young adults, is particularly significant since the cardiovascular morbidity and mortality of young adults have shown a striking increase over the past decades. Increased cardiovascular risk in young adults is caused mainly by prevalent behavioral risk elements such as unhealthy eating habits, smoking, sleep disorders and substance abuse (Antza et al., 2023). Recent research has shown a decline in the young age advantage. The growing prevalence of atherosclerotic cardiovascular disease among the youth requires serious attention (Gooding et al., 2023). In the last decades, hospitalisations for MI and ischemic stroke have risen substantially among young

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adults of both sexes, but especially among women (Virani et al., 2021; Arora et al., 2019). Furthermore, anxiety disorders rank among the most common mental health issues in the world, mainly affecting young adults and adolescents and leading to significant social and psychological impairments (Bie et al., 2024). In this context, a study focusing on the cardiac anxiety of healthy adults is very substantial.

In American Psychological Association (APA) style (Publication Manual, 7th ed., section 3.17, p.95), the term adult is defined in line with the legal and psychological conventions of the United States of America. According to the APA age classifications, individuals aged 18 and above are considered adults. Therefore, the age range used in the study for adults is from 18 to 39 years (APA 7th edition; Hurlock, 1980; Papalia et al., 2012). This age group is also termed young adulthood. Young adulthood is a transitional period, generally defined as the late teens or early twenties through the thirties, bridging adolescence and full adulthood. Research has found that younger age is associated with more severe cardiac anxiety (Rosman et al., 2015). While the reasons for increased cardiac anxiety among this population are largely unknown, studies on cardiac anxiety among adults are comparatively few. It is also to be noted that most of the existing studies on cardiac anxiety focus on the elderly population, for whom age is an essential factor in determining cardiac anxiety. Considering the practical limitations in conducting in-depth interviews with older adults, the increased severity of cardiac anxiety among young adults, and the absence of studies in this direction, the researcher conducted this study among young adults.

A study published in the *Lancet*, an international journal, in 2020, which revealed the prevalence of anxiety in the Indian states, found that Kerala was the

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highest, followed by Manipur, West Bengal, Himachal Pradesh, and Andhra Pradesh (Sagar et al., 2020). Another recent research showed that CVDs are high in Kerala, Tamil Nadu, and Punjab (Sreenivas& Sinha, 2020). It has also to be noted that in India, Kerala has the greatest prevalence of CAD risk factors (Thankappan et al., 2010). According to Manoj et al. (2018), 41% of anxiety among individuals diagnosed with heart diseases is among persons with MI, which is prevalent in Kerala. Therefore, a study focusing on cardiac anxiety among adults in Kerala is significant.

Statement of the Problem

The present research aims to explore the psychological factors associated with cardiac anxiety among adults.

The current study is entitled: Exploring the Psychological Factors Associated with Cardiac Anxiety among Adults.

Chapter 2

Review of Literature

The researcher, through a systematic process of review of literature, attempted to summarize, analyze, and evaluate the existing research studies in the field of cardiac anxiety. This review chapter aims to provide background information, identify potential research gaps in existing knowledge, and establish the context and relevance of the current study (Sylvester et al., 2013). This review lays a theoretical foundation for the present research, substantiates the presence of the research problems, justifies the significance of the study, and supports the selection of appropriate methods (Hart, 1998; Levy & Ellis, 2006). The chapter reviewed the theoretical and empirical foundations in the domain of cardiac anxiety among individuals with and without cardiac-related diseases. It focused on one theory and a model of cardiac anxiety. This review synthesized empirical foundations of cardiac anxiety, including the difference between cardiac anxiety and other forms of anxiety, cardiac anxiety among the general population and cardiac patients, contributing factors, consequences, and management of cardiac anxiety. It also explored methodological patterns across studies, including populations, research designs, statistical techniques, key findings, implications, future research recommendations, and limitations. This comprehensive review not only offered a deeper understanding of the phenomenon of cardiac anxiety but also helped the researcher identify research gaps, thereby providing a clear rationale and justification for the present study. Furthermore, it guided the formulation of the

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research objectives and research questions, as well as the study design and population, offering a solid foundation for the research method to be followed for conducting this study.

Theoretical Basis

The theoretical framework of this study integrates theories and models that can exclusively explain cardiac anxiety and cardiophobia (extreme forms of cardiac anxiety). Drawing on established theoretical perspectives, this section of the chapter provides a comprehensive theoretical framework for understanding the key determinants and conceptual underpinnings of cardiac anxiety. It includes the pragmatic behavioral model of cardiac anxiety and the interoceptive conditioning theory of cardiac anxiety.

Paradigmatic Behavioral Model of Cardiophobia

The paradigmatic behavioral theory of abnormal behavior by Staats and Eifert (1992) defined the five key components of anxiety disorders. The five key components of this framework are the same for all anxiety disorders. However, the specific relationships and causal interactions between past learning experiences, personality traits, biological predispositions, environmental factors, and affective, cognitive, and behavioral symptoms must be specified separately for anxiety subtypes (Eifert, 1990; Eifert et al., 1990). Based on a general model of health anxiety (Salkovskis & Warwick, 1986), Eifert (1992) designed a framework to explain the health anxious concerns and beliefs that are specific to people who fear cardiac difficulties. However, the majority of the studies that attempted to build this model involved people with NCCP.

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According to Eifert (1992), the following specific components and mechanisms are thought to have an important role in the origin and maintenance of cardiophobia: (1) deficient and inappropriate personality repertoires formed by prior learning conditions related to experiences of separation, abandonment, and cardiac deaths and illness behavior; (2) basic personality styles of behavioral repertoires that constitute a particular psychological vulnerability for the development and maintenance of cardiophobia, such as obsessive-compulsive behaviors, poor emotional coping skills, and hypervigilance to somatic cues; (3) recent adverse life events and conflicts that contribute to the development of heart-related symptoms; (4) biological predispositions, both acquired and hereditary, including arousability of the central nervous system (CNS), chronic hyperarousal, and mild coronary spasms; and (5) the current symptoms of the cognitive, behavioral, and affective components as well as the stimulus characteristics.

It is easy to understand how the elements of cardiac anxiety might readily sustain or worsen heart-focused worry once it has begun to emerge. The physiological signs of anxiety resemble those of cardiac events and heighten cardiac anxiety. Fearful thoughts make people think that something is physically wrong, which increases cardiac anxiety and makes them worry about dying. The behavioral symptoms, such as skipping crucial daily activities and constantly seeking medical reassurance, might further promote cardiac anxiety. In particular, an instantaneous reduction in anxiety levels reinforces reassurance seeking and avoidance. The physiological symptoms of anxiety may decrease as a result of avoidance, whereas reassurance may temporarily alleviate fearful thoughts (e.g., I am going to have a heart attack when my heart races; I avoid activities that make

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my heart beat faster because I am afraid of having a heart attack). These symptoms have a high chance of coming together to create a serious illness that could be fatal.

Interoceptive Conditioning Theory of Cardiophobia

Even though most people experience heart-related physical stimuli or sensations during any of their daily functioning activities or as a result of stress or anxiety, only a limited number of them experience cardiophobia. In short, people who are in such bodily discomfort generally fail to express concern about the risk of a heart attack. Instead, people lay such somatic experiences off as a typical body reaction or as a result of a stressful day. However, those who acquire cardiophobia show signs of anxiety related to the potential for cardiac malfunction. Regardless of the situation, these people try to prevent or avoid cardiac symptoms, worry about cardiac occurrences, and predict changes related to the heart. Along with other researchers in this field, it is thought that conditioning anxiety connected to heart stimuli, both directly, such as actual body sensations, and indirectly, such as words, is a key mechanism in the etiology of cardiophobia. For those who are more likely to associate cardiac-related bodily events with personal danger, such as those with high cardiac anxiety, this conditioning process is probably most pertinent.

It is proposed that an interoceptive conditioning process of physical sensations, which are frequently made worse by biological processes and/or stressful situations, is significant in the genesis of cardiophobia, even though not all cardiac-based bodily changes inevitably result in conditioning. Interoceptive conditioning, which is a basic form of learning, refers to a learnt association

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between internal somatic cues and other bodily sensations associated with a systemic 'alarm' response (Bouton et al., 2001; Forsyth & Eifert, 1996; Barlow, 1991; Bouton et al., 2001; Razran, 1961). On the other hand, exteroceptive conditioning develops a connection between ambient or exteroceptive signals, such as words or situations, and systemic body alarms (Razran, 1961).

According to the interoceptive conditioning theory of cardiophobia, proposed by Zvolensky et al. (2008), cardiac-based distress is a self-reinforcing process, with identifiable sensations turning into interoceptive conditioned stimuli (CS) that ultimately result in fear or a panic situation (Eifert, 1992). This is in line with previous research on panic disorders by Bouton et al. (2001). Unexpected autonomic arousal's high intensity, for instance, could act as an unpleasant unconditioned stimulus/unconditioned response (UCS/UCR) complex that is conditioned by otherwise innocuous interoceptive cardiac cues (CS). The anxiety that occurs with unexpected autonomic arousal may then be significantly linked to these innocuous stimuli. According to Barlow (1991), once learned, internal or even external triggering stimuli can indicate the occurrence of danger or another systemic alarm reaction. Similarly, in response conditioning scenarios, stimuli that have learned to have punitive or reinforcing properties may transmit those properties to other stimuli that are present and may subsequently also serve as emotion-elicitors.

The ability to quickly link emotional reactions to physical and environmental stimuli is highly adaptive in the context of emotional processes. Therefore, as long as the chest discomfort and other body sensations do not occur frequently or as long as excessive concern regarding the functioning of the heart does not develop,

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a demonstrated relationship between certain stimuli and heart function is not always detrimental. These interoceptive and exteroceptive stimuli can only become a clinical issue if they consistently elicit excessive anxiety, which can result in functionally detrimental avoidance behavior. Numerous trials are not necessary for this conditioning process because a strong association can be formed from a single, intense, or unexpected emotional event (Forsyth & Eifert, 1998).

Cardiophobia is a condition in which anxiety is conditioned to cardiac sensation and chest pain, as well as occasionally more subtle environmental situational cues, such as being distant from a medical facility. In the end, the person who has cardiophobia has come to link heart-related sensations with more severe panic attacks. It is noteworthy that this conditioning process does not consist of any one kind of conditioned response. For instance, in the context of fear and anxiety, conditioned responses have different types of reflexive reactions and different changes in the functioning of autonomic systems. These several co-occurring reactions serve the primary purpose of preparing the person for a "dangerous" event in the current circumstance. As a result of this learning process, a variety of responses are conditioned to be elicited; however, only a subset of these responses is clinically significant for those with cardiophobia.

Accordingly, the conditioned cardiac anxiety exacerbates severe reactions, which usually show up as abrupt chest discomfort and/or panic attacks with few symptoms. Additionally, increased cardiac anxiety, such as a reviewing habit to minimise fear or anxiety about developing heart disease, leads to strong attempts to avoid or escape heart-related symptoms. Based on the growing amount of experimental and clinical data, it can be argued that this type of process is apparent

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cardiophobia. For instance, lab-related investigations reveal that increased cardiac anxiety before the test is an important determinant of limited-symptom panic attacks, including disturbance related to cardiac activity during biological challenges (Zvolensky & Eifert, 2000). In addition, a large number of cardiophobic persons reported experiencing multiple episodes of increased interoceptive distress or that their illness started with a disturbing physical event, such as non-fatal angina, panic attack, or acute chest pain (Eifert, 1992). Indeed, events or items that are likely to generate fear-evoking functions, including evaluative labels for such events or objects, must be associated with a strong enough unconditioned response (Eifert, 1987; Martin & Levey, 1987). This process is essential for respondent conditioning.

Specific Psychological Processes that Increase the Chance of Conditioning of Anxiety to Chest Pain and Heart Sensations

There is a chance that physical sensations, especially those related to the heart, would be perceived as acute can be increased by a number of circumstances. The existence or lack of safety signals, the controllability and predictability of unpleasant occurrences, and prior learning experiences involving upsetting somatic experiences are among the most significant of these elements.

Clinical findings indicate that cardiac symptoms and chest pain are often unexpected and unpredictable (Eifert & Lau, 2001). Once these physiological changes are established, there will be nothing that the person may be able to do to halt or reduce this “hard-wired” process. On the other hand, rapid physical changes brought on by cardiac stimuli could be seen as unpredictable and/or uncontrollable. Interoceptive experiences in the current situation are viewed as sudden and

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unpredictable, even if certain activities and life events may bring them on.

Perceiving physical changes as unpredictable and unmanageable is clinically significant because these bodily changes can be seen as very strong and may therefore result in the acquisition of fear through interoceptive conditioning.

The strength of the psychological process has been illustrated by studies that show people who are unable to stop cardiopulmonary distress are much more likely than those who can control such an event to experience enhanced levels of anxiety conditioned to these physical sensations (Zvolensky et al., 2001; Zvolensky et al., 1999; Zvolensky et al., 1998). Accordingly, those who experience anxiety related to their heart when they have little to no chance of escaping, like during a business conference, are particularly susceptible to interoceptive conditioning (Barlow, 1991, 2002). It is important to be aware that a variety of characteristics, including ethnicity, often impact how certain situations are seen in terms of their perceived value as control-oriented threats. There is evidence that aversive situations that are unpredictable are perceived as more painful than those that are predictable. According to other clinically intriguing findings in this area, Individuals who are predicted to have somatic experiences are more likely to experience unpredictable panic episodes (Craske et al., 1995).

Another psychological process variable that has a strong correlation with interoceptive conditioning is relative levels of perceived safety. According to Seligman and Binik (1997), safety signals are stimuli that convey an aversive stimulus's offset or the absence of the start of an unpleasant stimulus.

Interestingly, unpleasant experiences such as panic attacks and chest pain are fully expressed in only certain situations; as a result, reliable safety signals are typically

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not present (Craske, 1991). However, similar to people with panic disorder, many cardiophobic patients exhibit increased emotional reactivity in situations they believe to be dangerous. Therefore, the relationship between signs for an aversive event and prior occurrences of the same event may determine the level of perceived safety. This perspective is supported by research showing that a lack of access to safety information can result in more cardiovascular emotional distress than having access to it (Rapee et al., 1991; Schmidt & Telch, 1994). For instance, Carter et al. (1995) found that during a biological challenge, people who had panic attacks exhibited less interoceptive-related anxiety and bodily reaction when a “safe person” was present as opposed to when one was not. Furthermore, these experiments offer strong support that safety may reduce the learning of fear related to cardiac events, as the likelihood of conditioning is partially determined by reaction intensity.

Prior experience with interoceptive distress, such as panic disorders, chest pain, and general negative emotional reactivity, may also influence the extent of reaction intensity related to cardiac-based sensations. To put it briefly, prior exposure to unpleasant interoceptive events has a “kindling effect,” making the person more sensitive to comparable subsequent experiences and causing them to react anxiously. This can be the primary reason for being exposed to stressful life events that might produce a psychological environment that raises the risk of developing psychopathologies, such as cardiophobia. Sensitisation processes involve a variety of mechanisms (Rosen & Schulkin, 1998). From a functional point of view, the net result is identical. Sensitisation mechanisms raise the

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possibility of cardiac-based conditioning by increasing the chance of more intense interoceptive reactions.

Biopsychosocial Process of Cardiophobia

The probability of developing cardiophobia is accompanied by general vulnerabilities, along with the interoceptive conditioning of anxiety. As mentioned before, many, if not all, people have cardiopulmonary distress at some point in their lives. Additionally, a sizable portion of the population will experience severe interoceptive reactions, including respiratory infections, strained chest muscles, gastrointestinal issues, panic attacks, and panic attacks with restricted symptoms. It is actually hard to picture a person living their entire life without having at least one significant cardiac-related disturbance, as cardiac-related distress is a common part of the human experience. The current section addresses the biopsychosocial elements that contribute to the development of cardiophobia in general.

Inherited Risk for Emotional Responsivity

There is strong empirical support that negative emotionality has a hereditary component or substrate. Researchers use numerous terms, such as neuroticism, negative affectivity, and trait anxiety to describe this genetic tendency (Grey & McNaughton, 1996). Uninhibited temperament is linked to high reactivity (Kagan, 1989). These synonymous expressions refer to a natural propensity to feel unpleasant affect, such as anxiety, and possibly to react emotionally abrupt manner, such as panic, to stressful or challenging conditions. High levels of negative emotionality are linked to a lower threshold to initial affective response, slower recovery to baseline, and greater reactivation of arousal with repeated experience of stressful situations, despite the fact that the characteristics of

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negative affectivity differ depending on the type of negative emotional experience (e.g., panic vs. anger). Because temperamental characteristics either limit or enable particular types of behavior, they are frequently linked to the experience and control of affect (Kagan et al., 1992). Certain theoretical models in the area of behavioral genetics express the degree to which a certain gene or gene combinations lead to a particular anxiety condition or emotional functioning. It is inevitable to understand that a general tendency toward negative affectivity is influenced by heredity at this point in the developmental process of study. According to Kendler et al. (1992), this genetic component is thought to account for 30% of the emergence of panic-related disorders. Despite some evidence that anxiety disorders overlap and have different genetic vulnerabilities, no study has determined the precise contribution of explained variance to the origin of cardiophobia. By establishing the molecular prerequisites for anxiety and panic reactions, a genetic predisposition probably raises the possibility of developing anxiety disorders like cardiophobia (Kendler et al., 1992, 1995).

Emotion Regulatory Skills Development

Previous studies indicated that humans acquire a set of regulatory skills early in life to cope with high physiological arousal and the accompanying distress. Research has also shown that, for instance, an infant's crying informs caregivers that the baby needs something (e.g., food), and stopping the crying and the accompanying behavioral reactions (e.g., smiling) promotes caregiver behavior (Derryberry & Rothbart, 1998). Children learn how to approach and avoid important environmental cues as they become older. Different facets of society expect them to develop greater emotional regulation abilities (e.g., suppressing

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crying in school). It is anticipated that by adulthood, the person will possess advanced emotional regulation abilities and the capacity to pick up new skills for a range of shifting sociocultural situations. Research consistently shows that people with poor emotional regulation skills or those who are unable to change their regulation techniques quickly have a lower ability to function adaptively and successfully in social situations than people with stronger regulatory abilities (Rothbart, 1989). People are more prone to anxiety, negative affect, and physical discomfort when they are unable to effectively change their emotional experiences (Rothbart et al., 1992). When the children learn to explore the surroundings both literally and metaphorically, it significantly leads to developing their emotional regulation skills. It is considered a mastery learning chance (Rothbart, 1989).

Compared to environments linked to a contingent consequence, high emotional distress can be caused in children when the parents or caregivers react in a non-dependent manner. For instance, research conducted by Chorpita et al. (1998) discovered that children are more likely to feel like they have little control if their parents overprotect them from any possible danger while discouraging autonomy. Similar outcomes were found in studies conducted among non-human animals where they were raised in certain situations in which limited control over the availability of food (Mineka et al., 1986). These findings are vital for understanding the origin of cardiophobia, since a high level of perceived uncontrollability determines the heightened anxiety and fearful reaction to stressful situations (Zvolensky et al., 2000).

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Language-based Learning

Verbal cues that reflect cardiac-related events and sensations are likely to elicit affective reactions in people as well. By giving people emotional situations without exposing them to the real event or stimuli that often produce those emotions, language fulfils significant symbolic roles (Staats & Eifert, 1990). For instance, verbal comprehension, some activity, and their relationship are all part of “knowing what to do” and “knowing what to feel.” As a result, cardiac anxiety can be viewed psychologically as a complex process of relating essentially random verbal-symbolic stimuli to other psychological processes and events within a context. In turn, the relationship quality of sentences that convey emotions can only be determined by particular descriptions. The meanings of these descriptors, such as good, bad, pleasant, unpleasant, and painful, as well as the stimulus functions, such as eliciting, evoking, reinforcing, and punishing, are often associated with events and behaviors. On the other hand, people usually employ metaphors to make sense of their emotional experiences for other people (e.g., ‘When I feel anxious, it is like a knife piercing through my chest’).

Without taking into account the natural characteristics of the stimuli used, the social verbal community decides the events and stimuli given in relation to each other as well as the nature of the relation (Hayes & Hayes, 1989). The frequent observations of cultural variations in anxiety disorders may have this as one of its underlying causes (Horwath & Weissman, 1997). For this discussion, the main idea is that, irrespective of the exact procedure of acquiring language-based emotional properties, people with anxiety conditions may acquire sophisticated repertoires of different symbolic and verbal events that can elicit adverse

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emotional reactions. Additionally, these affective reactions act as discriminative triggers for escape/avoidance behavior in a variety of situational circumstances and as punishers (Staats, 1972, 1996; Staats & Eifert, 1990). The palpitation or chest pain can cause a number of spontaneous and spoken reactions in healthy people. They might think they are suffering a heart attack as a result of this (Eifert, 1992). A rapid or unpredictable heartbeat in this instance is more than just a physical occurrence. It turns into a thorough understanding of what chest pain or an irregular or fast heartbeat signifies. For instance, ideas like “I am having a heart attack” or “I have heart disease” come to mind. In response to these feelings, the person may rush to the emergency department. Furthermore, any additional personal or public trigger associated with this response may potentially acquire negative connotations. This covers things like working hard, smoking, and exercising.

Observational Learning

Compared to those without cardiophobia, those who have it have probably been exposed to more heart-related scenarios. Research has begun to reveal that many individuals who suffer cardiophobia have witnessed the fatal repercussions of heart disease in their close friends and family members (Eifert et al., 1996; Eifert & Forsyth, 1996). Those people who experienced the agonising psychological and physical effects of heart disease might have been more conscious of cardiac perspectives and their physiological interpretations. Research indicates that understanding pain ratings, pain tolerance, and nonverbal pain emotions is significantly influenced by observational learning (Flor et al., 1990). Later in life, people may be more likely to express and comprehend arousal and

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discomfort as heart problems as a result of this learning. This happens because social experiences shape how people perceive and respond to symptoms of illness (Nerenz & Leventhal, 1983). For instance, if the individuals have more heart-related issues, their children may notice how their parents react to these problems. In addition to responding to stress with increased cardiovascular activity, children of parents who exhibit a lot of illness behavior may also learn to recognise and categorise their own symptoms as indicators of a serious illness. They might therefore be less able to cope effectively.

In Western culture, the heart represents life and love. The association between emotional pain and physical pain is linked to it. The heart stands for intense feelings like the heartbreak that comes with losing a child or partner, as well as the shattered heart that follows the end of a relationship or impending separation. People with cardiophobia are not the only ones influenced by this symbolism. However, it is interesting to consider whether personal distress, such as separation, becomes more closely tied to the heart for those with cardiophobia. This could be due to their experiences, which led them to attend to and possibly be aware of their cardiac functions.

Summary of General Vulnerability Processes

Cardiophobia can arise due to several reasons. These elements probably play a part in the rise in unpleasant emotional reactions and inefficient coping mechanisms. Individuals who suffer from heart-related conditions or who become aware of the possible risks associated with heart sensations may feel more vulnerable. For example, different socioeconomic, cultural, and ethnic characteristics may affect how people react to situations relating to the heart. The

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emergence of detrimental concerns centred on the heart can be attributed to both individual situations and larger social influences. As research progresses in these areas, in the near future, it will be possible to identify who might develop cardiophobia. Understanding these factors will help one correctly identify individuals with cardiophobia, and effective prevention and treatment efforts can be implemented (Feldner et al., 2004)

Empirical Basis

An empirical review is essential for establishing the current state of knowledge on a given topic. It is carried out by critically examining findings from previous research. It enables the identification of consistent patterns, methodological strengths and weaknesses, and existing gaps in the existing literature. Through the systematic analysis of empirical data, researchers can contextualise their studies within the broader scholarly landscape, justify the relevance of their research questions, and avoid duplication of research work. For the convenience of understanding, this section of the chapter has classified the literature under various titles: the distinction between cardiac anxiety and other forms of anxiety, cardiac anxiety in the general population and cardiac anxiety in cardiology patients. Following this, the chapter discusses the key findings derived from the two systematic reviews conducted by the researcher on the factors influencing cardiac anxiety and its consequences, as well as the strategies for managing it.

The Difference between Cardiac Anxiety and Other Forms of Anxiety

According to Eifert (1992), cardiac anxiety is a particular type of anxiety that is present in individuals with panic-related issues, such as persistent chest

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discomfort, cardiophobia, or panic disorder. Cardiac anxiety is the fear and worry about cardiac sensations and stimuli based on the anticipated adverse outcomes (Eifert et al., 1999). The moderate associations between CAQ and the other questionnaires support the idea that cardiac anxiety is different from depression (Beck Depression Inventory (BDI)), worry or generalised anxiety (State Trait Anxiety Inventory (STAI)), somatic anxiety (Beck Anxiety Inventory (BAI)), and panic episodes (Agoraphobic Cognitions Questionnaire (ACQ)). This connection aligns with earlier studies in ACS that found a link between depression and anxiety (Martens et al., 2007; Denollet et al., 2006; Frasure-Smith & Lespérance, 2008).

Since cardiac anxiety is specifically related to the heart, it differs from general anxiety. General anxiety measures have been used in numerous studies to evaluate cardiac patients for anxiety. These measures might indicate anxiety, but they cannot help identify its cause (Hinkle, 2014). Cardiac anxiety is unique to heart-related activities and experiences. Those who have had a cardiac episode and have worried more about their health, those who have a personal or family history of cardiac diseases, and individuals who are at low risk but are nevertheless too worried about their heart's health are more likely to suffer this kind of anxiety (Hinkle, 2014). Another study revealed that there was only a weak to moderate correlation between cardiac anxiety and generalised anxiety in their cohort. It indicated that the two concepts are different (Rosman et al., 2015). The Diagnostic and Statistical Manual of Mental Disorders and the International Classification of Diseases do not list cardiac anxiety as a medical problem to be diagnosed, since it is seen as a symptom of anxiety and not as an anxiety disorder. As a result, those with heart palpitations are often diagnosed with panic disorder (Fisher, 2012).

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Heart-related pain and variations in heart activity are the specific causes of cardiac anxiety, as opposed to hypochondriasis, in which there are more diverse and frequent generalised health concerns (Eifert, 1992; Bass, 1990). These causes distinguish it from other forms of fear of illness and health anxiety. These worries can also manifest on their own or in combination with other forms of fear, such as panic-related anxieties (Philip, 1987). For instance, one of the diagnostic characteristics for panic disorder is concern about health in general and heart attacks in particular (American Psychiatric Association, 1994).

Cardiac anxiety is similar to other psychological factors linked to anxiety issues, but it is more specific. These factors include trait anxiety and AS (Taylor & Cox, 1998). While cardiac anxiety focuses on the fear of heart-related events, symptoms, and functions, trait anxiety usually refers to negative feelings based on anxiety. Additionally, cardiac anxiety differs from other anxiety disorders linked to health. Instead of the variety of broader health-related anxiety that persons with hypochondria experience, it focuses on the heart (Bass, 1990; Eifert et al., 1998). For instance, fear of cardiac death only arises and becomes more intense while one is suffering significant chest discomfort or palpitations. Therefore, concerns over other anxiety-related situations and experiences, such as social situations, are not the same as cardiac anxiety.

Cardiac anxiety is highly correlated with other psychological factors, such as AS, that have been connected to the origin and continuation of psychological distress (Eifert, 1992; Eifert & Forsyth, 1996). Cardiac anxiety appears to involve the fear of specific heart-related activities and sensations (Eifert et al., 1999; Taylor & Cox, 1998), whereas AS is the fear of anxiety-related sensations in a broader

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sense, referring to their negative implications (Reiss & McNally, 1985). As a result, cardiac anxiety is more specific than other psychological characteristics, including AS, that have been connected to the emergence and maintenance of anxiety disorders. One important general anxiety construct that can aid in our understanding of responses to cardiac problems is AS. The fear of anxiety symptoms, such as cognitions and bodily sensations, is known as AS. This anxiety stems from the perception that these symptoms could have detrimental psychological, bodily, or social repercussions (Reiss et al., 1986). According to some researchers, AS can make people react more strongly to certain interoceptive events (Asmundson et al., 1999). According to Taylor (1993), those who tend to fear anxiety symptoms associated with autonomic arousal are also likely to fear and avoid circumstances like being near strangers or related stimuli like hospitals and blood. Early research has indicated that cardiac anxiety and AS were significantly correlated in heart patients evaluated in outpatient settings or after angiography (Eifert et al., 2000). In essence, anxiety sensitivity is the fear of anxiety-related symptoms that generally result from the thought that they have detrimental repercussions. In contrast, cardiac anxiety is the fear of heart-related events, sensations and functions (Reiss & McNally, 1985). As a result, cardiac anxiety can be considered a subset of AS since it is limited to cardiac-related stimuli rather than broad body sensations (Taylor & Cox, 1998).

Cardiac anxiety may now be considered a lower-order component of the general AS concept (Reiss, 1991; Taylor & Cox, 1998c). However, current research indicates that there are relatively moderate zero-order correlations between the CAQ and the Anxiety Sensitivity Index, as well as its global and

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lower-order elements (Eifert et al., 2000). Additionally, there is a moderate link between the CAQ and some subscales of related measures, like the Illness Attitudes scale, which reflects fear about being sick. This implies that the CAQ measures a unique and potentially more comprehensive feature of cardiac anxiety. For example, the CAQ focuses on key dimensions of cardiac anxiety, such as fear, avoidance, and attention, which the AS Index does not explicitly capture (Eifert et al., 2000). More directly, AS may contribute to both panic disorder and the fear, attention, and avoidance of cardiac symptoms (Eifert et al., 2000b).

Cardiac Anxiety in the General Population

According to Eifert et al. (1996), healthy heart-anxious individuals show the following symptoms: (a) They share the same fear of chest pain and variations in heartbeats as experiences by heart disease inpatients; (b) they experience the same symptoms and utilize medical services as both inpatient groups; and (c) they report higher levels of belief in having heart disease, awareness of their heart, and heart-protective behaviors than both surgical patients and nonpatients, but less intense than cardiac inpatients. In other words, heart palpitations or chest pain are the primary causes of worry and anxiety in those who suffer from cardiac anxiety. Healthy heart-anxious individuals have reported higher physical symptoms, obsessive-compulsive worry, panic and other anxiety disorders, and unpleasant emotions than the other groups. In addition, heart-anxious individuals feel low safety and are under control and exhibit more disturbing sensations and thoughts following a hyperventilation test than nonpatients and surgical patients (Eifert et al., 1996). Overall, the findings indicate that compared to cardiac and surgical inpatients and nonpatients, physically healthy individuals with cardiac anxiety and

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ongoing concern about their symptoms show more physical symptoms, higher levels of depression, anxiety, anger, hostility and obsessive-compulsive concerns (Eifert et al., 1996).

It has been found that the average attention and worry/fear factor scores of a sample of general people without coronary atherosclerosis were noticeably higher. This implies that individuals with coronary atherosclerosis are less concerned with and attentive to their heart-related symptoms than those without a recognised heart problem. Even in the absence of CHD, cardiac anxiety can be a costly problem that lowers an individual's quality of life and results in recurring, unnecessary medical bills. Studies show that cardiac anxiety is common and quite costly when it occurs without CAD (Marker, 2008).

Cardiac Anxiety in Cardiology Patients

Cardiac anxiety or disease-specific anxiety is a condition marked by fear related to the heart, avoidance behaviors, and excessive monitoring of heart symptoms (Eifert et al., 2000a). This group of symptoms is important for cardiology patients. It has been linked to higher rates of distress related to CVD, avoidance of exercise, self-reported disability and poorer health outcomes (Marker et al., 2008; Eifert et al., 2000a; Hoyer et al., 2008; van den Broek et al., 2009; Hamang et al., 2011). Both individuals with and without heart disease can experience cardiac anxiety. However, people with cardiac disorders often report higher levels of this anxiety (Eifert et al., 1996; Hoyer et al., 2008). In other words, cardiac anxiety may impact patients experiencing panic attacks, as well as those experiencing both cardiac and noncardiac thoracic pain. Furthermore, according to

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the specific medical condition of the patient, cardiac anxiety itself may be a major overwhelming issue (Hoyer et al., 2008).

Research has shown that people usually start to concentrate on understanding how the heart functions after being diagnosed with heart disease; it is primarily driven by anxiety and worry about cardiac symptoms (Hohls et al., 2020; Murphy et al., 2020; Tremblay et al., 2018). According to Carmin et al. (2003). Individuals with NCCP also report comparable or higher levels of anxiety, discomfort, and autonomic sensations than those with coronary calcium. This is in contrast to individuals with heart disease. However, established medical care environments have rarely taken this kind of anxiety into account (Dragiotti et al., 2011). In addition to having a higher risk of cardiac morbidity and death, people with CVD who experience higher levels of cardiac anxiety also experience psychological distress. Hence, in clinical settings, it is crucial to detect the presence of cardiac anxiety (Leissner et al., 2022).

Cardiac anxiety and NCCP cardiac anxiety may not be limited to those with a MI or ischaemic heart disease. Higher cardiac anxiety is also reported in individuals at increased risk for arrhythmias and sudden cardiac death because of a personal or family history of an inherited cardiac disorder (Hamang et al., 2011). A specific group of people is more likely to have elevated cardiac anxiety if they have cardiac symptoms, including chest pain, even when there is no medical cause for them, as is common in individuals with NCCP (van Beek et al., 2012). The primary psychological factor that contributes to the onset or maintenance of NCCP-related impairment in the six months after an emergency department visit was cardiac anxiety among individuals with NCCP and concomitant panic disorder

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or generalised anxiety disorder (Hamel et al., 2024). Cardiac anxiety is common in individuals with recurrent NCCP (Mourad et al., 2016). This creates a vicious cycle, as it maintains both anxiety and pain. It also leads to a secondary avoidance of physical activity (Lethem et al., 1983; Leeuw et al., 2007).

Angina attacks in people with CAD can be triggered by cardiac anxiety, which can also increase their frequency and severity. Additionally, it may increase the chance of dying from heart disease (Fleet & Beitman, 1998). Health behaviors and healthcare utilization are linked to cardiac anxiety (Hohls et al., 2020). Additionally, significant levels of cardiac-specific fear, avoidance and obsession with heart symptoms are supported by SCA survivors. Anxiety regarding cardiac security and functioning must be addressed for individuals with SCA to be managed successfully (Rosman et al., 2015). Preliminary study results and existing studies indicate that clinicians might take cardiac anxiety into account when analysing SCA survivors' behavior. For instance, even when medical tests show that their heart is functioning normally, individuals with significant cardiac anxiety may continue to worry about it (Rosman et al., 2015).

According to a longitudinal study, even when the global anxiety and depression levels declined following the implementation of elective bypass surgery, one-fifth of cardiac patients (n=90) still experienced clinically increased cardiac anxiety for six months following a bypass surgery (Hoyer et al., 2008). However, it is challenging to determine the clinical significance of this elevated and ongoing cardiac anxiety because of a paucity of data on cardiac prognosis. One possible explanation is that patients are faced with greater uncertainty when their heart injury is less severe. If the electrocardiogram (ECG) does not show a ST

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elevation (non-ST-elevated ACS), patients will have to wait for the blood test findings to be verified and, as a result, for the final diagnosis. While the initial response given to patients in this category is “nothing is wrong, but we have to wait for the blood results,” they themselves feel that something is wrong with them. Because of the felt signs, they often go to the emergency departments. As these patients sense a loss of control and are confused whether their physiological suffering is due to a medical problem, these uncertainties cause an increase in the levels of cardiac anxiety. This ambiguity could cause cardiac anxiety by raising awareness of cardiac symptoms. Based on the results of a cross-sectional study done on 184 individuals with ACS, people who thought a heart attack caused their symptoms were more likely to have a fear of dying (van Beek et al., 2014).

When anxiety and heart disease symptoms, such as palpitations, dyspnea, or chest discomfort, partially overlap, it can be challenging to diagnose cardiac anxiety among cardiac patients. As a result, undetected cardiac anxiety patients are only eligible for medical care and cannot be referred to psychological services. This could have adverse effects on them (Wedegärtner et al., 2020). A major adverse cardiac event, which is defined as hospital readmissions with discharge diagnoses of ischemic heart disease, ventricular fibrillation and flutter cardiac arrest, and/or readmissions for an acute coronary intervention, is predicted to occur in individuals with MI based on cardiac anxiety (Van Beek et al., 2016). Cardiac anxiety is linked to general anxiety and lowers the quality of life in individuals HF (Bunz et al., 2016). Additionally, in the absence of acute cardiac dysfunction, it results in preventable medical expenses from frequent doctor visits (Marker et al., 2008; Tremblay et al., 2018). It is noteworthy that there is frequently little time in

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clinical routine for a thorough assessment of the patient's psychological state (Wedegärtner et al., 2020). Besides, individuals who experience cardiac anxiety have a huge tendency for medical reassurance seeking for regular changes in cardiac function, which can lead to unnecessary emergency room visits, expensive diagnostic tests and procedures, and create a burden (Marker et al., 2008).

Factors Influencing Cardiac Anxiety and Consequences of Cardiac Anxiety

The researcher of this study conducted a systematic review on factors influencing cardiac anxiety and the consequences of cardiac anxiety among individuals with and without cardiac diseases. The review included studies on individuals with different CVDs, NCCP, and the general population. The review was conducted in accordance with the “Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA) guidelines” 2020 checklist (Page et al., 2020). A systematic search was carried out using the following databases: Scopus, Web of Science, ScienceDirect, APA PsycNet, EBSCO, and Google Scholar. Only peer-reviewed articles published in English from inception till July 2025 were included. The keywords used for the search were "Cardiac anxiety," "Heart-focused anxiety," "Heart-focused anxiety," "Disease-specific anxiety," or "Cardiophobia." The review used appropriate Boolean operators to combine the search keywords (AND, OR, NOT). To ensure the maximum inclusion of relevant studies, the keywords were kept as broad as possible. Reference lists of the selected studies were also examined manually to retrieve additional empirical evidence, if any. A total of 47 articles that reported factors influencing cardiac anxiety and the consequences of cardiac anxiety were included for the final analysis. The Joanna Briggs Institute(JBI) checklists for cross-sectional studies,

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cohort studies, and case-control studies were used to examine the quality of the selected studies. Following this, a thematic analysis was employed for data synthesis.

Influencing Factors of Cardiac Anxiety

The review classified the factors influencing cardiac anxiety as psychological, socio-demographic, cardiac, and other illness-related, treatment-related, family history-related, laboratory, and lifestyle factors.

Psychological Factors

The analysis of studies on NCCP, HF, and other groups of individuals with CVD showed that psychological issues such as anxiety, depression, poor quality of life, and fear of uncertainty were common in many patients and were substantially associated with or even predicted cardiac anxiety (Pokrajac-Bulian et al., 2022; Hamang et al., 2011). It found that avoidant behavior and agoraphobic thoughts were prevalent, and it suggested that individuals who engage in cardio-protective avoidance behavior due to the anticipated negative consequences of cardiac stimuli may exacerbate the cardiac anxiety condition (van Beek et al., 2014; van Beek et al., 2012). One study noted that body vigilance, the tendency for people to pay close attention to their physical sensations, has been shown to have an impact on them and heighten the fear of cardiac events (White et al., 2010). Intolerance for ambiguity has also been highlighted as another significant psychological element (Pokrajac-Bulian et al., 2022). It has been found that cardiac anxiety is more common in those with a lower threshold for ambiguity. It was also discovered that self-efficacy expectations (Hamanget al., 2012) and perceived parental overprotection (Ong et al., 2011) had an impact, particularly on the development of

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anxiety levels and long-term coping mechanisms. Importantly, it was found that personality factors, specifically conscientiousness (Wedegärtner et al., 2020), affected the degree of cardiac anxiety, with higher levels of this trait associated with potential anxiety and heightened health vigilance. Furthermore, it has been observed that a number of individual perceptions, including attitudes toward and perceptions of illness as well as their perceived general health, were taken into consideration as predictors of cardiac anxiety (O'Donovan et al., 2016; Panzaru et al., 2015; Eifert et al., 1996).

Socio-demographic Factors

The review identified that certain sociodemographic factors are associated with cardiac anxiety. It has been found that high cardiac anxiety is correlated with female gender (Carmin et al., 2003). Women frequently endorsed higher levels of heart-focused attention, cardioprotective behavior, and fear of heart-related feelings. It has been found that there were no gender differences in the general population's ability to predict cardiac anxiety (Fischer et al., 2012). Another significant predictor is age; more severe cardiac anxiety is linked to younger ages (Rosman et al., 2015) and up. Additionally, cardiac anxiety increased linearly with age (Fischer et al., 2012), and higher cardiac anxiety was detected at older ages (Pokrajac-Bulian et al., 2022). Education (O'Donovan et al., 2016) also had a significant impact on cardiac anxiety. A lower cardiac anxiety was associated with higher educational attainment (Fischer et al., 2012). A study conducted by van Beek et al. (2012) found that individuals with cardiac anxiety remained and were less likely to be employed. Subjects who were retired from their job showed higher cardiac anxiety. However, the level of cardiac anxiety was unaffected by

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unemployment (Fischer et al., 2012). Relatedly, marital status and income also influenced cardiac anxiety (Fischer et al., 2012).

Cardiac and Other Illness-related Factors

The severity and course of illness (O'Donovan et al., 2016) were found to be the significant predictors of cardiac anxiety among individuals with more severe or prolonged cardiac problems. Because chest pain is linked to potentially fatal cardiac events, it was consistently associated with heightened cardiac anxiety, regardless of its degree or the cause (Carmin et al., 2003). Those without coronary artery calcium (CAC) presented with higher levels of attention towards cardiac sensations (Carmin et al., 2003). As a result, cardiac anxiety is common in people who do not have coronary artery calcium or apparent signs of CAD. This suggested that perceived risk, rather than merely actual medical indicators, is the main factor influencing anxiety levels. Additionally, cardiac anxiety is linked to a lower degree of cardiac injury in individuals with ACS, as evidenced by ST-elevated myocardial infarction and troponin levels (van Beek et al., 2014). Furthermore, increased cardiac anxiety was detected by individuals with a history of ACS (van Beek et al., 2012) and MI (Bunz et al., 2016). Similarly, individuals with congenital heart disease, cardiac anxiety is linked to heart murmur in individuals with SCA (Rosman et al., 2015) and heart defect complexity (Ong et al., 2011). Furthermore, higher cardiac anxiety was associated with concomitant diseases such as diabetes mellitus (van Beek et al., 2012) and anaemia (Pokrajac-Bulian et al., 2022).

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Treatment-related Factors

The decrease in cardiac anxiety was largely due to treatment-related factors. Individuals who undergo heart surgery (Panzaru et al., 2015) have lower levels of cardiac anxiety and a higher quality of life than those who merely take medicine. Cardiac anxiety was considerably decreased by pulmonary vein isolation (PVI) treatment (Pavlicek et al., 2022). Predicting the various cardiac anxiety symptoms over time was impacted by procedural satisfaction with genetic counselling (Hamang et al., 2011). Significant improvement in cardiac anxiety was documented by individuals with an implanted cardioverter defibrillator (ICD) over a longer period of time (Sears et al., 2020), defibrillator installation, and history of implantable cardioverter defibrillator shock (Kindermann et al., 2021). Additionally, after two years, individuals with a history of shock or anti-tachycardia pacing (ATP) had significantly higher levels of cardiac anxiety and cardiac avoidance than participants without shock or anti-tachycardia pacing (Kindermann, 2021).

Family History-related Factors

The review found that patients' family-related characteristics, such as a family history of cardiac illness or a cardiac death in the family, are potential predictors of cardiac anxiety. It was significantly predicted by the presence of sudden cardiac death in close relatives (Hamang et al., 2011). Anxiety was higher among people with a family history of sudden cardiac death because they were concerned about their own cardiac risk, particularly if it was unclear if other family members had previously had genetic testing done (Hamang et al., 2011). Their fear and anxiety about the possible cardiac issues were heightened by the uncertainty

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surrounding hereditary risk. Additionally, during their relatives' hospital stays, family members of critical care patients (Konstanti et al., 2016) had mild to severe cardiac anxiety. People whose parents have heart problems and those whose parents have divorced reported high cardiac anxiety (Eifert et al., 1996). Further, perceived parental overprotection is also notably related to increased cardiac anxiety (Ong et al., 2011).

Laboratory Factors

Estimated glomerular filtration rate (eGFR) and the findings of renal function tests were regarded as significant laboratory variables with predictive validity for cardiac anxiety (Wedegärtner et al., 2020). Lower eGFR (renal function) was associated with higher levels of cardiac anxiety and its subscales, fear of cardiac-related sensations, and avoidance of physical activity. Additionally, avoiding physical exercise, heart-focused attention, and overall cardiac anxiety were all associated with decreased haemoglobin levels (Pokrajac-Bulian et al., 2022).

Lifestyle Factors

Participating in exercise regimens under medical supervision was a preventive factor that decreased the risk of cardiac anxiety in heart patients (Sardinha et al., 2012). Conversely, cardiac anxiety is at risk from a sedentary lifestyle. Research has found that regular smokers with CAD demonstrated significantly more heart-focused attention than both frequent smokers without CAD and regular smokers with CAD (Zvolensky et al., 2003). Participating in sports or not, physical activity was another important predictor of cardiac anxiety.

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A lower level of physical activity was associated with higher cardiac anxiety (Hohls et al., 2020).

Consequences of Cardiac Anxiety

In terms of consequences, the themes were classified into psychological, physical, treatment-related, cardiac, and other illness-related, work-related, and lifestyle-related consequences.

Psychological Consequences

Depression and depressive symptoms in male patients were found to be important adverse effects of cardiac anxiety (Pokrajac-Bulian et al., 2020; Hamang et al., 2011; Mayorga et al., 2022). Similarly, anxiety, anxious arousal and social anxiety were found to be various consequences of cardiac anxiety (Pokrajac-Bulian et al., 2020; Hamang et al., 2012; Mayorga et al., 2022). Furthermore, suicidality was a statistically significant predictor of cardiac anxiety (Mayorga et al., 2022). Both heart patients and healthy individuals exhibited these issues. Additionally, the quality of life associated with mental health was cross-sectionally predicted by cardiac anxiety (Schmitz et al., 2022). Postpartum cardiac patients' worse quality of life was significantly correlated with cardiac anxiety (Liu et al., 2024). Cardiac anxiety may cause kinesiophobia (the fear of movement) in cardiac patients and interoceptive fear in individuals with NCCP (White et al., 2010; Zhang et al., 2023; Keessen et al., 2020). Additionally, cardiac anxiety predicted habitual motives progressively. In terms of smoking outcome expectancies, cardiac anxiety was progressively predictive of negative reinforcing outcome expectancies in adult smokers who smoke on a daily basis (Leyro et al., 2010).

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Physical Consequences

Poor physical health was reported by individuals with high cardiac anxiety (Hamang et al., 2012; Schmitz et al., 2022). Similarly, cardiac anxiety was found to be a negative predictor of physical activity, exercise capacity, and physical health-related quality of life (Schmitz et al., 2022; Sadlonova et al., 2022). Undergraduate students' decreased running behavior (frequency and intensity) was strongly predicted by cardiac anxiety (Wolf & Hopko, 2008).

Treatment-related Consequences

Healthcare visits of people with NCCP have increased as a result of cardiac anxiety (Mourad et al., 2018). Increased cardiac anxiety specifically led to more medical consultations (Tremblay et al., 2018), doctor visits for chest discomfort (Israel et al., 2017), more frequent contact with general practitioners and increased outpatient healthcare utilization (Hohls et al., 2020). Cardiac anxiety had an impact on the commencement of cardiac rehabilitation (Keessen et al., 2020) and the non-participation in a coronary exercise group (Wolf & Hopko, 2008). Increased cardiac anxiety may cause individuals with NCCP to seek medical attention more frequently (Mourad et al., 2016).

Cardiac and Other Illness-related Consequences

The review found that heart disease-specific medical complications may result in cardiac anxiety. It has been revealed that cardiac anxiety was a significant predictor of a major adverse cardiac event (MACE) after MI (Eifert, 1992; Leissner et al., 2024). Moreover, cardiac anxiety may contribute to increased intensity of symptoms associated with atrial fibrillation (Sadlonova et al., 2022). Both cardiac-related fear and avoidance were found to be substantially correlated

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with pain-related life interference, or the extent to which pain interferes with day-to-day functioning in individuals with NCCP (Israel et al., 2017). Furthermore, cardiac anxiety exacerbated the intensity of the chest pain (Zvolensky et al., 2003).

Work-related Consequences

Among employees with NCCP, presenteeism and absenteeism at work were significantly correlated with cardiac anxiety (Félin-Germain et al., 2018).

Presenteeism may be impacted by cardiac anxiety since it encourages the adoption of fear avoidance behaviors and raises attention and worry about NCCP and general anxiety (Eslick et al., 2003; Campbell et al., 2017; Sokoreli et al., 2016).

Lifestyle Consequences

It has been observed that sedentary behavior results from those with high cardiac anxiety avoiding or engaging in less frequent physical activity (Hohls et al., 2020; Bakker et al., 2021). Reduced alcohol use and current smoking were substantially correlated with higher cardiac anxiety avoidance scores (Hohls et al., 2021). Additionally, higher cardiac anxiety among regular adult smokers may contribute to smoking for negative affect reduction motives (Leyro et al., 2010).

Management of Cardiac Anxiety

The researcher conducted another systematic review to identify the major interventions to manage cardiac anxiety among individuals with cardiac diseases and NCCP. Even though there are biological or medical interventions, psychological and social interventions, the review exclusively focused on psychological interventions. The researcher could not find any intervention developed for the general population without any cardiac-related disease during the database searches. The researcher conducted the review in accordance with the

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“Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA) guidelines” 2020 checklist (Page et al., 2020). A systematic search was carried out in the following databases: PubMed, Scopus, Science Direct, APA PsycNet and Web of Science, and Google Scholar. Peer-reviewed articles published in English from the inception of the studied topic till July 2025 were included. Experimental studies, such as randomised controlled trials and non-randomised controlled trials, where cardiac anxiety was reported as either a primary outcome or a secondary outcome, were considered. The review excluded medical interventions. The review found that the majority of the studies were on psychological interventions.

Different synonyms were used to get the maximum relevant studies on interventions to manage cardiac anxiety among this population. The Boolean operators "AND" and "OR" were used to suitably operate the search words in each database based on their strategy. The key terms used for the systematic search included (“Interventions” OR “Treatments” OR “Therapies” OR “Psychotherapies” AND “Cardiac anxiety” OR “Health-focused anxiety” OR “Cardiac related anxiety” OR “Cardiac-related anxiety” AND “Cardio-vascular diseases” OR “CVD” OR “heart diseases” OR “Cardiac diseases” OR “Non-cardiac chest pain” OR “NCCP”). A total of 14 articles reporting the psychological interventions for cardiac anxiety were included for the analysis. The Joanna Briggs Institute checklists for randomised controlled trials and quasi-experimental studies (or non-randomised experimental studies) were adopted. Narrative synthesis was used to compare and contrast the extracted data, and themes were generated.

Most of the studies suggested the administration of internet-based cognitive behavioral therapy (I-CBT) (n=11) (Bethge et al., 2023; Humphries et al., 2021;

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Lundgren et al., 2016; Mourad et al., 2016; Rondung et al., 2022; Mourad et al., 2022; Schneider et al., 2019; Thesen et al., 2022; Johnsson et al., 2025a; Johnsson et al., 2025b; Eriksson-Liebon et al., 2024). It was found that this type of intervention is useful in reducing cardiac anxiety and other comorbidities like general anxiety, depression, fear of body sensations in individuals with CVD and NCCP (Humphries et al., 2021; Lundgren et al., 2016; Mourad et al., 2016; Rondung et al., 2022; Schneider et al., 2019; Thesen et al., 2022). Additionally, the review revealed that this type of intervention can enhance patients' quality of life (Lundgren et al., 2016; Rondung et al., 2022; Mourad et al., 2022). Apart from I-CBT, the review noted interventions based on patient expectations of coronary surgery outcomes (Lakri et al., 2023), multimedia education in combination with the teach-back method (Mohammadi et al., 2021), and psycho-cardiological rehabilitation programmes (Matzka et al., 2025) significantly reduce cardiac anxiety. The review observed that a large burden of untreated cardiac anxiety can lead to situations in which the CVD and NCCP will have to face challenges related to their quality of life and cardiac-related distress. In this context, the review opined that treating the psychological comorbidities like cardiac anxiety on a timely basis is necessary for those individuals to achieve their overall well-being and management of their cardiac issues. This review provided valuable insights about the potential of I-CBT as a cost-effective, accessible, and promising treatment modality for reducing cardiac anxiety and improving overall mental health outcomes in this diverse patient population.

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Research Gaps

The extensive review conducted in this chapter revealed several potential research gaps. The review identified that while CVD remains a leading global health concern, a significant but underrecognised population experiences cardiac-related psychological distress without organic pathology. These individuals frequently overuse healthcare services, pursue unnecessary diagnostic procedures, and alter their behavior based on fear rather than medical necessity. However, research addressing the specific cognitive-affective processes driving this phenomenon remains limited, especially in adult populations who are at increased risk of both cardiac events and anxiety-related somatic symptoms (Rashid et al., 2025). Individuals with heart disease frequently experience symptoms of general anxiety, which is thought to have a negative impact on their prognosis; however, it is still unclear the role that specific cardiac anxiety plays (van Beek et al., 2012). People who have cardiac sensations, such as chest pain, without a documented biological substrate, as occurs in individuals with NCCP, are a subpopulation that is especially vulnerable to acquiring elevated cardiac anxiety (van Beek et al., 2012). Despite its wide-ranging influence, cardiac neurosis, also referred to as heart-focused anxiety or cardiac anxiety, is still an unexplored domain, especially in relation to health-anxious and psychosomatically concerned populations. There is a great need to investigate how anxiety related to heart health influences perceived symptoms, changes in lifestyle and psychological distress (Rashid et al., 2025).

The review found that the etiology of cardiac anxiety among adults is multifaceted, involving various psychological factors, such as health-related

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anxiety, perceived vulnerability to heart problems and coping mechanisms.

However, there is a gap in the existing research on the interplay of these psychological factors and their impact on cardiac anxiety among adults. The need for psychological support is rarely acknowledged, despite the fact that these people try to receive medical assistance and specialised services. It is also highly necessary to know the influence of psychological factors in cardiac anxiety, as psychiatric comorbidities like depression and generalised anxiety also occur along with cardiac anxiety among individuals. A greater awareness of these indicators could aid in identifying individuals in need of psychological support and discovering the comorbidity that underlies cardiac anxiety (Pokrajac-Bulian et al., 2022). Additionally, future research ought to concentrate on cardiac outcomes and cardiac anxiety treatment approaches for the subgroup with chronically elevated anxiety levels (van Beek et al., 2012).

The review further revealed that younger patients generally reported experiencing more psychological distress, with such symptoms reducing as age increases (Hinz et al., 2011). Developmental studies also suggest that young adulthood is characterised by heightened susceptibility to significant psychological challenges (Arnett, 2001; Kim & Kim, 2020). According to Dağ et al. (2025), health anxiety is commonly observed among university students across all societal groups. Moreover, findings in the early study indicated that those with cardiophobia were considerably younger than cardiac patients (Katon et al., 1988). It has also been found that young people who start their university education struggle with the issues of adolescence as they attempt to adjust to their new surroundings. In this case, a student's physical and emotional health is significantly

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impacted by the situation when they are living away from home, adjusting to university life, making new friends, and managing money issues. During this stage, especially if they have not yet developed close friendships, they often search on internet for gathering information about mental and sexual health matters. Anxiety will be high in such circumstances, and young adults with little e-health literacy can feel increased anxiety as they are receiving information from unreliable sources. Heavy academic work, demanding course schedules, and the quest for identity are some other major variables that contribute to their elevated stress levels (Bati et al., 2018; Mofatteh, 2021; Asif et al., 2020).

Research Gaps Identified Through Systematic Reviews

The two systematic reviews conducted by the researcher also helped her identify potential research gaps in the domain of cardiac anxiety. The review on the factors influencing cardiac anxiety and the consequences of cardiac anxiety revealed that most of the studies in this direction are cross-sectional or cohort in nature. Most studies were conducted among individuals with any of the CVDs and NCCP. Since these studies were on cardiac patients, the participants were middle-aged and older adults. Only limited studies have been exclusively conducted on the general adult population, that too employing young adults. Hence, this review noted that there is a lack of qualitative studies that explore various dimensions of factors associated with cardiac anxiety and the consequences of cardiac anxiety (Vest et al., 2022), especially among young adults. The review noted that studies that specifically focus on the protective factors of cardiac anxiety are limited. The available literature revealed the treatment-related protective factors rather than the psychological and social factors that reduce the severity of cardiac anxiety. Though

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some studies examined outcomes related to cardiac anxiety, research specifically focusing on its direct consequences of cardiac anxiety remains limited. In many existing investigations, the primary focus has been on other variables such as depression, general anxiety, depression, kinesiophobia, or cardiac illness-related or treatment-related variables, with cardiac anxiety only emerging as a secondary predictor. This indirect approach leads to a gap in understanding the unique and potentially long-term impacts of cardiac anxiety itself.

The review on the management of cardiac anxiety found that psychotherapies such as CBT have been widely used along with medical treatment to address cardiac anxiety. However, the review found that the self-management strategies used by the affected individuals are largely unknown. CBT often requires repeated sessions and ongoing professional guidance, which may not be feasible for all individuals. In contrast, self-management strategies such as breathing exercises, meditation and distraction activities offer a more sustainable, patient-driven approach. Despite their potential to empower patients, reduce healthcare dependency, and promote long-term adherence, the evidence base for self-management in cardiac anxiety is sparse. Therefore, it is important to explore such management strategies in detail before testing their efficacy. Hence, it is vital to conduct a qualitative study to gain a profound and in-depth understanding of the lived experiences, perceptions, and contextual factors influencing cardiac anxiety and its varied consequences in the lives of affected individuals. Such a study can uncover insights that quantitative research may overlook, including the subjective and biopsychosocial dimensions of cardiac anxiety, and offer valuable information to develop tailored interventions and support mechanisms for affected individuals.

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This study addresses these critical gaps identified through the review of the literature. It will primarily investigate the interplay between multidimensional factors associated with cardiac anxiety, aiming to clarify the underlying mechanisms that sustain fear and avoidance behaviors. By identifying the multidimensional risk factors, protective factors, consequences, and self-management practices, the study can inform screening practices in primary care and cardiology settings. It will also offer guidance for timely referrals to mental health professionals. Ultimately, this research will contribute to an integrated model of care that recognises the psychological dimensions of somatic symptom presentations and supports early psychological intervention to prevent chronic functional impairment.

Research Questions

The key research questions derived through the extensive review of literature conducted for this study are the following:

1. How do adults describe the various psychological factors associated with cardiac anxiety?
2. What do adults perceive to be the aftereffects of cardiac anxiety?
3. What are the strategies used by adults to manage their cardiac anxiety?

Chapter 3

Method

This chapter outlines the research design, method, specific procedures and approaches used in this research, which aims to understand and explore various psychological factors associated with cardiac anxiety among adults. The study adopts a qualitative exploratory research design, integrating a semi-structured questionnaire followed by a reflexive thematic analysis to offer a comprehensive understanding of risk factors, protective factors and consequences associated with cardiac anxiety and its self-management strategies. The chapter opens with the statement of the aim, objectives, and research questions. It then describes in detail the research design, researcher characteristics and reflexivity, sampling techniques, data collection procedures, procedures of data analysis and ethical protocols. This systematic research design is developed on the understanding that methodology is an essential framework for researchers to design their studies, collect and interpret data, and ultimately draw valid and reliable conclusions (Sreekumar & Sreekumar, 2023). The detailed description of the research design and method that were employed in this study to address the aims, objectives and research questions will help others understand how systematically this research was conducted. This chapter is crucial for establishing the rigour and validity of the study, allowing others to clearly understand the research process and potentially utilize the findings derived from the study for future research.

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Aim

The primary aim of this study is to understand and explore various psychological factors associated with cardiac anxiety among adults through a qualitative exploratory research design.

Research Questions

In line with the stated aim of the study and the extensive review of literature conducted for this study, the researcher has formulated a set of specific research questions. These questions reflect the potential research gaps identified in the domain of the current study. By addressing these research questions, this research study will provide meaningful insights into the domain of cardiac anxiety among adults.

1. How do adults describe various psychological factors that are associated with cardiac anxiety?
2. What do adults perceive as the aftereffects of cardiac anxiety?
3. What are the management strategies used by adults to manage their cardiac anxiety?

Objectives

Based on the stated research gaps and the subsequent formulation of the research questions, this study has framed a set of objectives. The key objectives are:

1. To explore the perceptions of risk factors of cardiac anxiety among adults.

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2. To explore how adults perceive the protective and mitigating factors of cardiac anxiety.
3. To explore the perception of consequences of cardiac anxiety among adults.
4. To explore the management strategies for cardiac anxiety among adults.

Research Design

Research design is the overall plan of a research study that systematically describes the procedures for the collection and analysis of data in the most economical manner, ensuring the relevance of the research topic (Selltiz et al, 1959). In other words, it acts as a blueprint that outlines the overall strategy to address the research question and ensure the validity and reliability of the study. Considering the significance of a strong and clear research design and based on the objectives of this study, the researcher employs a qualitative exploratory research design. The rationale for choosing an exploratory research design is that this study is qualitative and exploratory in nature, and it is found suitable for addressing the key objective of this study: various risk factors, protective factors, consequences of cardiac anxiety in adults and its self-management strategies. Several studies have highlighted the probable benefits of using an exploratory research design. Polit and Beck (2012) have opined that exploratory research has the potential to elucidate how a phenomenon is manifested and to uncover the whole nature of a less-understood phenomenon. According to Reid-Searl and Happell (2012), a qualitative exploratory design is appropriate for studies that seek to investigate a subject that has received little attention in the literature. They also note that it

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allows the participants of the study to offer new knowledge to the studied area. A recent study conducted by Rendle et al. (2019) noted that in exploratory studies, the researchers often approach a topic of study that remains mostly or wholly unexamined by the scientific community through an inductive fashion. The employment of a rigorous qualitative exploratory method offers the researchers an opportunity to collect rich, in-depth information from participants that focuses on their perceptions and experiences of the particular phenomenon studied.

Based on these understandings, those who gave consent (see Appendix A) for participation were invited for the initial screening phase. By using the general information questionnaire (see Appendix B) and Cardiac Anxiety Questionnaire (Eifert et al., 2000) (see Appendix C), the researcher conducted an initial screening test to identify adults with high cardiac anxiety to recruit them for the subsequent qualitative phase. Following this, the researcher conducted semi-structured interviews with selected eligible samples.

Researcher Characteristics and Reflexivity

In research, particularly in qualitative studies, professional and personal traits of the researcher may positively or negatively influence the research process. Therefore, it is important to report the individual characteristics and possibilities of subjective biases of the researcher. This exercise will reveal the possible impacts of the researcher's characteristics in the study process and strategies employed in the research to address and control such factors.

The researcher of this study has previous experience conducting qualitative studies. She has conducted two qualitative studies previously. The first one was the

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dissertation conducted as part of the requirements for the completion of a Master's Programme in Psychology. The second one was a study conducted as part of the internal assessment requirements during the post-graduation period. Both these studies were conducted in the domain of health psychology, which is the same broad area where the present study also focuses. Additionally, the researcher has completed a six-credit paper on qualitative research as part of her coursework. The researcher has also participated in four qualitative research methodology workshops and several seminars and webinars conducted by different organizations, aiming to enhance researchers' skills to design, conduct, analyze and report qualitative studies. Thus, the insights and experiences gained from prior experiences of conducting studies in the same domain, coursework, attending workshops and seminars, the extensive literature review conducted for this study, and academic discussions have equipped the researcher with the expertise to carry out the present study.

Prior to the beginning of the data collection for the present study, the researcher purposively sought guidance from experts in qualitative research domains, cardiology, health psychology, social work, and public health. Further, the researcher conducted two systematic reviews: (1) predictors and consequences of cardiac anxiety and (2) interventions to manage cardiac anxiety. These exercises helped her get a comprehensive overview of the empirical foundations in the domain of the studied topic.

To avoid the influence of any personal traits of the researcher that may affect the process of research, the researcher has taken utmost care. For this, she

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employed a set of strategies. Prior to the research, the researcher assessed her role in the current study objectively, convinced her to set aside any personal opinions that she may have had about the subject, and continuously conducted self-reflection. The researcher maintained a reflexive journal throughout the phases of data collection and analysis to enhance researcher reflexivity and be cautious about the possible biases that may occur. The reflexive journal contained her thoughts, possible biases, and first impressions that she encountered while collecting, processing and analysing the data. The researcher revisited the journal in certain intervals to minimise possible biases. To avoid any chance of influence, the researcher ensured that no participants were previously personally acquainted with her. While dealing with participants, the researcher kept a nonjudgmental attitude and spoke with them in an empathic but personally detached manner.

Sample and Sampling

Nearly all research in the behavioral sciences, especially in the fields of sociology, psychology, and education, draws inferences from a well-specified and identifiable group of individuals employing selected measures. The well-specified and identifiable group is known as a population or universe, and the selected number of persons or objects is known as a sample (Singh, 2015). In any research, a sample must be carefully selected from the target population to best represent the larger population with the least possible errors.

For this study, the data were collected through semi-structured interviews from 34 adults from Kerala, a southern state in India, who were aged between 18 and 28 years. The study employed a non-probability sampling strategy, utilizing a

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purposive sampling technique to recruit the participants. By selecting individuals with particular knowledge and traits, non-probability purposeful sampling allows for a thorough examination of relevant problems within the research area (Ritchie et al., 2003).

Previous research has shown that the non-probability sampling strategy is employed only when a particular segment of the population has the expertise and knowledge needed to accomplish the goals and objectives of the present research. (Silverman, 2017). Therefore, this study identified non-probability purposeful sampling as the most appropriate sampling procedure for this study. The sampling strategy used in exploratory-descriptive qualitative research is often classed as purposeful. The most appropriate approach for descriptive qualitative research is purposeful sampling, which should enable the researcher to document and characterize the phenomena in a range of contexts (Sandelowski, 2000). Similarly, Stebbins (2001) suggests that the goal of sampling should be to maximise a population's representativeness, and purposeful approaches may be used to do this. In the end, the researcher must find participants who can provide accurate information needed to meet the study's objectives (Sandelowski, 2000). For this reason, and considering the focus of the study on adults with cardiac anxiety, the researcher adopted non-probability purposeful sampling.

The researcher assured that all the selected participants were without having cardiac diseases or a history of cardiac diseases. The majority of participants were recruited from different colleges in Kerala, studying

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undergraduate or postgraduate degrees. The participants were selected through a screening test.

Method of Data Collection

The data collection procedures for this study included several key steps, such as screening of the population, recruitment of the participants to the qualitative phase, inclusion criteria and exclusion criteria.

A survey method was used to screen and recruit eligible young adults belonging to the age group of 18-39 years without having any diagnosed cardiac diseases. Most of the participants were selected from various colleges in Kerala. The researcher approached 1004 individuals in the age group of 18-39 years for screening purposes and included a total of 755 participants for screening. Their level of cardiac anxiety was assessed during this phase. Individuals with high levels of cardiac anxiety were found to be eligible for the qualitative phase. The screening test was continued among adults to get sufficient participants for conducting interviews.

On the list of 755 participants, those who scored high on cardiac anxiety and consented to be interviewed were selected to take part in semi-structured interviews, which aimed to explore the factors, consequences, and management strategies of cardiac anxiety among the youth. As a widely used data collection procedure in qualitative studies, this study also chose semi-structured interviews. Through the use of focused questions, the interviewer attempts to elicit information from the subject during semi-structured interviews. While the interviewer possesses a checklist of topic areas or questions to address, the

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sequencing of these questions is not predetermined. However, these questions are posed in a manner that facilitates the progression of the dialogue, typically in a unidirectional way. The questions are strategically formulated to elicit responses from the participants according to specific domains of interest to the interviewer. There exists no stipulation mandating a predetermined sequence for the posing of questions. According to prior studies, semi-structured interviews improve the quality of study findings since they provide the chance for clarification and the probing of insightful questions (Rubin & Babbie, 2017). This also gives participants an opportunity to reflect on topics that they feel are important. The interviewer, by using open-ended questions, allowed the interviewees to examine the issue in detail.

Inclusion Criteria

The study included only those individuals who fulfilled the stated inclusion criteria. The inclusion criteria included three conditions: Participants must be adults from Kerala who belong to the age group of 18-39. Participants who have scored high on the cardiac anxiety questionnaire were included in the study. Additionally, the participants should be proficient in speaking, reading, and writing in English or Malayalam

Exclusion Criteria

The study selected only those individuals who were fit for this study. The study excluded a number of candidates from the screened list of 755 individuals as they were found to be ineligible for this study based on the following exclusion criteria. The study excluded those: Individuals who were not willing to participate and

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who were currently diagnosed with any of the cardiac diseases or have a cardiac disease history in the past. Individuals who were under investigation for cardiac disease, but were waiting for results, were excluded. Individuals with NCCP, and with poor psychological conditions, such as anxiety, depression which were assessed by the Depression and Anxiety Scale-21 developed by Lovibond & Lovibond, 1995 (see Appendix D), trait anxiety, or anxious personality traits which were assessed by the State-Trait Anxiety Inventory developed by Spielberger et al. (1983) (see Appendix E). Individuals with all types of self-reported anxiety-related disorders, such as social anxiety, social phobia, panic disorders, generalised anxiety disorders, health anxiety disorders, including hypochondriasis and other psychiatric issues were eliminated. Individuals with cognitive impairment and language difficulties were excluded. Individuals who are suffering from a terminal disease and have serious communication issues were not able to complete the interview or the questionnaires due to problems such as a psychotic state, intoxication, schizophrenia, dementia, cognitive impairment, or intellectual deficiency. Individuals with comorbid conditions like cancer, diabetes, respiratory diseases and kidney diseases were eliminated.

Instruments for Screening and Data Collection

The study employed a set of instruments and measures for the screening of the study population and data collection, such as a general information sheet, cardiac anxiety questionnaire, and interview schedule.

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General Information Sheet

The researcher prepared the general information sheet to collect basic socio-demographic details of the participants, including information on age, sex, education, area of residence, perceived socio-economic status, marital status, and certain health-related parameters

Cardiac Anxiety Questionnaire

For screening and identifying individuals with high cardiac anxiety from the candidates who were initially included in the list of candidates before eligibility screening, the study used the Cardiac Anxiety Questionnaire (CAQ) (Eifert et al., 2000). Each of the 18 self-report items is rated on a five-point Likert scale, with 0 denoting "never" and 4 denoting "always." There were no reverse-scored items on this measure, and higher scores corresponded with increased cardiac anxiety. They found the CAQ was composed of three components: fear of heart sensations, avoidance of activities believed to elicit cardiac symptoms, and heart-focused attention and monitoring. The mean of each response to each individual item is used to determine the CAQ total score. According to a prior study, the total and subscale scores had good internal consistency (Cronbach α = 0.84 and 0.6–0.9, respectively), strong test-retest reliability (0.88, $P < 0.001$), and low to moderate correlations with tests like the Beck Depression Inventory (BDI, 0.27), the State-Trait-Anxiety Inventory (0.39), and the Agoraphobic Cognitions questionnaire (0.31).

Since this questionnaire lacked an established cut-off score (van Beek et al., 2014; van Beek et al., 2012; Mourad et al., 2016), the researcher adopted the

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following method to identify the cut-off for the present data (Cohen, 2013; Field, 2024).

The mean and standard deviation of both general adults and cardiac patients were determined. For this purpose, the data were obtained from 447 general adults and 52 cardiac patients by the administration of CAQ. After that effect size was calculated by the following formula,

Effect size, Cohen's $d = (M (\text{General adults}) - \text{Mean (patients)}) / \text{pooled standard deviation}$

$[\text{pooled standard deviation} = \text{SQRT} ((\text{SD (general adults)})^2 + (\text{SD (patients)})^2) / 2]$

General adult, $n = 447$, Mean = 17.37, SD = 10.76

Patients with Cardiac Anxiety, $n = 52$, M = 32.06, SD = 16.04

Effect size, Cohen's $d = (M (\text{General adults}) - \text{Mean (patients)}) / \text{pooled standard deviation}$

$[\text{pooled standard deviation} = \text{SQRT} ((\text{SD (general adults)})^2 + (\text{SD (patients)})^2) / 2]$

Cohen's $d = (32.06 - 17.37) / (\text{SQRT} ((16.04^2 + 10.76^2) / 2)) = .87$

The effect size is large. Hence, there is a substantial difference between the two groups.

The potential cut-off score could be set at the mean of the general adult group + one standard deviation. This would aim to minimise false positives

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(identifying individuals without cardiac anxiety as having it) while maintaining reasonable sensitivity for identifying those risks.

Cut-off score = $17.37 + 10.756$ is approximately equal to 28.13.

Hence, the suggested cut-off score for the given data is 28. The optimal cut-off score may vary depending on the context and desired sensitivity and specificity.

Interview Schedule

Following an extensive analysis of the literature on cardiac anxiety and consulting experts in the field of qualitative research and health psychology, the researcher developed a validated semi-structured questionnaire (see Appendix F). The questionnaire included four sections: Consent form, general instructions, a section for socio-demographic details, and 13 pre-determined open-ended questions to explore factors influencing and consequences of cardiac anxiety and its management strategies. The study chose a semi-structured interview as the researcher intended the participants to provide accurate and vivid information that demonstrates a clear expression of the phenomenon of cardiac anxiety in them and various factors associated with it. The expert validation of the schedule was done with the help of six experts in the field of health psychology, behavioralcardiology and qualitative research methods. A few of the sample questions included in the questionnaire are given as follows:

- What do you think contributes to your anxiety about your heart health?
- How do you usually cope with anxiety related to your heart health?
- How has cardiac anxiety affected your daily life?

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Procedure

Screening

The screening test was conducted among the population based on the feasibility and availability of the participants. A survey form was prepared to seek information on socio-demographic details, CAQ and other details for screening the population to exclude the ineligible population. This form was shared through social media platforms and through mutual networking among adults in Kerala. Additionally, it was circulated among the college students across various colleges in Kerala. Prior to the distribution of the questionnaire, the researcher approached the heads of the colleges in Kerala from where the population was intended to be recruited. The researcher informed the heads of the institution about the research and convinced them of the significance of the study. With their formal consent, the researcher provided a debriefing session with the students in each of their respective classes to create a positive relationship and to perform the screening examination. Only those students who showed a genuine interest in taking part in the screening process were included. There were 755 people who showed interest in taking part in the entire screening process that was intended to determine eligibility for the next step of the study. Those students who scored high in the CAQ were selected for the qualitative phase. Screening was continued until the stipulated number of eligible participants was identified for the interview phase.

Pilot study

Upon completion of the screening, prior to the main study, the researcher conducted a pilot study. A pilot study is essential for a qualitative study conducted

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with semi-structured interviews, as it may introduce bias into the study due to the researcher's choice of questions and the way they are asked. (Hofisi et al., 2014). Rose et al. (2019) emphasise its importance for improving the validity and reliability of the research through a pilot study. The goal of pilot studies is to determine whether the interview questions or any other aspects of the research design need to be changed in order to generate sufficient responses or enable the collection of rich and useful data (Vogel & Draper-Rodi, 2017). The researcher conducted a pilot study to eliminate any potential for bias during the data collection stage. This pilot study's main objective was to improve the standard of the research. The researcher conducted three pilot interviews in Kerala and assessed participants' perceptions of the interview questions in terms of the duration of the interview and involvement with the questions. Out of the three semi-structured interviews that were conducted as part of the pilot study, two were with teaching faculty and one with an undergraduate student. Based on the insights gained from the pilot study, the researcher modified the questionnaire for the semi-structured interviews. It increased the overall quality of the questionnaire for the main study.

Main Study

The main phase of this study was based on data that were collected from the adults who scored high in the cardiac anxiety test and gave consent for participation in the interview process. After obtaining permission, the researcher personally contacted the participants and fixed the schedule for the interview. The researcher met each participant in person to debrief them on the rationale for the

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study and to build rapport. Before beginning the interview, the participant's background information was obtained. The researcher ensured that the participants felt free to open up and express their perspectives. They were also given sufficient time to reflect and think. The researcher acted only as a facilitator, allowing participants to describe their experiences in detail while directing them back to the topic of conversation if they strayed too far from it. If the participant gave insufficient information for specific questions for which the researcher felt that the participant was on the verge of giving a vital point, probing questions were asked to elicit more specific responses. Thus, every attempt was made to get an in-depth understanding of participant experiences rather than merely following a set of questions. Each interview lasted approximately 30-40 minutes, and it was audio recorded with the interviewees' consent.

The researcher recorded separate notes on the non-verbal behavior of the participants while they responded to the questions. The researcher confirmed their answers by rephrasing what they stated. Although not strictly followed, the interview schedule was adopted and used as a guide for conducting each interview. Before wrapping up, the researcher double-checked the interview schedule to ensure that all important topics were addressed. Participant recruitment was continued until the data reached saturation. Previous research has shown that demonstrating data saturation is a crucial step in interview-based studies to ensure that the data collected is adequate to improve the validity of the study (Fusch & Ness, 2015). The data saturation for this study was reached at the 31st participant. She felt data collection was sufficient at a point when she realized that any further data collection would create similar results (Morse et al., 2017). However, to

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ensure nothing was missed, the data collection continued and stopped with the 34th interview. The researcher made the reflexive notes about the participant responses, which she had collected along with the interview. At the same time, she re-heard the audio recordings during transcription or read the transcripts during analysis.

Interviews were conducted either in English or Malayalam.

Techniques Used to Enhance the Trustworthiness and Credibility of the Study

In qualitative research, data collection is often subjective and context-bound; therefore, researchers who engage in qualitative studies often use a number of techniques to improve the trustworthiness and validity of the study (McGovern, 2017; Flick, 2018; McKim, 2023). A qualitative study can have excellent methodological rigour only if the researcher undertakes specific steps to establish credibility, reflexivity, transferability, dependability, and confirmability for the study (Lincoln & Guba, 1985).

Credibility: Credibility refers to the confidence that one can place in the research findings. Credibility establishes whether the research findings represent plausible information drawn from the participants' original data and are a correct interpretation of the participants' original views (Lincoln & Guba, 1985). To establish credibility, the researcher continuously updated the research supervisor on the progress of the data collection throughout the data collection phase. The researcher, in certain intervals, submitted the field notes to the research supervisor and discussed the issues and concerns she encountered during the fieldwork. The researcher used the following strategies to enhance the credibility of the present study:

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Prolonged Engagement: Prior to the beginning of the actual data collection, the researcher, for 2 to 3 days, visited the colleges from where she intended to collect data and mingled with the students during their free hours. It was to get acquainted with the potential participants of the study. This engagement helped the researcher invest sufficient time to get familiar with the participants. This, in turn, helped her make the participants feel comfortable and gave them the opportunity to give their honest responses during data collection.

Member Check: Upon completing the preliminary draft of the study findings, themes, and corresponding interpretations, the researcher contacted three participants and invited them to validate the researcher's inferences about perspectives. The researcher ensured that participants who were chosen had maximum differences in their socio-demographic characteristics, such as gender, age and employment. This purposeful method of participant selection for member check helped this study to control the influence of the socio-demographic characteristics of the participants, if any, in reviewing the study findings. The study conducted the member checks in a face-to-face and one-to-one interaction. It helped the researcher develop a partnership with the participant and come up with findings that closely aligned with the original views of the participants. The execution of member checks helped the researcher resolve the uncertainties around some of her inferences and helped her gain additional insights for some other interpretations.

Triangulation: The present study also employed a data triangulation and researcher or investigator triangulation strategy to ensure credibility. To ensure

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data triangulation, data were gathered from various geographic locations across Kerala and diverse organizational settings. Furthermore, it was ensured that participants represented a broad range of socio-demographic groups in terms of gender, age, and employment status. This approach enabled the study to enhance credibility through the incorporation of multiple perspectives, thereby offering a comprehensive understanding of cardiac anxiety across different population segments. Though the reflexive thematic analysis of the present study was carried out by the researcher alone, the themes were later validated by six experts, either working in areas related to health psychology or qualitative research methodologies. Whenever the researcher had an opportunity to interact with peer researchers or knowledgeable faculty members, the researcher invited divergent views, if any, about her findings to confirm the same. Toward the end of the study, the researcher returned to the audio records of the interviews and listened to the interview recordings to check for any deviant responses, if any, that did not fit with the thematic framework developed for this study. Furthermore, Van Maanen (1979) contends that since many experiences and points of view can be cross-checked, the perspectives of various interviewees might offer triangulation.

Transferability: Transferability is the degree to which the results of qualitative research can be transferred to other contexts or settings with other respondents. The researchers facilitate the transferability judgment by a potential user through thick description (Lincoln & Guba, 1985). The researcher of this study provided excerpts of interviews, details of the protocols used for thematic validation, detailed descriptions of the context of the study, sample, sampling strategy and data collection procedure to enable readers to assess how the findings of this study

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align with their own context of interest. The researcher also clearly stated that the specific conditions and limitations are to be kept in mind while applying the inference of the present research in various contexts.

Dependability: Dependability in the context of research refers to the stability of research findings over time. Dependability involves participants' evaluation of the findings, interpretation, and recommendations of the study, such that all are supported by the data as received from participants of the study (Lincoln & Guba, 1985). By employing strategies such as member check and triangulation, this study established the dependability of findings derived from this study.

Confirmability: Confirmability in the context of research refers to the degree to which other researchers could confirm the findings of the research. Confirmability is the establishment that the interpretations and findings of a research study are not the investigator's imagination, but clearly derived from the data (Lincoln & Guba, 1985). To ensure confirmability, the researcher of this study gathered evidence from literature that questioned her presumptions, made reflexive notes about her evolving knowledge and shifts in perspectives about the studied topic. She also sought opinions from her colleagues who were not associated with this study; it was to buffer the influences, if any, through her personal biases.

Audit Trail: An audit trail gives readers evidence that the researcher used theoretical and methodological frameworks to inform their decisions. It is necessary for any research to establish that throughout the study, the researcher had a rationale for their decisions (Koch, 1994). Audit trail shall be accomplished by retaining raw data records, reflexive journals, transcripts and field notes (Halpren,

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1983). Considering its significance, the researcher maintained an audit trail. This involved recording the entire research process, beginning from conceptualisation to finalisation of findings. The researcher has kept an organised record of every procedure with regard to the present study, including the interview transcripts and audio recordings. This audit trail establishes the researcher's transparency, and its examination can help one understand the different research decisions the researcher has taken at each phase of this study.

The Reflexive Journal: The reflexive journal is a personal record related to particular research where a researcher records their role, thoughts, assumptions, decisions, and potential biases in the research process to retain the deeper insights arrived from the data. The researcher of this study maintained a reflexive journal throughout the study to chronicle the daily research logistics, methodological choices, justifications, and the researcher's remarks regarding their personal beliefs, interests, values, and insights about oneself (Lincoln & Guba, 1985). The reflexive notes served as a reminder for the researcher about her position concerning the study and facilitated a detailed understanding of various factors associated with cardiac anxiety. Though member checks aided objectivity towards inferences of this study, the research progress of the present study was reviewed on a half-yearly basis by the Council for Advanced Studies and Research members at the Central University of Karnataka. This external audit also helped the researcher check the level of subjectivity in the qualitative findings.

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Data Analysis

In the phase of data analysis for the main study, the researcher transcribed all the interviews into a Microsoft Word file with the participants' consent. Malayalam interviews were translated and retranslated with the help of a language expert and cross-validated by the research supervisor by listening to the interview audios. In addition to giving the researcher the chance to fully immerse themselves in the interview, the use of audio recording and transcriptions improved the accuracy and reliability of the data analysis (Biggam, 2009). The researcher manually analyzed the raw data collected through semi-structured interviews. Further, the extracted data was compiled and thematically analyzed. Researchers have identified that thematic analysis is the most suitable approach for data analysis in research studies that aim to obtain fresh perspectives through interpretations (Ibrahim, 2012). Through a thematic analysis, the study systematically identified, organised, and offered meaningful insight into patterns of meaning (themes) across the given data set. By focusing on meaning across a data set, the researcher might identify and interpret shared or collective meanings and experiences. But, finding the unique meaning and experiences that surfaced only in one data item was not the main goal of the thematic analysis in the present study. Instead, it focused on identifying what is common in the studied topic and on making sense of those commonalities (Braun & Clarke, 2012, 2006).

The present study employed Braun and Clarke's Reflexive Thematic Analysis (RTA) (Braun & Clarke, 2019). It involves a reflexive, recursive engagement with the dataset to produce a robust analysis. Reflexive thematic

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analysis is interpretative and subjective. The researcher plays an active role in analysing data. This active role provides sense-making of the data, which is influenced by the researchers' reflexivity and positioning in relation to the research subject and population being studied (Braun & Clarke, 2022). Instead of going over the data in a linear fashion, this type of analysis enables the researcher to analyze the data by going back and forth in a recursive manner (Braun & Clarke, 2021). The data was analyzed using the following methods.

Steps Involved in the Analysis

Phase 1: Familiarising yourself with your data

The researcher familiarises themselves with the data by repeatedly reading the data and gaining a sense of familiarity with the semantic meanings. The researcher can also make notes about general observations that might later foster theme development

Phase 2: Generating initial codes

Codes are then developed to capture key analytic ideas within the data, which may relate to the research question. This should be repeated to ensure key codes are not missed

Phase 3: Searching for themes

Themes are generated by grouping codes that relate to a particular concept. The themes identify patterns of meaning across the data.

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Phase 4: Reviewing themes

The themes are reviewed in relation to the coded data and the data as a whole. A thematic map can be used to structure the analysis and define the relationships between the themes.

Phase 5: Defining and naming themes

The themes are defined and named. It is here that the researcher constructs an analytic narrative to explain what is happening within the data, how this relates to the research question, and why the reader should pay attention to this.

Phase 6: Producing the report

The final phase is the drafting of the report.

The researcher repeatedly read the transcript line by line and familiarised herself with the data set. Then she generated codes and allocated them under possible themes, and the emerging codes were matched with the relevant phrases or excerpts. To gain a deeper comprehension of the phenomenon, these emerging codes and possible themes were reviewed with the help of the research supervisor. These codes and potential themes were transformed into prospective themes based on significance and recurring patterns in order to convey the perceived risk factors, protective factors, consequences and management strategies of cardiac anxiety.

By reviewing the gathered excerpts and searching for a logical pattern, the researcher developed major themes and sub-themes with a narrative based on descriptive and reflective conceptions. It was then sent for the supervisor's review. Following this, the researcher incorporated the suggestions and ideas offered by

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the research supervisor into the study. Apart from this, six experts were asked to evaluate and provide feedback on the themes developed by the researcher. The researcher further modified the overarching themes, themes and subthemes according to the relevant feedback, suggestions and comments given by the experts.

Ethical Considerations

Every research requires that researchers adopt and adhere to a set of ethical guidelines (Todd et al., 2017). It is the researcher's responsibility to follow specific guidelines for collecting and evaluating data, using the best methodology that is required by a field of study. As a result, the researcher must carefully document data and avoid changing or fabricating the results (McCormack & Garvan, 2014). Understanding the significance of ethical protocols in a research study, the researcher of this study followed the seventh edition of ethical guidelines stated by the American Psychological Association (2020). As the first step, prior to the commencement of the study, the researcher presented a detailed synopsis, based on the proposed plan of action, to the Institutional Ethics Research Committee at Khaja Bandanawaz (KBN) University-Faculty of Medical Sciences, Gulbarga, Karnataka, India, and obtained their approval. Informed consent was obtained from the participants. The researcher educated participants about the importance and purpose of this research. The participants were informed about their rights and informed that their responses would not be disclosed to anyone, complete confidentiality would be maintained, and their identity would not be revealed at any point in time. The researcher confirmed to them that the data collected would

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be used for the sole purpose of the study. The participants were informed that though the study results may be presented at scientific gatherings or in publications, their identities would not be disclosed at any instance. To ensure this, the researcher removed all kinds of information from the transcripts or replaced them with number codes, and maintained anonymity by naming the audio and transcript files with number codes. The researcher assured the participants that participating in the study would not involve any harm or risk. However, participants were informed they could be offered psychological help if they were distressed while conducting the interview. None of the participants displayed any intense emotional distress during the interview. In addition, the researcher informed the respondents that the participants' responses would be digitally recorded as audio and that they could ask the researcher to pause the recording whenever they wanted to. No monetary benefits were given to persuade the participants to consent. They were also informed about their right to express their discomfort whenever they feel and to withdraw from the study at any point in time without being penalised. No clues or misleading information were provided to the participants before or during participation.

Chapter 4

Analysis

This chapter presents a detailed analysis of the data to address the research questions. The inferences drawn from a reflexive thematic analysis of the information gathered from the semi-structured interviews were highlighted in the chapter. The following chapter presents the key inferences organised in themes and includes direct quotations from the participants to acknowledge their unique experiences and perspectives related to cardiac anxiety. Substantial qualitative data emerged from the participants' experience. The themes generated for this study are based on predetermined research questions and objectives. Hence, this chapter presents an in-depth qualitative exploration of the various associated factors, consequences, and management strategies of cardiac anxiety among young adults. This chapter entails the outcomes of 1) descriptive statistics applied to get a comprehensive overview of the data, 2) qualitative analysis applied to explore the unfolding of cardiac anxiety, the dynamics of resilience and support, the manifestations of an internal conflict, and a dual-path journey: adaptation vs. avoidance

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Table 1

Socio-demographic characteristics of study participants

Variable	N	%
Age (in years)		
18-25	3	88.2%
26-28	4	11.8%
Gender		
Male	4	11.8%
Female	3	88.2%
Education		
Under graduation	2	58.9%
Postgraduation	1	41.1%
Occupation		
Employed	5	14.8%
Students	2	85.2%
Permanent Residence		
Urban	9	26.4%
Semi-urban	1	47.1%
Rural	1	32.3%
Marital status		
Married	4	11.8%
Unmarried	3	88.2%
Religion		
Hindu	1	50%
Islam	1	44.1%
Christian	2	5.9%
Perceived socio-economic statu		
Lower middle	1	2.9%
Middle	2	70.6%
Upper middle	7	20.6%
Upper	2	5.7%

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Table 1 describes the frequency and percentage analysis of socio-demographic characteristics of the study participants. There was a total of 34 participants, and 88.2% were aged 18-25 years, while 11.8% were aged 26-28 years. The mean age of the participants was 21.76, with the oldest being 28 years and the youngest being 18 years. The majority of the participants were female, with 88.2% and the representation of male participants accounted for 11.8%. Regarding the highest educational qualification of the sample, 58.9% were undergraduates, while the rest were postgraduates. While 85.2% were students, only 14.7% were employed. Among the participants, 26.4% were from urban areas, 47.1% were from semi-urban and the remaining were from rural areas. Only 11.8% were married, and the other 88.23% were unmarried. In the case of religion, half of them belonged to Hinduism, 44.1% belonged to Islam, and the remaining belonged to Christianity. Of the participants, 70.6% individuals were from the middle class, 20.6% were from the upper middle class, 5.9% were from the upper class, and 2.9% were from the lower middle class.

Thematic map

The thematic map illustrates the visual representation of the overarching themes and themes that emerged after employing the reflexive thematic analysis of the collected data (see Figure 1)

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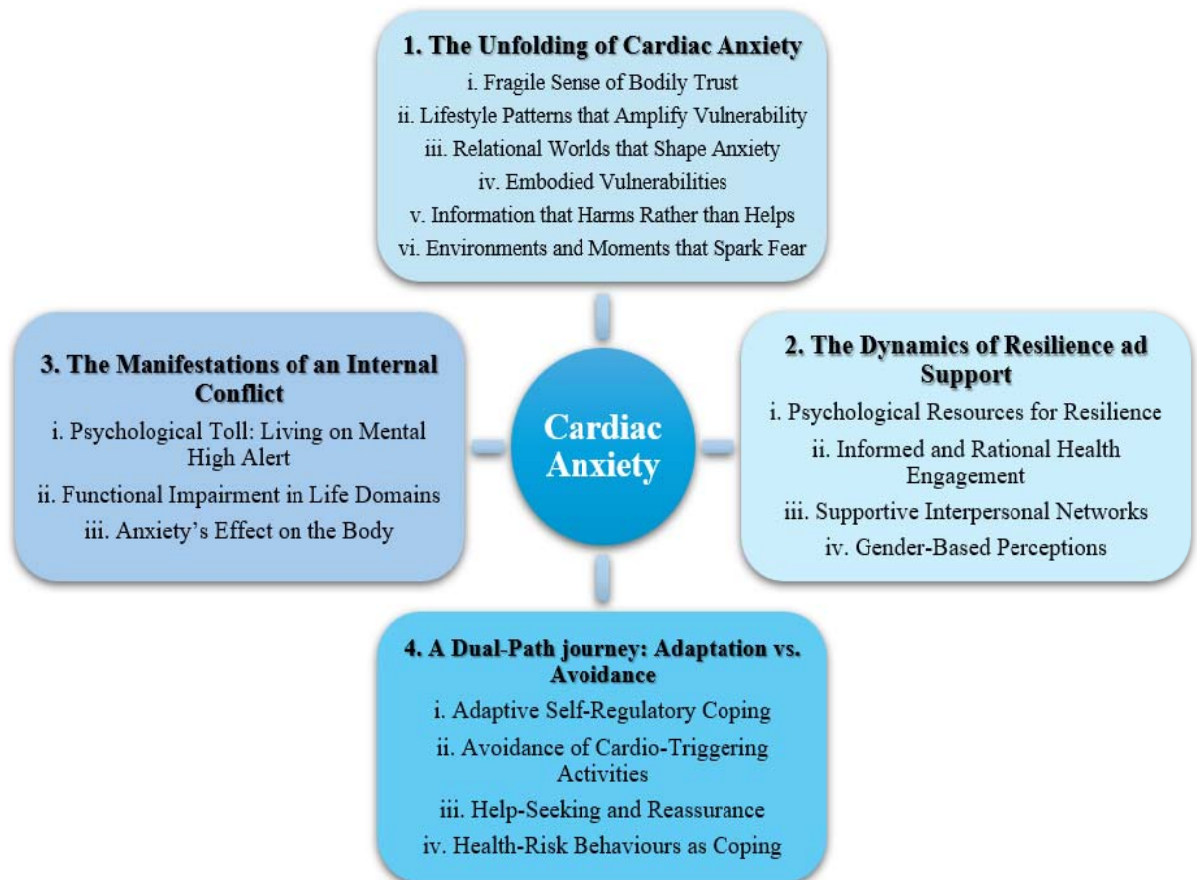


Figure 1: Thematic map of the overarching themes and themes

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Table 2

Overarching themes, themes, and sub-themes that emerged from the data

S. No	Overarching theme	Themes	Sub-themes
1	The Unfolding of Cardiac Anxiety	1.1. Fragile Sense of Bodily Trust	1.1.1 Health perceptions & cognitive distortions 1.1.2. Emotional distress 1.1.3. Limited health literacy 1.1.4. Hypervigilance towards cardiac sensations 1.1.5. Symptom validation struggle
		1.2. Lifestyle Patterns that Amplify Vulnerability	1.2.1. Unhealthy lifestyle 1.2.2 Perceived danger in physical exertion
		1.3. Relational Worlds that Shape Anxiety	1.3.1. Family influence or health beliefs and emotional regulation 1.3.2. Lack of emotional and informational support
		1.4. Embodied Vulnerabilities	1.4.1. Genetic predisposition 1.4.2. Physical health issues

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			1.4.3. Post-COVID cardiac vigilance
		1.5. Information that Harms Rather than Helps	1.5.1. Cardiac death cases in newspapers
			1.5.2. Distressing cardiac content on social media
			1.5.3. Googling symptom
		1.6. Environments and Moments that Spark Fear	1.6.1. Environmental factors
			1.6.2. Instant triggers
2	The Dynamics of Resilience and Support	2.1. Psychological Resources for Resilience	2.1.1. Perceived control and self-efficacy
			2.1.2. Reflective thinking and health awareness
			2.1.3. Optimistic belief system
		2.2. Informed and Rational Health Engagement	2.2.1. Reliance on scientific and medical expertise
			2.2.2. Digital health literacy
		2.3. Supportive Interpersonal Networks	2.3.1. Family support

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		2.3.2. Open sharing with family/friends and reassurance seeking
		2.3.3. Secure home environment
	2.4. Gender-Based Perceptions	2.4.1. Perceived lower vulnerability among women
3	Manifestations of an Internal Conflict	3.1. Psychological Toll: Living on Mental High Alert
		3.1.1. Emotional Distress and Mental Health Impact
		3.1.2. Diminished Psychological Vitality
	3.2. Functional Impairment in Life Domains	3.2.1. Erosion of Daily Role Functioning
		3.2.2. Strain on Social and Relational Engagement
	3.3. Anxiety's Effect on the Body	3.3.1. Cardiovascular Symptoms
		3.3.2. Respiratory Symptoms
		3.3.3. Neurological Symptoms
		3.3.4. Autonomic Nervous System Symptoms

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- | | | |
|---|--|---|
| 4 | <p>4.1. Adaptive Self-Regulatory Coping</p> <p>A Dual-Path Journey: Adaptation vs. Avoidance</p> | <p>4.1.1. Health-Oriented Lifestyle Modifications</p> <p>4.1.2. Stress Management and Other Psychological Techniques</p> <p>4.1.3. Engagement in Recreational and Digital Activities</p> <p>4.1.4. Emotional Relief Through the Presence of Loved Ones</p> <p>4.1.5. Faith-Based and Spiritual Coping</p> <p>4.1.6. Body-Based Self-Soothing Strategy</p> |
| | <p>4.2. Avoidance of Cardio-Triggering Activities</p> | <p>4.2.1. Avoidance of Direct Cardiac-related Triggers</p> <p>4.2.2. Avoidance of Social Exposure</p> <p>4.2.3. Avoidance of Physical Exertion</p> |
| | <p>4.3. Help-Seeking and Reassurance</p> | <p>4.3.1. Medical consultations and tests</p> <p>4.3.2. Talking to trusted others</p> |

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4.3.3. Use of health
monitoring devices

4.4. Health-Risk
Behaviors as Coping

4.4.1. Smoking

4.4.2. Unhealthy Form of
Eating

Table 2 presents the overarching themes, themes, and sub-themes that emerged from the reflexive thematic analysis. Thus, four overarching themes were identified, namely, the unfolding of cardiac anxiety, the dynamics of resilience and support, the manifestations of an internal conflict and a dual-path journey: adaptation vs. avoidance.

The overarching themes, themes, sub-themes and codes are presented in detail in a table (see Appendix G)

Overarching Theme 1: The Unfolding of Cardiac Anxiety

The first overarching theme is named as the unfolding of cardiac anxiety. There is no single cause of cardiac anxiety. Instead, multiple factors interact to contribute to its occurrence among young adults. There are six themes that were identified, including fragile sense of bodily trust, lifestyle patterns that amplify vulnerability, relational worlds that shape anxiety, embodied vulnerabilities, Information that harms rather than helps, and environments and moments that spark fear.

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Given the multifaceted etiology of cardiac anxiety, gaps remain in understanding how these factors interact among young adults.

Theme 1.1: Fragile Sense of Bodily Trust

This theme reflected distorted perceptions, emotional distress, and hypervigilance towards cardiac sensations, particularly in relation to cardiac health concerns, leading to struggles with trusting one's own body and interpreting its signals accurately. A variety of psychological factors that influenced the onset and persistence of cardiac anxiety were highlighted in the participant narratives. These factors shaped how individuals interpreted their bodily sensations and responded to perceived health threats, even in the absence of actual cardiac disease among the participants. The sub-themes identified are health perceptions and cognitive distortions, emotional distress, limited health literacy, hypervigilance towards cardiac sensations, and symptom validation struggles. These are considered as the psychological risk factors of cardiac anxiety.

Sub-theme 1.1.1: Health Perceptions and Cognitive Distortions

According to the experiences of the participants, distorted health beliefs and maladaptive thought patterns had a major role in the development and maintenance of cardiac anxiety. Their internal perceptions of cardiac health and the faulty cognitive processes they employed to decipher body signals are also included in this sub-theme. Many participants informed that their perceived susceptibility to cardiac diseases and deaths contributed to the onset of cardiac anxiety.

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I am very much expecting such heart-related issues in the coming future, because of the influence of genetical factors, when I checked cholesterol before, it was on borderline. (FS)

That I might die....like cardiac death. (PN)

Additionally, a lack of sense of control over cardiac health was reported by the participants.

Right now, I don't have any control over it .. So, sometimes, it's mostly external sometimes I don't feel the ...sense of control. (MLK)

I felt that sometimes my heart health is not under my control. Even if I feel that it's under my control, my heart reacts on its own. (AL)

This perceived lack of a sense of control over their own physiological responses was both distressing and disorienting, reinforcing the belief that they were at serious risk of a cardiac event.

Excessive negative automatic thoughts also acted as a risk factor for the occurrence of cardiac anxiety. Many participants reported an automatic tendency to catastrophize minor bodily sensations, particularly those that related to the heart.

I feel like I am having overthinking and negative automatic thoughts and so on. Yes, I have. The main issue that I had was, I have severe troubles with my heart but when I consult a doctor, do checkups there won't be any serious medical conditions, but my symptoms and troubles are real and it is not curing with

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anything. So I had severe hopeless and worthless feelings sometimes. I had those confusions and negative thoughts. (FS)

Overthinking and negative automatic thoughts, coupled with severe hopeless and worthless feelings, further deteriorated the conditions of the affected individuals.

Sub-theme 1.1.2: Emotional distress

Participants' experience revealed that underlying emotional vulnerabilities and distress played a significant role in predisposing them to cardiac anxiety. Various forms of psychological distress, whether chronic, situational, or rooted in past trauma, contributed to heightened sensitivity to bodily sensations and an increased tendency to misinterpret them as cardiac threats.

A participant narrated that the grief occurred from the bereavement of her grandfather due to a cardiac event, which significantly affected her, and that emotional loss contributed to the experience of cardiac anxiety and its intensification.

I thought all this happened because my because of my grandfather's death. Otherwise, maybe I would have also taken mmm more lightly. I don't know, because aa that one loss of my grandfather is still.. still a grief for me. Like I still miss those moments. I still wish him aa to be with me. ... there were time when I was... too disturbed. That kind of thoughts always haunted me. (ANM)

Loneliness was a common emotional state among individuals, particularly when dealing with anxious thoughts alone. Emotional fragility was exacerbated by

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the lack of intimate, supportive interactions, and several individuals said that being by themselves frequently made them more focused on their internal sensations, which increased cardiac anxiety.

I fear that this cardiac issue might occur, when I am alone, I feel like this issue is more. For example, once I had this issue in college, it was severe and I think I had the feeling of loneliness and helplessness. I feel the issue more when I am alone. I think I have that worry actually. (FS)

Some participants mentioned that, at times when they experience any kind of anxiety or worry, they are concerned about their heart. The participants feared that worry or anxiety itself could harm their hearts.

Sometimes when I have too much of worry and anxiety, I feel okay, my heart will get affected if I like, I'm so much anxious. So that's why I feel that oh, maybe something will happen to me because of the anxiety. (TD)

Further, being stressed also caused similar concerns. Feeling stressed can increase palpitations, which can result in worrying about these altered cardiac sensations. In general, they are concerned about experiencing negative emotional states since it has a direct link to the experience of cardiac anxiety.

Yeah, sometimes like if I feel stressed... , my heart will start to beat very fast that I can hear without even paying attention that okay, now the heart is beating too fast. (TD)

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Hence, excessive fear about the altered cardiac sensation led to thoughts of getting cardiac diseases and death in the future. This vulnerability could cause the onset of cardiac anxiety. A participant stated that,

As this cardiac arrest and something is very unexpected....I'm worried like, aa what if, aahm if I'll get that. (MLK)

I was worried like I was thinking, what if it will happen now? at times.. aa..we feel this kind of small chest pain or something..because of any food or something we have took, But at that time also, I'll think, Okay, what if it will become a heart attack and what if I'll die, that kind of thoughts will come. (ANM)

Finally, it was evident from the participant's narrative that the existence of past trauma and the persistent distress associated with it had a connection with cardiac anxiety. The repeated thoughts and memories associated with the trauma and relieving the condition led to a high heart rate, which resulted in anxiety about cardiac sensations.

The traumatic experiences in the sense ah..... yeah, once when I saw a violent moment, like as in family, that time I got much tensed and my heart palpitations was very high.

(AAR)

I have had childhood trauma, apart from that nothing blunt force or anything. Childhood trauma I had which has possible connection with this.

(KS)

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Sub-theme 1.1.3: Limited health literacy

Cardiac anxiety was greatly exacerbated by a lack of accurate knowledge and understanding of how the cardiovascular system works and how stress or anxiety might mimic cardiac symptoms.

I think there's not enough literacy around this issue.....and many people do not even know or not even aware that the causes...the ways it can be handled. Social media is causing so much misinformation. So, a lot of- like basic information if people can know, they will be ident-protect themselves and their families from um...you know, this kind of cardiac anxiety, is what I think. Basic information. (MG)

Lack of proper awareness, along with social media misinformation, can put people in danger. Adding to this, the prevalence of certain misconceptions regarding cardiac functions and health can be a risk factor.

I was mostly very thin. Even if I eat a lot, I was thin. So, people used to say, although that's a good thing, mostly because um...fat get deposited in the arteries and vein rather than the body so they have more risk of heart disease. (MLK)

A few of the participants attributed the occurrence of cardiac anxiety and related health concerns to their superstitious beliefs. A participant expressed that,

Yeah. They say Na, its karma, that previous life I might did something wrong, that's why it's happening. (PN)

The misconceptions and superstitious beliefs could prevent the affected individuals from understanding the exact nature and cause of the cardiac anxiety.

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This impedes the proper treatment seeking for the condition, which further exacerbates cardiac anxiety.

Sub-theme 1.1.4: Hypervigilance towards Cardiac Sensations

Cardiac-focused attention or the hypervigilance towards cardiac sensations could gradually lead to the occurrence of cardiac anxiety. Participants commonly reported being excessively conscious of their breathing, chest sensations, or heartbeat. A feedback loop was created by this continual scanning of internal body cues, whereby observing a sensation increased worry, which in turn intensified the sensation. The participants shared that they were frequently monitoring their cardiac sensations using different monitoring devices such as smartwatches, oximeters, stethoscopes, etc.

I recently bought a fitness band like apple watch so it like, sometimes it will show me that I have, I'm doing nothing but my heart rate was increasing like that notification used to come. So, one day randomly when it happened when I woke up so I was very scared so that day I went to the hospital and checked for the ECG and all those things but the doctor said that nothing is showing, nothing is variation or anything in the ECG of my heart, nothing to worry about. usually like, if it's like concerning like if I'm sitting idle and my heart rate, it will notify me itself. Otherwise, when like if I'm feeling anxious or I'm tensed about something then I'll be like okay I'll check the heart rate and I'll check it. um... Like that it's there or sometimes, like once in a month I'll check the ECG in the watch itself, there is a feature of ECG so I'll take that. (ALK)

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I don't use a smartwatch to monitor. But I have been using an oximeter for some time now with me. Then BP checking equipment is there at home. The measurement with that may not be that accurate, but even though I use it. (FS)

I experienced fear. I have stethoscope. I frequently checked on heartbeat and checked any changes visible. (TN)

The over-reliance on such health-monitoring devices and constant checking of cardiac sensations led to misinterpretation of cardiac sensations at times, and that led to distress.

Sub-theme 1.1.5: Symptom Validation struggles

Young adults with cardiac anxiety experienced various struggles and dilemmas due to the lack of medical validation of their symptoms. This is the major reason behind their excessive healthcare-seeking behavior and resultant exacerbation of cardiac anxiety. For instance, they feel that they are experiencing real symptoms, but it can't be diagnosed as of cardiac origin. A participant explained her concerns like,

The main thing is I am experiencing a lot of difficulties...but doctors are saying its not severe enough to be diagnosed with something...If it is diagnosed, we can treat that, but they are saying I am not having any issues. (FS)

This perceived dismissal of the symptoms and the resultant diagnostic uncertainty created huge distress due to the lack of recognition of their symptoms. Another participant reported that,

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The main issue that I had was, I have severe troubles but when I consult a doctor, do checkups there won't be any serious medical conditions, but my symptoms and troubles are real and it is not curing with anything.....that is causing much problems to me and am thinking why it is happening. (FS)

Understanding the exact origin of the symptoms will be helpful for tackling the excessive healthcare visits and thus reducing the distress associated with them.

Theme 1.2: Lifestyle Patterns that Amplify Vulnerability

This theme highlighted that the unhealthy lifestyle patterns and behavioral tendencies contributed to their experiences of cardiac anxiety. The sub-themes that emerged under this theme were unhealthy lifestyle and perceived engagement in physical exertion.

Sub-theme 1.2.1: Unhealthy Lifestyle

Following an unhealthy lifestyle routine was reported to increase fatigue, palpitations, or chest discomfort, which were symptoms that were often misinterpreted as warning signs of cardiac diseases. One of the major unhealthy lifestyle risk factors was the sedentary lifestyle followed by the participants.

Participants reported that

It's like... not feeling properly... overweight and all, not doing exercise can lead to heart issues. Like that's sedentary lifestyle. (TS)

Similarly, another participant reported the health threat posed by overweight or obesity.

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uh...I mean lifestyle factors may affect ma'am. I know that because I am obese, it is usually a burden to my heart. (MSS)

Finally, unhealthy dietary habits were also considered a risk factor for cardiac health.

Lifestyle....like overeating....eating from outside (NS)

Risk...by considering the current situation and food habits, there's a chance of getting heart disease in the future. Sometimes I am having fast food (SS)

Unhealthy lifestyles indirectly increased the risk of cardiac anxiety in such a way that having this kind of lifestyle increased the risk for future cardiac events, and vulnerability contributed to the anxiety about their cardiac concerns.

Sub-theme 1.2.2: Perceived Danger in Physical Exertion

Some participants perceived that certain behavioral factors, such as engagement in heavy physical activities, could alter and enhance their cardiac sensations. The resultant higher palpitations and accompanying somatic sensations caused them to worry about their cardiac health and functions.

This happens when engage in heavy physical activities. I think every day I am facing this. When I walk fast for class in the morning or climbing steps, all that time I feel this.(DA)

Body movements....when we lift weights, or just walking or climb steps....then heart beat rises, then breathing variations occurs like that only (DY)

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Even though an adequate amount of physical activity is good for cardiac health, most of the participants in the study believed that heavy physical activity could trigger high palpitations, which in turn caused issues with their cardiac health. This gradually led to cardiac anxiety.

Theme 1.3: Relational Worlds that Shape Anxiety

According to the participants' testimonies, their experiences of cardiac anxiety were significantly shaped by their interpersonal surroundings, especially those involving family and close relationships. Both their health-related beliefs and their ability to regulate their emotions were impacted by these dynamics, which either intensified their fear or made it more difficult for them to cope effectively. Two interlinked sub-themes emerged: family influence on health beliefs and emotional regulation, and lack of emotional and informational support.

Sub-theme 1.3.1: Family Influence on Health Beliefs and Emotional Regulation

Certain participants reported that there was a significant influence of their early family environments, parenting, and upbringing on the experience of anxiety in the later stages of life. A participant expressed that,

I think parenting has a huge relation in this. I have two siblings, one brother and a sister both are actually having anxieties. My father and mother are actually worried about how other people judge us. So they used to raise us like that. There was always a factor called 'good girl, good boy'. But my parenting style was like that. Parents always force us to be a perfect people and they were very orthodox. I think that had a huge influence on all of our behaviors. I had

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thoughts that I should be perfect in front of everyone. That had actually given me a huge anxiety I would say. (FS)

The parents insisted that their children should live according to the expectations of society and be perfect and orthodox always, which influenced all their behaviors, which also led to anxiety. Besides, family restrictions on the open expression of their emotions also made them vulnerable to such distressing cardiac concerns.

My mother-my family might get more...concerned about that...might be that (clicks tongue) our families are not used to uh...us expressing uh, anxiety concerns right. (FS)

Another participant shared that the repeated discussions of family members' cardiac deaths in all the family gatherings triggered cardiac anxiety concerns among them. Such discussions were very fatal and led to repeated thoughts about these unpleasant experiences and their genetic vulnerabilities to cardiac issues.

And of course, like aaa after this death and after this surgeries, aaa when family gatherings are happening, of course, the members will talk about that. Have a lot of discussions about that. I felt that that situations are making me more mmm vulnerable or making me more sad or worried, maybe I was not even thinking about that, but these gatherings will make me again think of this situation. I would also been more okay when nobody's talking about that. (ANM)

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Sub-theme 1.3.2: Lack of Emotional and Informational Support

Several participants reported that a lack of supportive communication from family members and friends, together with their lack of awareness about these issues, resulted in the amplification of cardiac anxiety concerns among the affected individuals.

Family was not much concerned on this. They were stay back on doctor's consultation. occasionally, I told my family to take ECG to check any variations on heartbeat. Also, conscious on pain and taking ECG. But family is not much willing to take all that. (HN)

Participants expressed that their family members were not supportive or encouraged to take medical treatments for their concerns, even though the affected individual perceived the need for healthcare seeking. This may have happened due to the knowledge gaps that existed among the family members.

They say like no problem, just to take any medicines for gas troubles.(HN)

They think I'm paranoid like I'm making a big issue out of it, there is nothing like that. (ALK)

They misinterpreted the signs of chest pain as a result of gastritis and underestimated the severity of the participant's condition. Besides the familial restrictions and risk factors, the negative experiences related to peers also significantly affected the condition among the affected individuals.

I try to avoid having that conversation with friend or somebody. Because, I have tried talking about it, it didn't go well. They didn't understand what I was

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saying. They just teased me and brushed it off. So, I have not discussed it my friends. (KS)

Another participant revealed that peer comparisons and judgments could negatively affect them while experiencing cardiac anxiety.

I'll think about that and worry about that too much. But I have seen aa under the same situation, my other friends, who take everything very easily. They have mmm they have survived, or they have overcome the situations far much better than me. (ANM)

Theme 1.4: Embodied Vulnerabilities

Beyond psychological and social contributors, participants identified biological and physical factors that shaped their vulnerability to cardiac anxiety. While many of them were medically healthy, certain hereditary, physical health experiences made them more prone to perceiving cardiac-related threats, increasing their fear and monitoring behaviors. Three sub-themes were developed, namely, genetic predisposition, physical health issues, and post-COVID vigilance.

Sub-theme 1.4.1: Genetic Predisposition

Cardiac anxiety among healthy individuals can be caused by their genetic predisposition to cardiac diseases and or deaths. This genetic vulnerability caused them to have a perceived susceptibility to cardiac events due to family history, which further contributed to the experience of cardiac anxiety.

My mother had some issues with heart. She had a heart attack and had undergone an angiogram and angioplasty. (AV)

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Yeah like, my grandfather died because of heart attack. It was a sudden.. It was a sudden..That's why itit really impacted me. (ANM)

Family related factor is the main. My paternal family members are having cholesterol. Then many heart attack deaths are there. So when we think like that, there is a chance of getting heart disease in future. (DY)

Along with a family history of cardiac diseases and deaths, a family history of cardiac risk factors, such as having high levels of cholesterol, also increased the vulnerability to cardiac anxiety.

Sub-theme 1.4.2: Physical Health Issues

Some participants have reported that certain physical health issues could cause them to worry about their cardiac health, which resulted in the experience of cardiac anxiety. It was explained by the participants that having chest pain and musculoskeletal issues made them worry more about their cardiac health.

...like sometimes I feel...like when feel a certain kind of pain in my chest so I feel like-like...kind of heart attack type. (MT)

I have the pain...Because the doctor said it's the muscle pain and my ribcage is weakening because of my bones getting what to say that thing no-getting weak, that's why... yeah. Yeah, yeah, muscle cramp and ribcage is weakening. So that's why it pains. (PN)

Moreover, a commonly reported physical health issue is gastritis. The pain related to gastritis often made individuals believe that they were getting cardiac disease. This fear often led to cardiac anxiety.

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Because in every time, it's a pain, because of that, it's not...my worry is about, why this again and again happening. Okay, I think that is maybe a gas trouble or anything, like that kind of issue also may happen. So, my thought is that, because of gas trouble, so I need to take some food, that is my thought. (KMP)

Apart from these physical issues, variations in heartbeat induced fear among the individuals and enhanced the susceptibility to cardiac anxiety.

I have fear when the heart rate is overly increases. It comes when variations in heart beat occurs. (AL)

I have a fear of having Blocks in my heart mainly during increased heart beat. (DA)

Sub-theme 1.4.3: Post-COVID Cardiac Vigilance

It is evident from the participants' experience that post-COVID-related factors significantly influenced the perception of cardiac anxiety. Participants reported that the controversial vaccine-related news and information were spread in society, which elicited a fear response from their side. A few participants reported that,

Yes, I feel like that.. I heard that heart issues are coming due to corona vaccine. So I felt some fear during that time. I felt more fear. I doubted whether heart issues come due to Covid vaccination. (NP)

Aa.... recently only, there was a news that whoever took covishield, or something aa covaccine anything, they are getting a lot of heart diseases. I heard that. So, like I.. I was rethinking, why did I take even I took booster dose also. So, I

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was like, I was so silly at that time, I could have aa read something more about this vaccine. I could have avoided those booster vaccine and everything..(ANM)

The participants believed that cardiac issues are caused by certain kinds of COVID vaccines. Since they have taken those vaccines, they became anxious about the perceived side effects of the vaccine, and it intensified their perceived vulnerability to cardiac events. Finally, it resulted in the worsening of cardiac anxiety.

Some of the participants viewed that the COVID infection itself has the capacity to place them under threat. They believed that cardiac issues were one of the post-COVID health complications. Since they were already infected with COVID, they were suspecting the risk for cardiac diseases and thus cardiac anxiety.

Then my heart related issues started to appear after COVID I think. Sometimes heart functions like heart beat increases without any stress or anxiety but most of the time it was due to my anxiety and worries. I think after COVID lungs and heart are affected and because of that may be these issues are arising. That is what I feel. (FS)

From their report, it was evident that their cardiac-related issues started after the onset of COVID infection. Thus, participants perceived post-COVID health complications as factors that heightened their vulnerability of cardiac anxiety.

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Theme 1.5: Information that Harms Rather than Helps

This theme shed light on the excessive exposure to cardiac content on different media platforms, especially stories involving young individuals experiencing sudden cardiac deaths, which acted as a powerful psychological trigger for experiencing cardiac anxiety among this young adult population. These adverse effects of media often led to intrusive thoughts, increased symptom monitoring, and fear of a similar fate. The following sub-themes emerged which are influence of cardiac cases reporting in newspapers, adverse effects of social media, and negative impact of googling symptoms.

Sub-theme 1.5.1: Cardiac Death Cases in Newspapers

Participants observed that exposure to a large number of cardiac death cases through newspapers could induce fear and anxiety about their own cardiac health. The unexpected news about the sudden cardiac deaths of young people often catastrophized the unpredictable nature of such deadly events.

but regarding this cardiac arrest, aa I have heard lot of cases in newspapers. Ahm daily life also, I've seen people.. I have.. recently watch something that a bus driver was driving...and suddenly he got this cardiac arrest and he passed. (ANM)

Like individuals who are just 20-in their 20's are getting cardiac ar-cardiac arrest. So, their-that thing worries me sometimes. Like, what if I am just like this...that thing yeah. (AR)

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Sub-theme 1.5.2: Distressing Cardiac Content on Social Media

Watching sensitive content about cardiac diseases and deaths on social media platforms brought difficulties to the participants, and they became scared of getting such cardiac issues.

when I see sensitive content in social media related to heart... that, it causes very difficulties. Its not extremely sensitive, but I'll watch it, it feels emotional and sometimes cry. I won't just skip after watching. I'll think about their situation and think on it. I won't rewatch it repeatedly. Watching it once itself makes me feel deeply troubled. (HN)

I scared of getting cancer and heart related diseases. There are a lot of videos like this in social media. (SS)

Another participant shared her experience that cardiac-related anxiety increased after the arrival of social media and exposure to such sensitive content on social media.

Anxiety.., aa mm that what I said. Maybe social media has influenced. Nowadays like.. Other news is from newspapers, everything is like quite I'm used to ahm hear, and I used to read about that, so they won't make me too anxious. But nowadays, after seeing videos and ..after this ahm arrival of the social media, that is making me more anxious.....That is making me more anxious maam. (ANM)

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Sub-theme 1.5.3: Googling Symptoms

A few participants reported that exposure to the cardiac death statistics appeared on Google while searching for certain symptoms caused a negative impact on them.

wh-what if sometimes it happens that we google information it comes no, this many people died, this many people died from this till day. (PN)

Hence, overloaded information exposure through media platforms could induce cardiac anxiety and exacerbate the condition.

Theme 1.6: Environments and Moments that Spark Fear

Certain situational and environmental factors also contributed to the onset of cardiac anxiety among young adults. Participants described these contexts as intensifying their sensitivity to bodily cues and often precipitating the onset of anxiety episodes. Two sub-themes emerged, which are environmental factors and instant triggers.

Sub-theme 1.6.1: Environmental Factors

Environmental factors consisted of the influence of climate change, aftereffects of shifting environments or relocations, and high sensitivity to sound. A participant said,

Yeah. And it only happens during nights or on cold-cold days actually. So my mother was like it might be just because of the cold. I-I am staying in northern part of India, usually the temperature is just from 2 degree Celsius to maximum of 38 degree Celsius. so whenever it is cold, I experience this more. (PPU)

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From the experience of various episodes of cardiac anxiety, the participant noted that the cardiac anxiety episodes usually occurred during the cold climate or winter season. Another participant told that, shifting from a comfortable environment to a new place for studying resulted in losing the secure feeling, and adjustment concerns from the new place contributed to experiencing anxiety and later to cardiac anxiety.

When-whenever your home or like your comfort zone if anything happens you can go to your mom or dad. Uh...if- and when I-whenever you're away from them uh...you have to handle everything by yourself, sometimes you may not have someone to tell or rely on... (KQ)

Sub-theme 1.6.2: Instant Triggers

Some participants noted that certain factors had the potential to trigger cardiac anxiety instantly. Such instant triggers were distinct cardiac sensations and an alarming smartwatch notification. As per the participant report,

I faced the kind of... electrical kind of...stimulation in my left chest...it's actually happening when I am listening any kind of loud voice or current sudden shock or any kind of stimulation happen. In the very first, I think that is this the cardiac arrest. like it's exactly, it is the electric impulse, like current shock we are experiencing from a iron box or anything, this is actually happening in my chest side. (KMP)

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It was evident that certain distinct cardiac sensations, like an electrical stimulation on the chest area, could contribute to the concerns about cardiac health. It eventually led to the triggering of cardiac anxiety.

Furthermore, those individuals who frequently monitor the cardiac sensations using smartwatches experienced another episode of cardiac anxiety when alarming notifications of increased heart rate came from their smartwatches.

Like whenever this notification comes like I'm, I'm sitting, or I'm not doing anything but my heart rate is still high, that notification comes I'll be like worried like what is happening like, what will happen, is it something I should be concerned about? Like that I get and there was some measure called VO2 max which also shows that I don't have any good cardiac fitness kind of thing so yeah.
(ALK)

The participant experienced a sudden increase in heartbeat during the resting time, which made her concerned about her cardiac health instantly, and it triggered anxiety about cardiac concerns.

In conclusion, it is clear that multidimensional risk factors can trigger the onset of cardiac anxiety and also worsen the already existing condition. Since the risk factors have this dual capacity, it is essential to address them properly to prevent and manage cardiac anxiety and the distress caused by it.

Overarching Theme 2: The Dynamics of Resilience and Support

This overarching theme represented the dynamics of resilience and support for cardiac anxiety among young adults. It covered the protective factors, which

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are attributes or conditions that lessen the effects of risk factors and encourage positive outcomes. Actions or resources that minimise the intensity or adverse effects of something, typically risk factors, are known as mitigating factors. In essence, mitigating factors aided in managing or minimising harm, and protecting factors foster resilience. A total of four themes were identified: Psychological resources for resilience, informed and rational health engagement, supportive interpersonal networks, and gender-based perceptions. It is noted that the participants expressed these characteristics along with a supportive social network, which was helpful for lessening the risk of cardiac anxiety and reducing the harm associated with it.

Theme 2.1: Psychological Resources for Resilience

Certain psychological factors emerged as both protective factors and mitigating factors of cardiac anxiety among young adults. Participants' experiences and management of cardiac anxiety were significantly influenced by psychological resources. A number of people exhibited cognitive tendencies and internal strengths that served as mitigating factors or protective buffers. These psychological variables affected their ability to control anxiety, their perception of vulnerability, and how they evaluated cardiac-related concerns. The sub-themes involved were perceived control and self-efficacy, reflective thinking and health awareness, and an optimistic belief system.

Sub-theme 2.1.1: Perceived Control and Self-efficacy

One important protective psychological factor against cardiac anxiety was the strong conviction that many participants had in their capacity to affect their

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physical and emotional well-being. People who felt that their own activities, rather than outside influences or uncontrolled circumstances, largely determined their health outcomes exhibited this sense of control, which was based on an internal locus of control. A few participants shared that,

Sometimes I feel like it's belonged to me, I can control it by myself. (DA)

I think in the way, I am the person who, who take care of the health of my heart, so I should be responsible, I should be doing things. (AAR)

Participants were able to approach cardiac-related sensations or symptoms with less fear and more autonomy because of these beliefs.

Self-efficacy, or the belief in one's capacity to successfully handle any health risks, was closely related to this. Participants with high self-efficacy talked about controlling their anxiety through logical thought processes and health-promoting actions. They took proactive measures to preserve their well-being and were more inclined to view physical symptoms in a non-catastrophic way, which strengthened their sense of control.

Yes, I believe in the sense of control related to my heart health. There is little chance of getting heart issues due to the food habits of modern life. But, maximum I will take care of it and control it. (NS)

When nowadays, after aa I started aa having a aa good healthy.. lifestyle everything..I felt that my.. life is more now in a good control. (ANM)

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These internal psychological resources worked in concert to help participants break the cycle of fear and avoidance that characterises cardiac anxiety, handle uncertainty, and lessen hypervigilance toward cardiac symptoms.

Sub-theme 2.1.2: Reflective Thinking and Health Awareness

This sub-theme captured participants' cognitive engagement in self-reflection and their awareness of cardiac anxiety and health-related behaviors, which played a meaningful role in mitigating the effects of cardiac anxiety. Positive self-introspection, in which individuals actively considered their thoughts, triggers, and behavioral patterns, was a significant component of this sub-theme. As a result, they were better able to understand the psychological basis of their symptoms, which lessened the likelihood of catastrophic interpretations and promoted emotional regulation. A participant stated that,

I mentioned that even though I took class everything today, still I felt, okay, I would have done much better. Aaahm.. All this happened because of this, yesterday's incident, I was kind of not blaming or maybe I'm trying to convince me. Aaa So I felt that. Aa here is no point of thinking too much. I felt, why are you thinking too much? Don't think too much into that. Everything went very well....why you're wasting your time thinking about it again and again, that thing happened. (ANM)

Some people's perspective was greatly shaped by the beneficial effects of their formal psychological education. Individuals having a background in psychology or mental health education were better able to distinguish between bodily sensations associated with cardiac anxiety and an actual cardiac pathology.

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They gained the ability to confront illogical beliefs and take a more logical, knowledgeable approach to their health issues as a result of this academic exposure.

Maybe because of our background in psychology- like I know that keeping it aside or distracting is not the right way so it's like, uh...it's like coming out of our body and telling us like "calm down, calm down" that's my usual way of doing things. (MLK)

Since we are learning about all these things as a part of our curriculum, I know why heart beat rises. So I didn't bothered much about it. Immediately we shall try the remedies for that. (NS)

Health literacy also turned out to be a crucial component. Participants who knew more about psychological symptoms and cardiovascular health were better able to recognize anxiety-driven sensations and prevent unnecessary fear. A participant explained that,

Somewhere I'm getting the feeling that okay if we need a healthy lifestyle, or if we do exercise, eat good food and all, maybe I can reduce any kind of aa heart related issues or any health issues. So after thinking about this things... I'm I'm getting this insight, that okay, if we control, if we regulate our body health, well..maybe I can deal with the situation. That kind of positivity is there in me now. But it was not there earlier. (ANM)

Health literacy can foster self-awareness, and resultant self-care practices were helpful to mitigate the effects of cardiac anxiety.

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Like nowadays, aaa..I think I'm getting a bit more conscious about my health... because after getting a job like, I have time to take care of myself...now I'm in home. So nowadays I'm trying to eat good foods, like good healthy foods... I'm giving more attention to health now. Because I'm getting time and I have money also, like I am getting some earnings, so I prefer to go with good healthy foods. (ANM)

When combined, these awareness-driven and reflective practices helped participants respond to anxiety in a more positive and knowledgeable way, which decreased the frequency and severity of distress associated with cardiac anxiety.

Sub-theme 2.1.3: Optimistic Belief System

People who had a generally optimistic view of life were more likely to perceive physical symptoms with less fear and react to stressors with greater emotional resilience. Because of their positive outlook, they were able to prevent the escalation of anxiety by reinterpreting potentially dangerous cardiac feelings as manageable or non-serious. A participant reported that,

First, be positive. Note that nothing is happening, its fine, its fine, I will be fine within few days and all... my future heart health would be perfect...am optimistic. (PN)

A lower perceived risk of cardiac diseases fostered the optimistic belief about their cardiac health, which further resulted in managing cardiac anxiety.

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If you ask like that... nobody in my family diagnosed with heart disease. So there is less chance of getting heart issues genetically. (AR)

Overall, an optimistic belief system played a vital protective role by reshaping the way individuals interpreted and responded to cardiac-related anxiety, promoting resilience, and reducing the likelihood of maladaptive coping.

Theme 2.2: Informed and Rational Health Engagement

This theme highlighted how participants actively engaged with health-related information and resources in a thoughtful, evidence-based, and rational manner to manage their cardiac anxiety. It acted as a protective factor against cardiac anxiety among young adults. There were two sub-themes developed under this theme, namely, reliance on scientific and medical expertise and digital health literacy. Instead of succumbing to fear-driven behaviors or misinformation, these individuals expressed a preference for logical, informed decision-making.

Sub-theme 2.2.1: Reliance on Scientific and Medical Expertise

Many participants said that they managed their concerns about cardiac symptoms by putting their trust in trained healthcare professionals in their family. This dependence on reliable medical knowledge served as a stabilising element, lowering anxiety and uncertainty about one's health.

The thing is, my mother is a nurse so, even she would help me to get some information so that is my main information sources which actually influence me.

(AAR)

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Some participants emphasized that they relied on scientific literature and published research articles to gain genuine information regarding cardiac anxiety and concerns rather than blindly following the information received through social media platforms.

I don't usually believe videos and reels which will be available in YouTube and Instagram because we know that those messages won't be that reliable. But I used to read research articles or research papers. (FS)

Sub-theme 2.2.2: Digital Health Literacy

Another key mitigating factor to cardiac anxiety is digital health literacy. Since an information explosion is happening through digital media about cardiac health and diseases, accurate perception of digital media information and awareness about the misinformation could lead to the prevention of catastrophic misinterpretation of cardiac sensations and psychological symptoms.

Social media is causing so much misinformation. So, a lot of- like basic information if people can know, they will be ident-protect themselves and their families from um...you know, this kind of cardiac anxiety, is what I think. Basic information. (MG)

No, no, I feel... I feel whatever comes on social media is a bit of fake. So I don't I don't go through that much. (TD)

Checking the genuineness of cardiac-related sources, content creators, and engagement in critical evaluation of online health content is a crucial step towards digital health literacy.

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In social media, I will check whether the content creator is a licenced doctor or not. I usually check the genuinity of the posts in social media so it won't that much influence me. (DA)

Along with this, proper awareness of online exaggeration and sensationalism was also vital in this scenario.

Yes, I am googling the heart related things.. Google...I know it exaggerates things, so it is not affecting me that much. (DR)

Additionally, some participants with and without the genetic risk of cardiac diseases and death shared the positive influence of social media in their lives related to the experience of cardiac anxiety. Some information or videos shared through social media could be thought-provoking and enable them to adopt healthy behaviors.

Recently I watched a video, a third or fourth grade student having a heart attack and then supposedly the reason being is consuming food high in cholesterol or fried food. I'm not sure how factually correct that is but that also made me a little more conscious of, you know, what I am consuming, how much exercise I am taking in a week. So that is one example and similar situations are what I can think of. (MG)

Hence, the capacity to navigate and critically assess digital health information was another important mitigating factor. Participants with higher digital health literacy showed caution while utilizing online resources, differentiating between trustworthy and untrustworthy sources.

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Theme 2.3: Supportive Interpersonal Network

One of the most important protective and mitigating factors in the management of cardiac anxiety has been identified as a strong and emotionally accessible interpersonal support system. Both types of participants frequently emphasised the value of having dependable friends, family, or a secure home setting that offered both practical support and emotional solace during difficult times. These interpersonal connections served as pillars of stability and confidence, in addition to making people feel less alone and more understood in their experiences. Three sub-themes were family support, open sharing with family and friends, and the positive influence of a secure home environment.

Sub-theme 2.3.1: Family Support

Family support, as meant by the participants involved, is a non-judgmental family that offers help to the affected person to manage the cardiac anxiety and manage their various responsibilities while experiencing cardiac anxiety. They strongly encouraged the individuals to seek treatment for their concerns. Active listening by family members to the concerns of the individual is crucial for sensing their support during a difficult time.

uh...they are helpful. Like uh...one thing, uh...they let me open up. So, uh...basically a non-judgmental space, I can open up about anything.....and they'll- they are very listening. Also uhh... they offer all kinds of help. (MLK)

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Sub-theme 2.3.2: Open Sharing with Family/Friends and Reassurance Seeking

Some people claimed that having a safe space to discuss their symptoms and anxieties with people they can trust helped them manage their anxiety. They were able to express their concerns without fear of rejection or condemnation, which reduced internal conflict and enhanced emotional clarity. A participant expressed that,

I shared with family and friends. friends suggested me to consult doctors. They were always concerned. (HN)

This shared emotional expression approach was said to be empowering and relieving since it ended the pattern of silent ruminating that is frequently connected to health anxiety.

Participants considered that sharing their concerns with their loved ones acts as a reassurance for them.

Seeking reassurance from loved ones.....yes, very much.(MLK)

Reassurance seeking.....only with friends mostly. (AV)

Participants reported that seeking reassurance from their loved ones could provide temporary relief to them.

Sub-theme 2.3.3: Positive Influence of a Secure Home Environment

Another stabilising aspect mentioned was a safe and peaceful family environment. Anxiety levels were lower among participants who lived in emotionally secure and structured households. They felt psychologically anchored

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and less vulnerable to emotional triggers because of the predictable, comfortable, and friendly atmosphere of these places.

Yes, ma'am. So, like, home, when I'm in my home, it's fine. Like, I don't have any issues. (TS)

Theme 2.4: Gender-Based Perceptions

This theme underscored how perceptions based on gender might impact risk appraisal and emotional reaction, hence impacting the subjective experience of cardiac anxiety. Although these ideas could provide psychological solace, they also represent broader sociocultural influences on coping and health awareness. This is a relatively smaller theme, which consisted of only one sub-theme named perceived lower vulnerability among women

Sub-theme 2.4.1: Perceived Lower Vulnerability among Women

Participants' belief in lower vulnerability among women for cardiac risks had implications for how some participants cognitively processed cardiac anxiety. Some participants expressed the notion that women are less likely to experience cardiac diseases, particularly at a younger age, compared to men. Two female participants expressed their views that,

I know that females are in very-very less- less risk of having cardiac arrest. (MLK)

And also, I got an idea that somewhere I just read out that for women, the risk of cardiac arrest is lower than men. (KMP)

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For some female participants, this notion acted as a cognitive buffer, lowering the level of anxiety associated with cardiac symptoms. They believed they were at comparatively reduced risk, and they frequently attributed this thinking to hormonal protection, healthier lifestyles, or broad presumptions about gendered health trends.

Overarching Theme 3: The Manifestations of an Internal Conflict

This overarching theme was intended to explore the manifestations of an internal conflict of cardiac anxiety among young adults. A total of three themes were identified: psychological toll: living on mental health alerts, functional impairments in life domains, and anxiety's effect on the body.

Theme 3.1: Psychological Toll: Living on Mental High Alerts

Cardiac anxiety can cause a wide range of consequences that can negatively affect individuals. Psychological consequences are the prominent aftereffects of cardiac anxiety, which threaten the mental health and well-being of young adults. The sub-themes developed under this theme are emotional distress and mental health impact, and diminished psychological vitality.

Sub-theme 3.1.1: Emotional Distress and Mental Health Impact

Most of the participants reported that their mental health was affected by the experience of cardiac anxiety. A few of the participants experienced suicidal thoughts due to the distressing effects of cardiac anxiety in their lives. A participant shared her experience that,

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At night times I get these thoughts, and it is very intensive, like that is night times and I, I'm not able to share with anyone...at a time I thought that why, why not should I kill myself because this is eating me, these thoughts are eating me (SB)

Even though the participants had suicidal thoughts and ideations, they never attempted suicide. It can be interpreted that the experience of various negative emotional states exacerbated the psychological distress and resulted in such debilitating impacts. The participants experienced self-reported depressive thoughts, anxiety, and stress related to the cardiac cues. As stated by the participants,

I have severe troubles with my heart but when I consult a doctor, do checkups there won't be any serious medical conditions, but my symptoms and troubles are real and it is not curing with anything. So I had severe hopeless and worthless feelings sometimes. I had those confusions and negative thoughts. I was in a kind of depression sometimes. (FS)

It's very stressful. And...Like it gives anxiety also and too much umm concern about what's gonna to happen next and all. (TS)

It is noted that the experience of depression, anxiety, and stress among the participants was objectively assessed using a standardized questionnaire during the screening process, and those who scored high were not included in the study. It may be inferred that the participants who report this during the interview may not be experiencing it all the time. It occurred temporarily when cardiac concerns became intense and worse.

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Additionally, cardiac-related concerns resulted in death anxiety. Individuals experienced a fear of cardiac-related stimuli and sensations based on their presumed negative consequences, such as the occurrence of cardiac events or death. This gradually led to high levels of death anxiety, and they doubt whether they will survive the next morning. An individual explained that,

Even while sleeping there's an intense fear of getting died and not wakes up next morning that there's fear of whether I might die. (HN)

Sub-theme 3.1.2: Diminished Psychological Vitality

Psychological vitality referred to a positive and energised state of being, characterized by feelings of aliveness, enthusiasm, and a sense of purpose in life. It's more than just a lack of fatigue; it encompasses a sense of vigour, engagement, and a zest for life. Cardiac anxiety could cause reduced psychological vitality due to impaired quality of life and impaired sleep quality among both individuals with and without cardiac diseases. An individual narrated about her quality of life as follows,

Quality of life? Aaa... Yes, ma'am. Like it's like I won't be feeling good about what, like I won't be satisfied with my life when I'm going through this thing. (TS)

Another person reported how the sleep quality has been affected.

I do have trouble sleeping. I really struggle with sleep. One night, I suddenly woke up at midnight, sweating.....when sleep got disturbed, heart rate was also increased. Then I felt too much stressed and was shivering. (AL)

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All these can adversely affect the mental health and well-being of individuals. Hence, addressing the psychological consequences is vital while managing cardiac anxiety along with other first-line treatment modalities.

Theme 3.2: Functional Impairment in Life Domains

This theme discussed the major consequences of cardiac anxiety among the various life domains of young adults. Most participants expressed disruptions in their daily life functioning. It refers to the significant interference or impairment in an individual's ability to perform daily tasks, responsibilities, and activities across various domains of life, such as personal life, interpersonal life, academic life, occupational life, and social life. The two sub-themes developed were erosion of daily role functioning and strain on social and relational engagement.

Sub-theme 3.2.1: Erosion of Daily Role Functioning

Cardiac anxiety can significantly impact the personal life of an affected individual. Participants reported that they have felt persistent sadness while thinking about this.

Yeah my, I would say my personal life, like I was always.. Sad, gloomy whenever I think about that. (ANM)

Individuals are unable to give attention to their goals, and they remain unfulfilled due to the procrastination of their personal life tasks. An individual stated that,

I had a huge interest to make some changes in life but it didn't happen. Inactivity was there in my life but in my mind I had the thought of doing so many

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things but I was not able to actually. If I do things in an organized way, I would be happy. So I have to do that. But I had procrastination issues. (FS)

Functional impairments in academic life are an important consequence of cardiac anxiety in the lives of students, since the majority of the participants were undergraduate and postgraduate students. These impairments ranged from lack of concentration to academic procrastination and difficulty managing responsibilities. Such disruptions are of paramount importance, as they may negatively affect students' future careers if not managed. Participants reported issues with their academic life. A participant described,

I usually procrastinate so much ma'am because of those thoughts...ah academic life also. (SB)

Students felt that the ruminations related to cardiac anxiety got in the way of using their time productively:

I'll just sit like that and time waste, which I'm not able to do good in academics also because of that. (TS)

In general, they were facing issues with studying, and it became aggravated and evident, especially during the exam season. They were not able to prepare well for the exams and had to face sleep-related issues while studying. As per the report of students,

Academically when I'm studying also this thought arises sometimes and... I couldn't study, I will not able to study. (SB)

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And during exams also, like because of anxiety, I won't be able to study properly because of the constant worry and all. (TS)

In my academic life, like I mentioned, during the exam season, it tends to happen-like even in the middle of the night I wake up uh, a fast heartbeat. So, these are the ways it academically affected. (MG)

Hence, they were experiencing burdens and were unable to meet their academic requirements and responsibilities.

Um... so if I talk about my academic responsibilities, I definitely fear a downfall, because I am not able to work as efficiently as I would if this cardiac anxiety had not happened. (MG)

From the narratives of different students, it is clear that thoughts and worries associated with cardiac anxiety significantly impaired their academic life and responsibilities.

Following the academic life, the subsequent occupational life disruptions occurred as a result of cardiac anxiety among employees. Although relatively few participants were employed, most reported disruptions in their work lives. A prominent concern is the impact of cardiac anxiety on work productivity. A shared experience of an employee is given below,

As I said, yesterday, when I saw the video..... for one hour, I was thinking about that only. Nothing even I had some work to do. But I was not doing that. I was just thinking about that..that is affected my occupational life by like my time

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for preparation for classes, everything got reduced. I just wasted my time over there. I had that thought.(ANM)

It is evident that the participants found themselves distracted by the cardiac anxiety induced by the cardiac death video of a young man, which led to unproductive hours and a delay in work-related task completion. Gradually, it translated into difficulty managing various work tasks.

In the case of occupational life, there were also issues. I had to stop teaching class after a while. But still I used to manage it by taking classes online. When we are having exam duty, due to low BP, I had issues. I had to take water by putting salt into that. I have to substitute with others due to some difficulties like this. (FS)

Additionally, many participants reported frequent workplace absences due to the distressing effects of cardiac anxiety. This frequent absenteeism can contribute to a lack of confidence in handling various job responsibilities.

In the case of occupational life, there were also issues, like I had to take so many leaves. (FS)

when this happens, I feel less confident to interact or to talk. It might be because of this heartbeat and breathing rate increasing but this feels like less motivation to talk or lack of confidence in doing tasks. (AW)

Work performance was severely affected by behavioral manifestations of cardiac anxiety, such as increased heart rate and rapid breathing. Another common concern shared by the participants was a lack of concentration.

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Like I said earlier if it is shivering while talking to someone or working, it feels less concentrated then in that particular task or feels like not completing the task and to stop it in-between. (AW)

As a result, they often felt a lack of concentration in fulfilling the routine task. These difficulties together led to work procrastination due to constant thinking about the cardiac-related concerns. This cognitive distraction can seriously affect the timely completion of work-related tasks.

Nothing even I had some work to do. But I was not doing that. I was just thinking about, thinking about that. (ANM)

Another participant also shared the same concern.

And yeah, I procrastinate also work related stuff. (TS)

Finally, the cumulative impact of these occupational challenges led to reduced job satisfaction. Many individuals attributed their diminished motivation and fulfilment in their jobs due to the ongoing burden of cardiac anxiety in their occupational life.

I am also taking classes for the 11th standard psychology students, so I had to prepare classes for them, for today. So yesterday, aa that was the time when I was expected to prepare the notes for the students. But I couldn't do that. Mmm I.. I and I tried to complete that after reaching the school today. So it was in a rush, and after taking class, also I felt I aaa was not that much satisfied, because I was a little bit unclear about the topic. I felt a little kind of unsatisfaction that okay, I would have ahm prepared a much more better. (ANM)

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Sub-theme 3.2.2: Strain on Social and Relational Engagement

The interpersonal relationships of individuals with their family members, partners, and friends were affected by the distressing effects of cardiac anxiety. It has affected multiple aspects, like issues with their family life, sexual life, peer relationships, etc. It was expressed by a person that,

Every domain was seriously affected I would say. In the case of family life, yes my husband is an understanding person, still my emotional expressions were very different now but he is adjusting what I feel. I am living with my in-laws so I have so many responsibilities as a wife and daughter. Everything was affected actually.... I am making others also into trouble. I had those confusions and negative thoughts. (FS)

It is evident that, even though the family members are supportive and understanding, the emotional issues caused by cardiac anxiety are causing trouble in their family life and making them unable to meet various responsibilities and relationship roles. Additionally, they experienced guilt as they perceived themselves as a burden to their family. This led to some communication issues and restricted interactions with family members.

Sometimes I feel like sitting alone and not communicating, but our family might ask us to be involved and share things but that I won't be able to sometimes. I used to show resistance and communication issues were there I have shown some kinds of avoidance also. (FS)

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Apart from this, one person described that her sexual life was also affected and reduced the libido due to cardiac anxiety.

Sexual life.....everything had affected I would say.....decreased libido. (FS)

Further, cardiac anxiety resulted in issues with the peer life of some individuals, as stated by a participant,

so in terms of peer relationships, its like, especially going for a trip or something, its like they makes fun of me. Because they are like.. you are so young, you don't have to, you know sit like this, old like us, specifically when I'm with older people, so this thing is there, so I'm like the emotions that goes at that time is a kind of sadness. (KS)

Experiencing cardiac anxiety at a young age, particularly when symptoms manifest in the presence of peers, can lead to feelings of embarrassment and social stigma, as such reactions are often misunderstood or ridiculed by peers. This can significantly impact the individual's emotional well-being and peer relationships.

Similarly, participants' social lives were also found to be adversely affected by cardiac anxiety. Many people reported a discernible decrease in social interactions because they frequently avoided social events out of fear of being misinterpreted by others or of having physical symptoms in public. This propensity to restrict social interaction was a defence mechanism to avoid embarrassment or distress, in addition to being a result of anxiety. A participant told that,

When this happens, I feel less confident to interact or to talk. (AW)

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Over time, participants distanced themselves from friends, peers, and even family get-togethers as a result of these practices, which eventually caused social withdrawal. Feelings of loneliness and a perceived lack of social support frequently accompanied this withdrawal, which exacerbated their anxiety and fuelled a vicious cycle of avoidance and emotional distress. A few participants said that,

ah social life.. I usually.... Disattach myself, I avoid people.....ah because of these concerns I will avoid the people. (SB)

So we'll just be rotting in the bed and all. Yes, ma'am. Like not at all going out, just staying in the bed. (TS)

when I am facing this kind of things, I'm a person who likes to isolate myself for some time. (TS)

Thus, recognising the multidimensional impact of cardiac anxiety in different domains of life is crucial for a comprehensive understanding of its impact. Healthcare providers and mental health professionals can implement more targeted and holistic interventions by identifying and addressing these multifaceted impairments as early as possible. This approach will be helpful to prevent the long-term personal, interpersonal, academic, occupational, and social life consequences that may emerge when cardiac anxiety remains unrecognized or untreated.

Theme 3.3: Anxiety's Effect on the Body

This theme described a wide range of distressing physical sensations that accompany cardiac anxiety episodes. These sensations contributed to increased

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anxiety and bewilderment because they frequently resembled those of real cardiac issues. This theme comprises four sub-themes: cardiovascular symptoms, respiratory symptoms, neurological symptoms, and autonomic nervous system symptoms.

Sub-theme 3.3.1: Cardiovascular Symptoms

Commonly reported cardiovascular symptoms included palpitation, chest pain, burning sensations in the chest, feeling heaviness in the chest, feeling of having a hole in the chest, feeling of the heart in the chest, heavy feelings of pulses in the wrist, and edema. These sensations were often misinterpreted as signs of an impending heart attack. Participants' reports are as follows,

In short, my palpitation will be high. (AAR)

Have burning, chest burning. (TN)

Yes, I had. I feel weight in my heart when something happens suddenly...I don't know where exactly it is feeling in my chest. I feel Extreme heaviness. (DA)

I feel some hole is there in my chest, Having some very heavy stone, or something in the chest. (DA)

So definitely like, uh, there are times where I feel like I can literally feel my heart even if I put my hand on, you know, the-my wrist to check my pulse, I feel that's so prominent than usual. (MG)

Also, sometimes I am used to have conditions like 'Edema' and I felt like these conditions become more when I am stressed or anxious. (FS)

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Sub-theme 3.3.2: Respiratory Symptoms

Participants frequently experienced some of the respiratory symptoms, such as breathing difficulties, panting, suffocation, increased breathing rate, loud/noisy breathing, a sense of being choked, and a feeling of something being stuck in the throat. Based on the participants' narratives,

Then breathing difficulties. Difficulties in inhaling. (HN)

Panting while climbing step. Panting is there when I am running. (AR)

Yes panting, breathlessness, suffocation and I become very tired and weak.

(FS)

And at times there's that sense of being choked...that kind of feeling.

Something being stuck in your throat, yeah. (MG)

Sub-theme 3.3.3: Neurological Symptoms

Individuals explained that they were having some neurological symptoms while experiencing cardiac anxiety, such as dizziness, headache, feeling blank, shaking of legs, unable to move, unable to talk, body pain, neck pain, pain in both hands, etc. They also reported on that,

I feel like dizziness and I feel I have to sit somewhere. (DA)

I feel headache. (NP)

it's blank. Nothing is there. (PPU)

One very common thing is whenever I'm much stressed or anxious, my legs will continuously shake. I have to hold my knees together to stop it. (TD)

And I can't move at that time, it's a kind of electric current is passing

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through my body. (KMP)

Sometimes we feel some pain on our body right.. I don't know if the pain is because of that. (AV)

There have been instances a lot of times in the past, like, in the night I will just wake up to a chest pain and it will be like piercing pain and it will some-somewhat go and localize back into my neck. And then it will go away. (PPU)

Pain at left and right hands. (HN)

Sub-theme 3.3.4: Autonomic Nervous System Symptoms

Sweating, shivering, cold sensation on hands, temperature variations in different body parts, fatigue, dryness of mouth were the autonomic system symptoms reported by the participants while experiencing cardiac anxiety. They explained that,

I.. I feel more sweating. (ANM)

There may be shivering that's it, all this only I have noticed. (AV)

When we tell about that symptoms, hand will become cold. Then.....hand will become cold.....that only occurs. (VV)

Like, right behind the stomach... So, there, it gets warm.. my hands would be extremely cold but that area gets unusually warm...people are like, (laughs) same body but different temperature. (MLK)

Usually its just fatigue, very tired easily. But apart from that, there is nothing. (KS)

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not that kind of...but dryness of mouth is there. (MLK)

Overall, the co-occurrence of these symptoms greatly increased the participants' emotional distress, misinterpretation of normal body sensations, and recurrence of anxiety episodes.

Overarching Theme 4: A Dual-Path Journey: Adaptation vs. Avoidance

This overarching theme aimed to explore the management strategies of cardiac anxiety among young adults. Management strategies included long-term, proactive approaches to address the root causes and reduce overall anxiety levels, and also short-term, reactive techniques to manage immediate anxiety symptoms. These strategies are therefore essential to prevent anxiety and manage it when it occurs. A total of four themes were identified: Adaptive self-regulatory coping, avoidance of cardio-triggering activities, help-seeking and reassurance and health-risk behaviors as coping. It highlighted both adaptive and maladaptive coping strategies used by the participants to manage cardiac anxiety.

Theme 4.1: Adaptive Self-Regulatory Coping

This theme unravelled the conscious and proactive strategies individuals use to manage stress associated with cardiac anxiety and regulate their thoughts, emotions, and behaviors effectively to promote well-being. It involved actively taking steps to reduce stress, improve emotional regulation, and adapt to challenging situations. The sub-themes included health-oriented lifestyle modifications, stress management and other psychological techniques, engagement

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in recreational and digital activities, emotional relief through the presence of loved ones, faith-based and spiritual coping, and body-based self-soothing strategy.

Among these, health-oriented lifestyle modifications, stress management and other psychological techniques, faith-based and spiritual coping strategies were considered long-term proactive approaches. The other strategies, such as engagement in recreational and digital activities, emotional relief through the presence of loved ones, and body-based self-soothing strategies, were considered as the short-term reactive approaches.

Sub-theme 4.1.1: Health-Oriented Lifestyle Modifications

Cardiac anxiety occurred in most of the participants who feared getting cardiac diseases in the future. Therefore, they engaged in the behaviors that reduce the risk of the probability of getting cardiac diseases, which in turn mitigate the intensity of cardiac anxiety.

Dietary improvements are the major lifestyle transition made by the participants. It encompassed a variety of food habits, including eating vegetables and fruits, high water consumption, taking vitamin supplements, avoiding fast food and processed food items, controlled sugar intake, acidic foods, and food that caused gastric issues. As reported by the participants,

Like eat vegetables and fruits as much as possible. (TS)

About food, I am- I take some supplements like vitamin supplements, multi vitamin tablets I take...(PPU)

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Sometimes, minimise the acidic foods and foods that cause gas. (HN)

Furthermore, participants also engaged in regular exercise or physical activity. *I started doing exercise only after getting this heart related concern (DR)*

Moreover, some also adopted a healthy sleep routine as an add-on benefit.

Like I try to maintain my sleep cycle. Like I put efforts at 12... I try to sleep. (TD)

Sub-theme 4.1.2: Stress Management and Other Psychological Techniques

This sub-theme covered a wide range of commonly used stress-management techniques and a few other psychological techniques. A combination of both techniques is crucial to effectively manage cardiac anxiety and associated distress. It included meditation and breathing techniques, distraction activities, journaling, acceptance of the condition, and self-affirmations.

Participants in the study adopted deep breathing exercises. A participant who is a sports psychologist reported that,

....adopt breathing techniques or mindfulness techniques. I usually do such techniques....there are many such techniques, since I am a sports psychologist, we are using different techniques. (AW)

These are a few among the strategies used by a sports psychologist who has cardiac anxiety. Participants reported that they experienced cardiac anxiety when they were staying free and doing nothing. To deal with the anxiety effectively, they engaged in various distraction activities to divert their mind from cardiac-related thoughts and worries. A few participants explained that,

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Usually, I use the five senses technique which is like, I'm sure you know about this, that five things you see for... that thing. (KS)

One participant reported that watching cardiac death-related videos on social media caused increased cardiac anxiety, and to distract from that, they uninstalled those social media platforms. Similarly, they reported that being engaged and busy with work-related and study-related activities helped them to focus more on that and stay away from the thoughts of cardiac concerns.

Strategies... now I am actually busy with my works like academics ..I am focusing on academic things and things that I postponed. I am spending a lot of time to prepare for that and earlier I was not like that. So now I am managing like that. (FS)

Journaling was also an effective strategy used by the participants. As per their explanation,

So usually, I have this practice of writing diary. So anything and everything happens I write it down in my diary. So, when I'm writing, my-my heart will be like, really racing. Like, um-usually emotional response kind of thing. So, I write it down and I mostly feel better after writing that. (MLK)

It was considered as a venting by the participants to feel relaxed while experiencing cardiac anxiety.

Another technique was also used by the participants in the study, which was acceptance of the condition. Usually, it was difficult for all of the individuals

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to practice. But once it was practiced, it was very helpful for alleviating the distress associated with cardiac anxiety. Based on the participants' accounts,

And I'm thinking that aa whatever that brings me, whatever good thing that brings me, let it come. But of course, I can't deny the fact that this cardiac arrest can happen at any time. So it's like that. If it's my fate, I'm ready to face that. (ANM)

I would just try to feel it. If something happening to me, then I'll be like no, nothing is happening to me. Then I will just calm down all-all by myself and then everything will be gone. (PPU)

The relaxation gained by the participants through the practice of acceptance was noteworthy. Similarly, another positive psychological technique adopted by the participants was positive self-affirmation.

When I'm getting this kind of anxiety... I'll sit down and I'll try to aahm mitigate the level of anxiety by taking deep breaths and by saying to myself that everything is going to be okay. This is just a part you have to relax. Relax. That's what I used to tell myself. (ANM)

The positive statement that was repeated to themselves by the participant helped to make her relaxed and provided a more positive outlook on life. They are a tool for reframing negative thoughts and beliefs about their cardiac health and for cultivating a more optimistic mindset.

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Sub-theme 4.1.3: Engagement in Recreational and Digital Activities

Engagement in entertainment activities was a useful short-term technique to gain temporary relaxation from cardiac worries. The participants were engaged in entertainment and recreational activities using digital devices and digital media platforms. A participant reported that listening to music provided relaxation to her.

I manage that situation by hearing music and make me feel relaxed. (DR)

Similarly, watching movies and YouTube videos was helpful to divert the mind from the cardiac concerns and made them feel relaxed for a while. The participant's reports as follows,

I distract my mind either with the help of hearing music or watching movies. (DR)

Yeah, I just go and watch something on YouTube, something very unrelated. (AR)

Engagement with these entertainment activities helped them to change their negative emotions and stay calm for a while.

Sub-theme 4.1.4: Emotional relief through the presence of loved ones

Spending quality time with loved ones, such as family members and friends, can provide great emotional relief to the affected individuals. Moreover, the perceived support received by the individuals made them stronger and gave them the strength to deal with the issue by thinking that they were not alone in this health threat battle.

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It will usually last for only a short time because I used to distract or deviate myself from that situation by spending time with my friends or engaging in other activities (AW)

I will sit with my loved ones and it will recover. (NP)

It can have a positive impact on heart health and potentially reduce cardiac anxiety.

Sub-theme 4.1.5: Faith-Based and Spiritual Coping

It is the human nature of some individuals to rely on religious beliefs and customs when they are distressed. Having strong faith in religion and turning to spirituality often acted as a temporary relief from the issue. A participant informed that the enhancement of their religious belief occurred after the onset of cardiac anxiety.

Yes, religious belief became strong after these heart related issues came. (DY)

This indicated that they have adopted it as a temporary coping strategy to deal with cardiac anxiety. Firstly, they started to thoroughly believe in God or the divine power that would protect her.

Keep trusting in God no. he has set, whatever he wrote it will only happen that.yes, having faith in God is the most upper thing no. if I am having faith in God, he will protect me. (PN)

Cardiac anxiety brought an uncertain situation to the affected persons, and they thought that the divine faith would be the only source of relief and protection

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for them. Hence, they started to invest more time in taking part in religious practices and customs.

Yeah, more prayer is there. Haa. I feel relaxed after prayer I won't get heart related concerns any more. (DR)

Oh okay, sort of puraanic verses, there are some verses which- it helps uh...it is good for our heart health, like, if we recite it daily or something it may help us um... ...calm down. (KQ)

By believing that certain prayers in their religion would be helpful for their heart health, they constantly followed them to calm down on their own. Additionally, they thought that prayers have meditative power and have hidden psychological aspects in them. An experience shared by a participant is as follows,

I feel like the Quran should be followed and recited. I believe that it has some meditation power and some reliefs or there are some psychological aspects in that. (FS)

Further, they considered that reliance on spirituality is a way of coping when they perceived their risk of getting cardiac death in the future. Following a spiritual path is considered as a relief from death anxiety associated with cardiac concerns.

Yes. Because we're going to die, we feel that we need something in our hands. During times of pain, everything else is put aside, and turn to spirituality. Its a relief. (HN)

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Therefore, following religious beliefs and practices can promote a sense of peace, hope, and well-being, potentially reduce anxiety, and improve overall health outcomes.

Sub-theme 4.1.6: Body-Based Self-Soothing Strategy

This sub-theme referred to using physical actions and sensations to calm and regulate the nervous system during times of distress. These techniques utilized gentle physical actions to promote relaxation and a sense of safety and comfort. Even though it encompassed a variety of techniques, only one participant reported usage. Here, supportive touch was adopted by the participant.

Like sometimes the unpredictable and some social gatherings and all if I am facing and this is very awkward. Like I try to tap my chest to resolve those problems. So, that is very difficult. (KMP)

Tapping on the chest was considered as a technique to reduce the intensity of cardiac anxiety induced by some unpredictable social gatherings. It was used as an immediate relief to the individual.

Theme 4.2: Avoidance of Cardio-triggering activities

Individuals with cardiac anxiety have the tendency to avoid the activities that they perceive to be eliciting their cardiac symptoms. To avoid such presumed harmful consequences, they tend to avoid such activities. They considered this form of cardio-protective avoidance behaviors as one of the coping strategies used to manage the distressing effects of cardiac anxiety. In other words, it involved engagement in certain cardio-protective behaviors such as actions taken to avoid

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situations, activities, or stimuli perceived as potentially harmful to the heart, even if those perceptions are not entirely accurate. The sub-themes identified were avoidance of direct cardiac-related triggers, avoidance of social exposure, and avoidance of physical exertion.

Sub-theme 4.2.1: Avoidance of Direct Cardiac-related Triggers

Individuals reported that they have been actively involved in any one form of the avoidance behavior. As a result of cardiac anxiety, they were actively engaged in avoiding direct exposure to cardiac-related information.

I think I avoid heart health discussion.....yeah, I have done it multiple times actually. (PPU)

Since cardiac-related discussions can trigger cardiac-related concerns, the participant actively avoided such instances multiple times. Similarly, any form of cardiac-related videos and news was intentionally avoided by the participants to prevent the trigger from such sources.

Yeah.. I.. I tried to avoid that. Even mm yesterday, I made this promise to me like that, if you see some kind of videos, just skip that video, If I see any kind of things, I'll just skip it. Ahm I'm planning not to spend too much time reading or seeing those kinds of videos on news. (ANM)

Sub-theme 4.2.2: Avoidance of Social Exposure

Many participants reported their difficulty and discomfort with social events and gatherings. They perceived that being in such uncomfortable situations can trigger their cardiac anxiety. Hence, to prevent such onset of the distress, they

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tried their maximum to stay away from such circumstances. A few participants shared their experiences,

Social events ma'am, I usually avoid social events..... like I have this fear of... like.... I get soo much anxious ma'am. (SB)

Like you know when I- in public gathering I have to speak, I get heat, and anxiety, my heart is so fast, it beats so fast.....and I am not able to control it. I'm like shivering all the time. (MT)

A participant shared her concern regarding public speaking, that,

But talking with someone, public speak-public speaking and all I avoid. (MT)

Similarly, another participant stated that avoidance of public presentations was often chosen by her often,

So that I avoid. Um...there are 2 times I avoided from being the presenter for conferences because uh...I think I'll fumble and I'll...uh... mess everything up so... uh, even if I prepare the PPT and I prepare everything, I don't present because I just...stop and I...listen to my heartbeat. Like, is ithigh? (Laughs) should I worry? That kind of thing. (MLK)

Sub-theme 4.2.3: Avoidance of Physical Exertion

A large number of participants reported that they avoided any forms of heavy physical activities by thinking that it might cause an increased heartbeat and gradually lead to adverse cardiac consequences. Even though regular exercise and physical activity are thought to be facilitators for cardiac health, they tend to avoid

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them due to the irrational thoughts associated with cardiac anxiety. As per the experience of a participant,

Yes, Maximum.....I am avoiding such activities that trigger cardiac sensation. I avoid doing any physical exertion. (NP)

Along with this, another participant reported that engaging in adventurous activities was also avoided by them.

Also, adventures. I like to do that, but when I reach the point, I feel anxious and avoid it. (TN)

All these avoidance behaviors are often driven by fear and anxiety related to cardiac health, and they can be both a normal and a maladaptive response. While this can provide temporary relief, it often worsens long-term anxiety and can negatively impact recovery and self-care for individuals with cardiac anxiety.

Theme 4.3: Help-Seeking and Reassurance

Since the participants in the study had not been diagnosed with any cardiac condition, they frequently ruminated about the unknown medical causes of their cardiac-related concerns. This persistent uncertainty led to excessive reliance on medical resources. The participants were hypervigilant about the cardiac sensations due to their perceived vulnerability. As a result, they constantly keep engaging in help-seeking and reassurance-seeking behavior. The sub-themes identified were medical consultation and tests, talking to trusted others, and the use of health monitoring devices.

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Sub-theme 4.3.1: Medical consultations and tests

Heightened heart-focused attention resulted in excessive utilization of health care facilities among individuals with cardiac anxiety. Lack of medical validation of symptoms and difficulty in identifying a cause that is of cardiac origin is distressing for them. To manage the distress associated with such difficult situations, they are frequently involved in doctor shopping and conducting multiple assessments and tests without knowing the psychological origin of the condition. A participant conveyed her experience of consulting multiple doctors to find the cause and thus the solution for the concern.

I always had a worry regarding what my issues are. So in order to understand that I used to go for every doctor appointment. Doctor referred me to another doctor to check these electrophysiological check-ups. (FS)

As a result, they have undergone various tests and procedures.

So, a few years back I had taken an examination called the Holter test. It's a kind of ECG test. My doctor says if the medicines are not working, we can do an angiogram. Then he mentioned about checking electro physiologically related issues are there or not. We may not notice such things even if we take ECG or Echo. (FS)

Even though they could not identify the exact cause of the issues with these medical tests and check-ups, this health-care seeking is providing some sort of relief to them

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Sub-theme 4.3.2. Talking to trusted others

The participants with cardiac anxiety concerns used to seek excessive reassurance from health-care providers. They find relief from cardiac distress when discussing their concerns with medical professionals. They spend more time on this purpose. A participant reported that,

Cardiac health related....When I meet doctors I explain every concern of mine and ask for the cause..... it is reassurance. (FS)

Explaining each concern to doctors is considered a reassurance by the participants, and it resulted in huge relief to them. Another participant shared that they openly share their cardiac-related concerns with their loved ones, such as family or friends. That is also considered a reassurance by them, and they feel relieved after that. As mentioned by the participants,

Seeking reassurance from loved ones.....yes, very much. (MLK)

Reassurance seeking.....only with friends mostly. (AV)

Sub-theme 4.3.3. Use of Health Monitoring Devices

Self-monitoring of cardiac-related sensations using various health monitoring devices such as smartwatches, oximeters, stethoscopes, etc. is useful for keeping a track of the cardiac functioning and to realize the variations in heartbeat and other sensations immediately. It will be beneficial to take precautions and necessary actions when required. Using such devices can reduce unnecessary hospital visits to merely check cardiac sensations like heartbeat, pulses, etc. A participant shared that,

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I recently bought a fitness band like apple watch so it like when like if I'm feeling anxious or I'm tensed about something then I'll be like okay I'll check the heart rate and I'll check it. um.... Like that it's there or sometimes, like once in a month I'll check the ECG in the watch itself, there is a feature of ECG so I'll take that. (ALK)

I don't use a smartwatch to monitor. But I have been using an oximeter for some time now with me. Then BP checking equipment is there at home. The measurement with that may not be that accurate, but even though I use it. (FS)

I experienced fear. I have stethoscope. I frequently checked on heartbeat and checked any changes visible. (TN)

The reliance on such health-monitoring devices and the checking of cardiac sensations can be helpful to the affected individuals.

Theme 4.4: Health-Risk Behavior as Coping

This theme highlighted how participants engaged in unhealthy or maladaptive lifestyle-related behaviors to find what they perceived as temporary relief. While these strategies might offer immediate comfort, they are likely to be harmful and counterproductive in the long run. Participants explained about two such coping methods, including smoking and unhealthy forms of eating.

Sub-theme 4.4.1: Smoking

Smoking is a maladaptive coping strategy to receive temporary relief from the distress caused by cardiac anxiety. The participant felt that smoking was effective in reducing stress and increasing heart rate. Gradually, these beliefs got

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strengthened and reinforced, and led to dependence on smoking. He found it challenging to adopt any other proactive coping strategy.

As I said, I'm 20 years old. When I joined for degree, I started smoking. Then I got stress and my heart beats would be increasing and I felt that when I smoke the heart beat comes back to normal. (RB)

Sub-theme 4.4.2: Unhealthy Form of Eating

A few participants adopted an unhealthy form of overeating as a management strategy to deal with the distress associated with cardiac anxiety. They continued to engage in such destructive coping methods, irrespective of their knowledge that it would be harmful for them in the future.

Umm... So, when I'm stressed, I overeat a lot. Not healthy, but an unhealthy form of overeating a lot. (TS)

Hence, it was noted that a few of the participants were engaged in such coping despite knowing that it was maladaptive. But, many of the remaining participants engaged in maladaptive coping without knowing its adverse effects that can be brought to their lives in the long run. Hence, proper awareness about both healthy and unhealthy forms of coping is required for the proper recovery and management of cardiac concerns

In conclusion, the inferences of the study revealed that cardiac anxiety among medically healthy individuals is shaped by a complex interplay of psychological, behavioral, interpersonal, biological, and situational factors. Participants' experiences highlighted multiple risk factors, including distorted

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health perceptions, emotional distress, low health literacy, unhealthy lifestyle patterns, familial and social dynamics, genetic predispositions, post-COVID health vigilance, adverse effects of media, and environmental factors. The impact of cardiac anxiety was evident across multiple domains, including personal, interpersonal, academic, occupational, and social functioning, with many reporting significant disruptions in daily life. Participants adopted a range of strategies to manage their anxiety, ranging from adaptive self-regulatory practices such as lifestyle changes, stress management, and spiritual coping, to maladaptive responses like unhealthy behaviors. Protective and mitigating factors such as a strong support system, health awareness, perceived sense of control, trust in medical expertise, and optimistic belief emerged as important buffers. Overall, the study provided a comprehensive understanding of the multidimensional nature of cardiac anxiety and the coping ecosystem surrounding it in the absence of clinical cardiac illness.

Chapter 5

Discussion

This chapter presents an elaborate interpretation of the study's outcomes and places them within the context of existing research literature. It accurately analyzes the study as a whole, evaluating its relevance and positive attributions. The results arrived at from the reflexive thematic analysis of semi-structured interviews conducted with 34 participants experiencing cardiac anxiety were examined to demonstrate their significance in addressing the research objectives and to establish connections with prior research in the field. This study provides a qualitative exploration of the perceptions about various factors influencing and the consequences of cardiac anxiety in adults who do not have pre-existing heart conditions.

This exploration also helped to highlight the perceived risk factors, protective factors, consequences, and management strategies of cardiac anxiety. In addition, it also describes how the present study contributes to the existing literature and advances our understanding of cardiac anxiety in adults by filling admirably significant gaps in the literature. Moreover, this chapter highlights the implications of the inferences, underscoring their significance for further primary research endeavours. Moreover, it points out the relevance of the inferences for policy-making, accentuating the potential for implementing management strategies and tailored interventions for dealing with cardiac anxiety among the general population. Therefore, the current chapter summarises the empirical evidence

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gathered, confirming the study's strengths and pinpointing its implications for both future research on the subject and real-world therapeutic applications.

The Unfolding of Cardiac Anxiety

Cardiac anxiety is characterised by incessant uneasiness and obsession with the possibility of developing heart disease despite the absence of any clinical diagnosis. Individuals often misinterpret benign bodily sensations such as increased heart rate or chest tightness as signs of severe cardiac conditions, leading to an uncalled-for distress and functional disability. This cycle is reinforced by psychological mechanisms such as interoceptive awareness (heightened sensitivity to internal bodily sensations), attentional bias toward perceived cardiac symptoms, and misattribution of normal physiological responses to life-threatening conditions (Rashid et al., 2025)

The study aimed to clarify the underlying mechanisms and risk factors that trigger the onset and maintenance of cardiac-related fear, attention, and avoidance behaviors among the non-clinically diagnosed young adult population. Cardiac anxiety is a multi-faceted condition resulting from the dynamic interplay between psychological, biological, physical, lifestyle, behavioral, environmental, social, and media-related factors. Since symptoms of anxiety and heart disease (such as palpitations, dyspnoea, or chest pain) partially overlap, diagnosing cardiac anxiety in individuals with heart disease can be difficult. As a result, individuals undiagnosed cardiac anxiety must continue receiving medical care and cannot be referred to psychological services (van Beek et al., 2016). To deal this issue, it is essential to identify the various risk factors of cardiac anxiety that will further aid

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in the diagnosis of this condition. Hence, the present study provides insights into the importance of several risk factors that are crucial for the occurrence, intensity, and maintenance of cardiac anxiety. The themes identified were fragile sense of bodily trust, lifestyle patterns that amplify vulnerability, relational worlds that shape anxiety, embodied vulnerabilities, Information that harms rather than helps environments and moments that spark fear.

The cardiac-health-related perceptions and resultant cognitive distortions acted as a threat to the individual in experiencing cardiac anxiety. Perceived susceptibility to cardiac disease and sudden death functions as a core precursor to cardiac anxiety. According to the Health Belief Model (HBM) (Hochbaum, 1958; Rosenstock, 1966; Orji et al., 2012), perceived susceptibility typically served as a motivator for adopting preventive health behaviors. However, in the context of this study, perceived susceptibility to cardiac disease and sudden death emerged as a psychological risk factor for cardiac anxiety rather than a protective one owing to the overstated risk appraisal. Participants who viewed themselves as biologically or situationally vulnerable were more likely to catastrophically misinterpret benign bodily sensations as signs of imminent cardiac events. This cognitive appraisal, when combined with high perceived severity and emotional salience (particular fear of death), led to a maladaptive cycle characterized by hypervigilance, reassurance seeking, intrusive and negative automatic thoughts, and avoidance behaviors.

Rather than facilitating proactive health management, heightened susceptibility, especially when compounded by cognitive distortions, low self-

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efficacy, and affective distress, intensified cardiac anxiety. The lack of sense of control over cardiac health reported by the participants can be explained in terms of the psychological models, such as Bandura's theory of self-efficacy (Bandura, 1977) and Health Belief Model (Janz & Becker, 1984; Rosenstock et al., 1988). Self-efficacy was first included in the model's perceived barriers construct by Janz and Becker (1984), but several psychologists have since recognised it as a crucial and separate cognitive construct. A lack of perceived control emerged as a significant psychological risk factor for cardiac anxiety. Participants who expressed low confidence in managing cardiac sensations or interpreting their bodily symptoms often reported elevated levels of distress and hypervigilance. A low self-efficacy not only impairs coping but also intensifies physiological reactivity to perceived threat. Within the Health Belief Model, reduced self-efficacy undermined the transition from risk awareness to positive behavior change. Thus, a diminished sense of control over internal states may contribute not to prevention, but to the escalation of cardiac anxiety. The results from the 'Heart and Soul study', which included individuals with HF, reported that less self-efficacy is linked to worse performance on four health outcomes of disease-specific and general health domains, such as a greater physical limitation, higher burden of symptoms, worse state of general health and impaired quality of life (Sarkar et al., 2009; Sarkar et al., 2007). The emergence of mood disorders in individuals having CVD, which may affect 15% to 20% of individuals with CAD (Wang et al., 2011), has also been linked to decreased self-efficacy (Tsay & Chao et al., 2002).

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It is highly significant to have an awareness about the influence of psychological factors in cardiac anxiety, as psychiatric comorbidities like depression and generalized anxiety also occur along with cardiac anxiety among individuals. The occurrence of cardiac anxiety is linked to psychological distress, such as self-reported anxiety, stress, loneliness, and distressed past traumatic experiences. Heart-focused attention and cardiac activity monitoring are higher in cardiac patients with higher anxiety (Pokrajac-Bulian et al., 2022). Similar results were shown by the prior study, suggesting that cardiac anxiety is best predicted by self-reported anxiety (Wedegärtner et al., 2020). Psychological distress can contribute to cardiac anxiety by increasing physiological arousal, catastrophic thinking, impaired emotional regulation, and hypervigilance. Heightened stress response can lead to cardiac symptoms such as palpitations, chest pain, that can be misconstrued as the signs of a serious cardiac condition (Satyjeet et al., 2020). Apart from this, grief associated with the cardiac death of a family member can significantly induced distress, followed by cardiac anxiety. The various symptoms of cardiac anxiety, such as fear and attentiveness, can be predicted over time by sudden cardiac death in close relatives (Hamang et al., 2012). Understanding these mechanisms is crucial for developing targeted interventions to address psychological distress and reduce the risk of cardiac anxiety.

Furthermore, one important and frequently disregarded risk factor for cardiac anxiety is low health literacy. Unhealthy lifestyle choices, which raise the risk of CVD, are linked to people with low health literacy because they struggle with complicated health-related tasks and abilities, like comprehending health information, and with limited healthcare accessibility, and communicating their

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needs, wants, and concerns (Jayasinghe et al., 2016). Timely access to health care is hampered by low health literacy, which can result in misuse or unnecessary use. A critical component of health and well-being, low health literacy has detrimental effects on illness prevention and health protection. Additionally, poor health literacy has significant influence on several health-related domains, including managing chronic illnesses, choosing healthy lifestyle choices, misinterpreting and abusing medications, frequent hospitalizations and mortality rates, and utilizing costly medical services, particularly emergency and specialist care. The consequences put more strain on health systems and raise their expenses (Vismara et al., 2022; Tran et al., 2022; Rababah et al., 2020). Individuals without proper awareness about cardiac function and health (Brørs et al., 2022) often misunderstood their benign sensations as medical emergencies, since it affects patients' ability to make health-related decisions (Arnett et al., 2019). In the absence of clear, trusted knowledge, they became more susceptible to misinformation and superstitious beliefs and fear-based narratives, particularly via online sources. This leads to heightened anxiety, excessive reassurance-seeking, and maladaptive health behaviors. Furthermore, low health literacy damages participants' ability to communicate effectively with healthcare providers, resulting in confusion, mistrust, and repeated diagnostic attempts. Thus, limited health literacy not only hampers effective coping but also actively sustains anxiety through misappraisal, helplessness, and impairs health navigation.

Besides, hypervigilance towards cardiac sensation equally contributed to the occurrence and maintenance of cardiac anxiety among the young adult population. It involved focusing attention on cardiac stimuli and monitoring

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cardiac sensations (Eifert et al., 2000) through smartwatches or bodily checking behaviors. This hyper-awareness led to the misinterpretation of normal cardiac sensations as pathological, triggering heightened fear responses. The process aligned with the concept of interoceptive amplification (Chen et al., 2021), where focused attention enhances both the perception and the emotional salience of internal cues. As a result, even minor fluctuations in cardiac rhythm were experienced as catastrophic, creating a self-reinforcing cycle of fear, monitoring, and physiological arousal. Hypervigilance not only sensitises individuals to their bodily states but also prevents cognitive reappraisal or habituation, thereby maintaining the anxiety. Thus, a more thorough understanding of these predictors (risk factors) could aid in identifying individuals in need of psychological assistance as well as diagnosing the comorbidity that underlies cardiac anxiety (Pokrajac-Bulian et al., 2022).

Lifestyle and behavioral risk factors included modifiable habits or routines that are known to impact cardiovascular health and general well-being, such as a sedentary lifestyle, unhealthy habits, and the resultant obesity or overweight. These are very crucial since they can significantly contribute to the increased vulnerability to health threat perception (Park et al., 2020). Gradually, it indirectly reinforces cardiac anxiety. Such individuals often experience physical symptoms that mimic cardiac distress. These sensations, when interpreted through the lens of perceived vulnerability, trigger heightened fear and reassurance-seeking. Many participants expressed awareness of their risk behaviors, but this knowledge paradoxically increased their anxiety rather than motivating positive change (Forslund et al., 2013; Konicki, 2012). Moreover, sedentary behavior, that is, the

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avoidance of physical activity due to fear of triggering cardiac symptoms, further reduces cardiovascular resilience, reinforcing the anxiety cycle. Thus, maladaptive lifestyle behaviors both contributes to and sustains cardiac anxiety through physiological, cognitive, and emotional channels.

A sedentary lifestyle can make cardiac anxiety worse (Sardinha et al., 2012; Wedegärtner et al., 2020). Lack of physical activity throughout one's life has been shown in numerous studies to be one of the primary determinants in the origin of heart disease (Sun et al., 2025). A sedentary lifestyle with consistently low levels of physical activity, according to the World Health Organization, lowers life expectancy and increases the chances of CVD, which are risk factors for the onset and progression of cardiovascular illnesses (WHO, 2024). In the general population, this risk perception has been identified as a risk factor for cardiac anxiety. Moreover, individuals with CAD may exhibit sedentary behavior, which can be accurately predicted by the components of the health belief model. Individuals with CHD are either directly or indirectly impacted by their knowledge of sedentary behavior and health belief variables. According to Jiang et al. (2024), these elements include self-efficacy, health motivation, perceived benefits, perceived barriers, perceived severity, perceived vulnerability, and understanding of sedentary behavior. In the future, community health workers will use the health belief model to create focused interventions for sedentary behavior.

Unhealthy dietary habits can contribute to both cardiac issues and anxiety, and the two can be interconnected. A diet with saturated and trans fats, for example, can lead to clogged arteries and increase the chances of getting heart

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disease. This, in turn, can trigger anxiety and fear related to heart health.

Furthermore, unhealthy dietary patterns can exaggerate anxiety symptoms, while managing anxiety effectively can improve adherence to a heart-healthy diet.

Together, these sedentary lifestyles and unhealthy dietary habits can lead to overweight and obesity. Obesity and cardiac anxiety are interconnected, with each potentially exacerbating the other. Obesity is a risk factor for CVDs, it negatively impacts prognosis, and increases cardiovascular morbidity and mortality.

Individuals with obesity issues may experience increased anxiety related to their heart health. Additionally, anxiety itself can contribute to weight gain and further complicate cardiovascular health (Perone et al., 2024). A holistic cardiovascular risk assessment is the key initial step to defining tailored management and multidisciplinary treatment for every affected individual. Additionally, physical activity significantly predicted cardiac anxiety (Wedegärtner et al., 2020). In contrast to the finding that cardiac anxiety was predicted by a lack of physical activity (Hohls et al., 2020), this study maintained that engagement in heavy physical activities was perceived to trigger cardiac anxiety.

Familial influence on health beliefs and emotional regulation, and lack of emotional and informational support from loved ones, are associated with cardiac anxiety. Fischer et al. (2012) stated that lower social and interpersonal support was considered a major predictor of cardiac anxiety. It is believed that a rise in emotional support explains the connection between relationship status and cardiac anxiety. Further, anxiety and depression are more prevalent in persons with poor social support (Allabadi et al., 2019). Reductions in social support networks or social isolation may exacerbate distress (Rashid et al., 2025). The current study

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provided insights into various factors that can affect overall perceived social support, such as knowledge gaps in family related to this condition, familial restrictions in open emotional expressions, peer comparison and judgment, and negative prior experience of sharing with friends. Also, early parental upbringings can influence all their behaviors to a certain extent, as does cardiac anxiety.

Genetic predisposition is a major biological risk factor associated with cardiac anxiety. Previous or a recent experience with a cardiac disorder or death in the family may influence and maintain cardiac anxiety (Eifert, 1992). Higher cardiac anxiety is also reported in individuals at increased risk for arrhythmias and sudden cardiac death because of a personal history or genetic predisposition to cardiac diseases (Hamang et al., 2011). Compared to respondents with low cardiac anxiety, those having increased CAQ scores showed greater medical and cardiac issues among their parents. (Eifert & Forsyth, 1996). These results provided some credence to the idea that children who witness their parents' exposure to a certain illness (such as heart disease) may be more susceptible to fearing that illness themselves (Eifert & Forsyth, 1996). The study results of Flor et al. (1990) pointed to the importance of vicarious conditioning and observational learning in this learning process. Besides, people who experienced cardiac anxiety are probably more likely than those who do not to have been vicariously exposed to heart-related stimuli and events. Many people who suffered from cardiac anxiety have witnessed heart diseases and its potentially fatal consequences, including death in close friends and family members (Eifert & Forsynth, 1996; Eifert et al, 1996). People who had a family history of sudden cardiac death were more anxious because they were worried about their own cardiac risk, especially if there was

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uncertainty about the previous genetic testing of their relatives (Hamang et al., 2011). The lack of clarity regarding genetic risk amplified their anxiety and fear about the potential cardiac conditions. Additionally, throughout their relatives' hospital stays, family members of critical care patient experienced moderate to severe cardiac anxiety (Konstanti et al., 2016).

Moreover, physical health issues like gastritis, chest pain, variations in heartbeat, and musculoskeletal issues are reported to cause cardiac anxiety. The thoracic cage pain can result in cardiac anxiety, and it can mimic heart-related pain. (Lakri et al., 2023). Individuals having chest pain also displayed very high levels of fear, avoidance, and attention subscales of CAQ and had a significantly higher total CAQ score than those who did not report chest pain. Those reporting chest pain also tended to endorse more overall cardiac anxiety symptoms (Carmin et al., 2003). Chest pain and heart sensations, in particular, are misinterpreted as indicative of heart disease, and during an acute chest pain attack, fear of cardiac death can be occurred (Eifert, 1992). Anxiety may be linked to heart-related physical problems such as palpitations, dyspnea, or chest discomfort, which account for up to 50% of general medical consultations (Katon, 1996). Although they are not necessary or distinct elements of cardiac anxiety, physical symptoms like chest discomfort and heart palpitations are frequently signs of "somatic uncertainty," which is crucial to the emergence and aggravation of heart-related concerns (Eifert, 1992). Therefore, it is not appropriate to label people who frequently present themselves to medical settings with chest pain but do not have organic pathology as having a "nonorganic" chest pain issue, since this diagnosis could obscure the possibility of serious cardiac anxiety (Eifert et al., 1996).

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Frequent chest pain has a severe impact on a person's social and professional life in addition to causing physical suffering (Eifert et al., 2000).

In addition to the CNS's easy arousability and the ANS's hyperarousal, two physiological processes may played a significant role in chest discomfort. First, the precordium's intercostal muscles and joints may experience strain and spasm as a result of hyperventilation (Lum, 1987). Hyperventilation can also actually compromise the myocardial oxygen supply in some situations, which can lead to coronary artery constriction (Neill & Hattenhauer, 1975). Second, those who are cardiophobic may develop a habit of tensing their chest muscles and activating their sympathetic nervous system in response to stress and discomfort. This could eventually result in learnt modifications to the sensitivity of the nociceptive system and input of the muscles in the chest area.

The current study particularly identified the influence of the COVID-19 pandemic on the onset and maintenance of cardiac anxiety. This relationship is a novel finding in which the widespread circulation of controversial information regarding the COVID-19 vaccine created huge fear in the people who took the vaccine. They were scared of getting cardiac diseases as a result of this vaccination, which ended up in experiencing high cardiac anxiety. The COVID-19 vaccinations have been associated with a number of problems, the most prominent of which are concerns about cardiovascular consequences (Barda et al., 2021; Rosenblum et al., 202; Montgomery et al., 2021; Hippisley-Cox et al., 2021). Conflicting findings about the impact of COVID-19 vaccines on cardiovascular events have been reported by a number of studies in this area. People believed that

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the COVID-19 immunization caused heart problems, even though a recent meta-analysis found no higher risk of heart attack, arrhythmia, or stroke after receiving the vaccine (Karimi et al., 2025). It is critical to address these claims, shed light on the actual cardiovascular impact of these vaccines, and relieve people's fears associated with them. A rational evaluation of the benefits of vaccination may be overshadowed by worries about the possible health hazards associated with it, which could lead to scepticism about vaccines during future pandemics. Therefore, it is crucial to respond to these allegations and give scientific justifications in order to ease concerns and restore public confidence in COVID-19 vaccinations (Karimi et al., 2025).

Along with these factors, the adverse effects of the media possessed a huge potential to induce fear about cardiac health and functioning. A large number of cardiac cases reported through the media contributed to the avoidance of such cues that remind the person about the debilitating effects of growing cardiac diseases (Eifert, 1992). Together, this fear and avoidance gradually resulted in the induction of cardiac anxiety in that person. On the other hand, the same media can be utilized for benefits. In individuals with HF, multimedia education together with the Teach-Back technique work well to improve the quality of life and lessen cardiac anxiety. Thus, it is advised that health authorities implement treatment programs using this media-based interventional approach (Mohammadi et al., 2021).

Another novel risk factor that emerged from this study is a few sets of situational and environmental factors. Certain situational cues in the environment can cause cardiac anxiety (Zvolensky et al., 2008). Participants reported that they

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observed a climatic influence and heightened cardiac anxiety during cold weather. This aligned with the psychophysiological understanding that cold weather induces cardiovascular and respiratory responses such as vasoconstriction, elevated blood pressure, and shivering that can mimic symptoms of cardiac distress. For individuals prone to cardiac anxiety, these bodily sensations were frequently misconstrued as life-threatening, triggering hypervigilance and panic responses. Therefore, cold climate may act not only as a physical trigger but also as a psychological cue reinforcing the cycle of cardiac anxiety. Additionally, certain situational triggers instantly caused the onset of cardiac anxiety among some individuals. A kind of distinct cardiac sensation, like perceived electrical stimulation on the chest, triggers fear about such sensations. Alarming smartwatch notifications about heart function also created sudden fear and apprehension about cardiac health and thereby lead to the experience of cardiac anxiety.

From a practical standpoint, individuals who frequently presented to emergency rooms and cardiology settings without organic pathology are likely to receive more suitable (psychological) treatment if cardiac anxiety and cardiophobic behaviors are identified early (Bouman & Visser, 1995). Hence, multi-dimensional risk factors of cardiac anxiety deepen the understanding of its etiology by highlighting its complexity and suggesting that it is influenced by various interacting factors rather than a single mechanism. These risk factors not only accentuated awareness of cardiac sensations but also disrupted adaptive coping, reinforcing a cycle of fear, avoidance, and physiological arousal. Understanding these interrelated factors is essential for developing targeted interventions that address the multiple dimensions of cardiac anxiety.

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The Dynamics of Resilience and Support

There is scant evidence in the literature that explicitly mentioned the different protective factors that reduce the intensity and severity of cardiac anxiety. These are the attributes or conditions that lessen the impact of the identified risk factors of cardiac anxiety and encourage positive outcomes. Various dimensions of protective factors have been identified in this study, including psychological factors, interpersonal support, digital health literacy, and reliance on scientific information about cardiac health and functioning.

Psychological factors were often identified as the essential protective factors that mitigate the intensity of cardiac anxiety. Individuals having internal locus of control think that they can influence their cardiac health outcomes (Rotter, 1966), tend to experience less cardiac anxiety, and have improved mental health outcomes. It can prevent the occurrence of cardiac anxiety to a certain extent. The research on the connection between locus of control and overall health-facilitating behavior suggested that internal locus of control is a mediating factor of actions taken to avert health issues (Carlisle-Frank, 1991; Lefcourt & Davidson-Katz, 1991). Internal locus of control was negatively correlated with anxiety (Sigurvinsdottir et al., 2020; Krampe et al., 2021) and overall psychological distress (Hovenkamp-Hermelink, 2019; Alat et al., 2021) in recent cross-sectional and longitudinal investigations, including adults. Additionally, early research indicated that the association between negative life events and feelings of psychological distress and anxiety was mitigated by high internal locus of control (Sandler & Lakey, 1982) and internal health locus of control (Hunter et al., 1984).

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Moreover, a sense of self-efficacy developed among the affected individuals due to their lifestyle modifications facilitated perceived behavioral control over the cardiac outcomes, which finally led to a reduction in cardiac anxiety. Individuals having high self-efficacy over their cardiac health are less likely to develop cardiac anxiety. It can be further explained in terms of cardiac self-efficacy, which is a cardiac-specific indicator of a patient's confidence in his/her ability to do tasks that may be impacted by CVD symptoms and problems (O'Neil et al., 2013). In light of their perceived susceptibility to CVD, this encouraged people to adopt healthy lifestyle choices by fostering a desire and readiness to do so (Breux-Shropshire et al., 2012). It has been demonstrated that a person's degree of dedication, effort, and persistence toward implementing recommended lifestyle changes is strongly influenced by their cardiac self-efficacy (Everett et al., 2009). A patient's attitude toward preserving a normal daily functioning and their capacity to manage symptoms are predictors of his/her ability to follow exercise and diet plans during the long-term recovery process from cardiovascular disease (Maeda et al., 2012)

Reflective thinking and health awareness can provide improvement in cardiac anxiety to a certain extent. Positive self-introspection can be a powerful tool in managing cardiac anxiety by fostering self-awareness, reducing negative thought patterns, and promoting healthy coping mechanisms (Kubzansky et al., 2018). By engaging in regular self-reflection and positive self-talk, individuals can learn to identify and challenge anxious thoughts related to their heart health, successfully resulted in reduced severity and frequency of cardiac anxiety symptoms. Intentional self-care behavior developed as a result of self-awareness

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improved the lifestyle of the participants, which reduced the perception of cardiac threats, and this reduced threat appraisal can lead to lesser cardiac anxiety. Similar to this, elements of positive psychological well-being, like optimism, have been recognised as positive health assets owing to their prospective association with improved CVD outcomes and the seven metrics of cardiovascular health (CVH) (Kubzansky et al., 2018). Consequently, they can indirectly lessen the severity of cardiac anxiety. The less perceived susceptibility to cardiac risks enhanced an individual's optimistic attitudes.

A proper and adequate health literacy played a pivotal role in lessening the effects of cardiac anxiety. Individuals with high cardiac-related health literacy have proper knowledge and awareness of the various risk factors that are dangerous to their cardiac health. Hence, they avoid such risk elements in their life and adopt a healthy lifestyle (Safeer et al., 2006; Alm-Roijer et al., 2004), that further reduces the severity of cardiac anxiety. This can protect them from cardiac anxiety. In this context, the positive influence of formal psychology education also facilitated improved health literacy among participants, which contributed to the proper management of cardiac anxiety. It provided individuals with a better knowledge of the psychological factors that can influence heart disease and the tools to cope with anxiety. Furthermore, interventions targeted to provide psychoeducation about the condition were crucial. One such intervention was the Teach-Back method in conjunction with multimedia instruction. The results showed that both multimedia education and multimedia education in conjunction with the teach-back method were highly efficient in lowering the intensity of cardiac anxiety and enhancing the quality of life for individuals with HF as

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compared to traditional strategies (Mohammadi et al., 2021). Furthermore, a multimedia educational intervention can help reduce cardiac anxiety, enhance the quality of life for individuals with HF, and ultimately reduce readmission rates (Boyde et al., 2018).

Relatedly, Informed and rational health engagement has an influential role in lessening the saddening effects of cardiac anxiety. Accessing cardiac-related health information from the health professional in the family and reliance on scientific literature and expert knowledge are important protective factors against cardiac anxiety. It helped in providing accurate symptom interpretation, reducing uncertainty and cognitive distortions, and counteracting the effects of misinformation. The presence of informed, trusted voices within the family enabled immediate clarification and reassurance, which preventing the escalation of fear. Together, these forms of informational support can enhance self-efficacy, reduce maladaptive coping, and disrupt the fear cycle associated with cardiac anxiety. Together with this, sufficient digital health literacy enabled them to critically assess the validity of information from social media or online platforms, reducing panic induced by external cues. Electronic health (eHealth) resources are a significant source of health information for cardiac medicine and care (Frederix et al., 2019). Studies have shown that cardiovascular risk, depression, anxiety, and cardiac events are negatively correlated with eHealth literacy (Lee et al., 2021). Recent findings showed a negative correlation between digital health literacy and health anxiety supported this notion. As digital health literacy increases, there is a significant decrease in health anxiety (Dağ et al., 2025).

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A crucial factor in the management of cardiac anxiety is interpersonal support, which includes social support and quality relationships. Since social isolation and low-quality relationships might damage outcomes and increase anxiety, strong social ties can help people recover from cardiac events and prevent anxiety (Dornelas et al., 2008). Limited social support, indicated with the quantity or quality of social contacts, has been linked to poor prognostication for heart patients, along with depression and anxiety in numerous studies. Initial CHD incidence and resultant mortality are predicted by low social support levels. The repercussions of the heart issues are mitigated by high amounts of social support. Death following a heart attack is predicted by lack of emotional support and isolation from the society. Studies show that family presence and involvement in care can reduce anxiety levels in individuals with heart conditions, particularly during acute care admissions (Bateman et al., 2016). The support from family and close friends can provide emotional support, practical assistance, open communication, etc. In essence, a supportive family can act as a buffer against the emotional and practical challenges associated with cardiac anxiety, promoting a more positive and manageable experience for the individual and their loved ones.

A unique protective factor identified by this study was the protective effect of gender-based perceptions of women in experiencing cardiac anxiety. They observed lower vulnerability to cardiac diseases due to the protective effect of female sex hormones such as estrogen. Female sex hormones result in a complex effect on the cardiovascular system, contributing to the gender differences in CVD. Compared to age-matched males and postmenopausal women, premenopausal women had a much less risk of CVD (Mendelsohn, 2002; Reckelhoff, 2001).

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According to Kannel and Wilson (1995), postmenopausal women are more likely to develop CVD than their premenopausal counterparts of the same age. However, the potential cardiovascular benefit of endogenous sex hormones is not consistent with the results of hormone therapy. Since all the females are adults in this study, they presume that they are in a safe zone. The deficiency of female sex hormones explained the increased cardiovascular risk in women, while the heterogeneity of postmenopausal hormone therapy efficacy may be related to factors such as initiation time, duration, administration route, formulation, and dosage (Kan et al., 2024).

The protective factors identified in this study indicate the prominence of psychological factors, accurate health knowledge, and supportive interpersonal environments in lessening the severity of cardiac anxiety. These protective elements not only mitigated symptom misunderstanding but also enhanced individuals' sense of control, self-efficacy, and coping ability, ultimately interrupting the cycle of fear and restoring a sense of safety and well-being.

Manifestations of an Internal Conflict

Cardiac anxiety can cause devastating consequences on the health, psychological well-being, and daily life functioning of individuals. The major consequence was reported as emotional or psychological distress and subsequent mental health issues among the affected individuals. This consists of several issues, including suicidality, negative emotional states such as anxious and depressive symptoms, stress, and death anxiety. It is true that negative emotion predominates in those with cardiac anxiety. Compared to normal controls, these

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people score noticeably higher on structured interviews and measures of anxiety and depression indices (Eifer, 1992). Furthermore, numerous researchers made it evident that individuals having higher levels of cardiac anxiety also have heightened psychological distress, including widespread anxiety and depression (Hamang et al., 2011; Pokrajac-Bulian et al., 2020; Hamang et al., 2012). Cardiac anxiety may increase mood sensitivity for depression and anxiety phenotypes by fortifying the perceptual basis for avoiding unpleasant internal inputs and catastrophic interpretations of heart-related symptoms (Mayorga et al., 2022). Simply stated, because heart-related events are viewed as aversive and harmful, cardiac anxiety can elicit an anxiety response, just like other psychological vulnerability dimensions. For instance, someone might think that palpitations or chest pain are a sign of a heart attack (a dangerous somatic consequence) and a sign of impending cardiac mortality (Eifert et al., 2000b). People may experience severe death anxiety as a result of this. According to a cross-sectional study of 184 people with acute coronary syndrome, those who thought their symptoms were caused by a heart attack did so out of fear of dying (Whitehead et al., 2005).

Furthermore, a healthy person does not learn that heart-related sensations from heavy physical activity do not indicate danger when cardiac anxiety contributes to avoidance. This perpetuates what Barlow (1988) calls a “vicious cycle” of psychological distress (Asmundson et al., 1999). The emergence of negative affect states is another way that elevated cardiac anxiety might contribute to elevated anxiety levels. People having heightened cardiac anxiety reported to experience more emotional distress (Eifert et al., 1999). “Response competition” may be aggravated by the correlation between cardiac anxiety and negative affect,

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which includes subjective pain, anxiety, and possibly depression over time. In other words, excessively unpleasant emotional reactions associated with heart sensations and functions may conflict with constructive or healthy behavior. As a result, attention is drawn to the emotional suffering rather than constructive substitute responses (Eifert et al., 2000b). Together, these can lead to suicidal thoughts among those distressed individuals (Mayorga et al., 2022).

Another commonly reported consequence is disturbed sleep quality. The current study identified a bidirectional relationship between sleep quality and cardiac anxiety. Constant anxiety and worrying can significantly influence the sleep patterns of people (Richardson et al., 2025), and such sleep impairments can lower the quality of sleep. Further, this may lead to a heightened risk of CVD through mechanisms like oxidative stress, vascular dysfunction, and poor blood pressure control. This cardiovascular risk perception can, in turn, trigger cardiac anxiety. Besides, cardiac anxiety coupled with emotional distress and impaired sleep quality results in perceived lower quality of life among individuals with high cardiac anxiety (Wedegärtner et al., 2020; Bunz et al., 2016; van Beek et al., 2012).

This study provided emphasis on certain physical sensations that accompany cardiac anxiety, such as cardiovascular symptoms, respiratory symptoms, neurological symptoms, and autonomic nervous system symptoms. The most typical symptoms include heart palpitations and tightness or discomfort in the chest. Sweating, a pounding in the neck, numbness, choking or suffocation symptoms, and irregular heartbeat are less frequent complaints (Zvolensky et al.,

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2008). Interoceptive and exteroceptive events often trigger these physical sensations, which usually happen suddenly and intensely. Heart palpitations, chest pain, hyperventilatory breathing, arrhythmias, increased tension (especially in the intercostal muscles), and an inability to relax are physiological indicators of cardiac anxiety, according to another study. People may also experience sweating, parasthesias, dizziness, and breathlessness during an episode of acute chest pain (Beck et al., 1990). People with elevated cardiac anxiety may become more aware of stress-related physiological reactions, like palpitations or a fast heartbeat (Hill et al., 2017). According to White et al. (2010), this increased awareness may intensify the body's stress response, resulting in more severe anxiety, depression, and exhausting symptoms. Due to their maladaptive health-related attitudes and increased interoceptive awareness, these individuals frequently report distressing physical symptoms such as palpitations or chest discomfort without organic cardiac findings (Rashid et al., 2025). Symptoms such as chest tightness, palpitations, and precordial discomfort are very similar to actual cardiac conditions but are caused mainly by anxiety (Wang et al., 2025). Particularly, heart sensations and chest pain are misconstrued as signs of heart issues, and during an acute episode of chest pain, people may experience severe anxiety of dying from a heart attack (Rashid et al., 2025). Awareness about these presentations is vital for early identification and management, particularly given their potential to mimic acute cardiac events and significantly impact daily functioning (Rashid et al., 2025)

Higher cardiac anxiety can cause significant functional impairments in the lives of individuals (Eifert et al, 1996; Rashid et al., 2025). It is understood from this study that cardiac anxiety can impair different domains of life, such as

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personal, interpersonal, academic, occupational, and social life. Heart-focused sensations are often overrated and interpreted as potentially fatal by these people (Hayward et al., 2000). Diagnostic uncertainty caused by cardiac anxiety gradually leads to intolerance of uncertainty, which can lead to impairments in routine functioning (Buhr & Dugas, 2002). Various issues that make personal life miserable are constant sadness, unrealized personal goals owing to procrastination, etc.

Additionally, in terms of interpersonal level, issues with family members, peers, and sexual life issues (Eifert, 1991) occur due to a high level of cardiac anxiety. Communication issues with family members further hamper the family dynamics. Since the majority of the participants are university students, cardiac anxiety significantly caused problems in their academic life in terms of reduced concentration, academic procrastination, difficulties in managing various academic responsibilities, exam-related issues, etc.

In addition to causing personal suffering, persistent chest pain, ongoing anxiety, and an ongoing obsession with heart function can have a disastrous impact on a person's social and professional life (Eifert et al., 2000b). Research indicated that cardioprotective avoidance behavior linked to cardiac anxiety may also negatively impact the affected persons' social networks and performance at work (van Ittersum et al., 2003; Belardinelli et al., 1999). Patients often persist in believing they have a heart condition, seek medical attention for their cardiac symptoms, and endure chronic impairment in daily functioning and long-term unemployment despite a large number of negative medical test results (Ockene et

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al., 1980; Potts & Bass, 1993). Further, work procrastination, frequent absenteeism, lack of concentration, and confidence in doing work tasks result in impaired work satisfaction, which seriously affects their occupational life. High cardiac anxiety contributed to social isolation (Sharif-Nia et al., 2025) and withdrawal, which significantly affected the social functioning of individuals. Hence, cardiac anxiety is a serious concern that has the potential to impair the daily functioning of various life domains. Hence, proper management of cardiac anxiety is crucial.

Health professionals can provide information on how routine activities are safe to deal with the functional limitations of daily life. Since avoiding everyday activities can interfere with social and professional functioning if it worsens, it might be crucial to stop a vicious cycle for the patients (Eifert et al., 2000b). Understanding the consequences of cardiac anxiety is vital for guiding timely referrals for psychological evaluation and appropriate intervention. Increased awareness of outcomes helps not only in clarifying the clinical presentation of cardiac anxiety but also in distinguishing it from purely physiological cardiac conditions. Importantly, exploring the multidimensional consequences offered a holistic view of how this anxiety disrupted various domains of daily functioning. This comprehensive understanding is essential for designing targeted, psychosocial interventions that focus on the diverse goals of individuals affected by cardiac anxiety and ultimately enhance their quality of life and overall well-being.

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Management strategies of cardiac anxiety

According to Eifert and colleagues (2000), anxiety associated with the heart can cause disturbances in social and personal functioning, as well as harmful emotional costs of worry. Identifying a practical strategy to lessen the impact of cardiac anxiety among those who have no significant organic cardiac disease is quintessential. Despite the absence of cardiac pathology, individuals experience distress comparable to clinical cardiac patients. Early psychological screening and integrated mental health care are essential for effective management (Rashid et al., 2025). The study highlighted various methods used by the affected individuals to deal with their distress related to cardiac anxiety. All these are adaptive self-regulatory coping strategies adopted by the participants, including health-oriented lifestyle modifications, stress management techniques, psychological techniques, engagement in recreational and digital activities, social support, and religious and spirituality-based strategies. Both emotion-focused and problem-focused coping methods (Lazarus & Folkman, 1984) were used by the participants. A few participants reported certain maladaptive and destructive coping mechanisms to deal with cardiac anxiety.

Changes in lifestyle have become increasingly recognised as important interventions in the management and prevention of CVD (Ghodeshwar et al., 2023), and they can lower a number of risk factors associated with these conditions (Sharifi-Rad et al., 2020). Changing one's lifestyle can change the threats associated with CVD. These risk factors are directly addressed by lifestyle adaptations such as exercising frequently, having a balanced diet, controlling

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stress, giving up smoking, and keeping a healthy weight. By addressing adaptable risk factors, people can significantly reduce their risk of CVDs (Rippe et al., 2019). According to Aggarwal et al. (2018), such modifications have a cumulative impact on heart health, resulting in long-lasting improvements and a reduced chance of negative outcomes. Thus, adopting healthy lifestyle modifications has a potential impact on reducing the vulnerability to cardiac diseases, which in turn can reduce the effect of cardiac anxiety.

Regular exercise is a very crucial factor that significantly lowers the risk of CVDs. One of the major risk factors for CVD is high blood pressure, which can be reduced with constant physical activity. Both systolic and diastolic blood pressure can drop when aerobic workouts like jogging, cycling, swimming, or brisk walking are performed. By improving the efficiency of the heart and blood vessels, it lowers the strain on the cardiovascular system (Nystoriak et al., 2018). In addition to being good for the heart in healthy individuals, moderate exercise also protects the heart in diseased conditions. Nevertheless, little is known about the molecular processes that underlie exercise's cardioprotective benefits. Changes in the epigenetic system, including DNA methylation, histone changes, and non-coding RNA synthesis, are crucial for preserving heart health and preventing heart disease, according to a growing body of research. Exercise is a powerful epigenetic modulator that activates biological signals linked to cardiovascular health and directly and permanently alters genes. There is a way to create genetic impacts through behavioral treatments because these changes can be altered by outside factors like physical exercise and may even be passed on to children (Sun et al., 2025).

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Regular exercise aids in regulating a healthy body weight and aids in weight management. Since obesity is a main threat to CVDs, exercising to lose excess weight or prevent weight gain might help prevent CVDs, stroke, and type 2 diabetes (Cercato & Fonseca, 2019). Regular exercise improves mental health, reduces stress, and helps control psychosocial factors that increase the risk of cardiovascular disease. A good way to handle stress is by physical activity, as high levels of stress can have a damaging effect on cardiovascular health (Franklin et al., 2021). These potential benefits of physical activity highlight the importance of promoting regular physical activities or exercise instead of avoiding physical activities, thinking that it can trigger adverse consequences to cardiac health, which finally contributes to cardiac anxiety.

Furthermore, it is becoming increasingly acknowledged that sleep has a major role in the onset of CVD. The "Life's Essential Eight" framework of optimal cardiovascular health includes sleep length, according to recent American Heart Association guidelines (Amin et al., 2024). Since cardiac anxiety is causing impaired sleep, keeping a healthy sleep routine can reduce the impact of cardiac anxiety.

The incidence of CVD is affected by a number of modifiable lifestyle factors, like diet, smoking, physical activity, and alcohol use. Of these, diet is one of the most significant (Zhang et al., 2021; O'Connor et al., 2020; Li et al., 2021). In order to lower cardiovascular risk, a heart-healthy diet is essential (Ghodeshwar et al., 2023). The Mediterranean diet is linked to a lower risk of CVD; altering dietary habits is essential for preventing CVDs, particularly heart attacks

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(Martínez-González et al., 2019; Estruch et al., 2020). Numerous dietary factors have been linked to millions of deaths from CVDs worldwide, with the most common being a high intake of salt and a poor intake of fruits, whole grains, vegetables, nuts, and seeds.

In order to change dietary habits and avoid health issues, education is crucial (Wadden et al., 2020). The most profound educational initiatives are grounded in behavior change models and theory-based methodologies (Joveini et al., 2022). One of the most popular models for changing health-related behavior is the Health Belief Model (HBM), which is frequently applied to disease prevention (Jose et al., 2021). The elements of health belief models, such as perceived benefits, cues to action, and self-efficacy, have a significant impact on participants' lifestyle changes for lowering their risk of heart attacks and, consequently, their anxiety levels. There are synergistic effects on cardiovascular health when several good habits are combined. These lifestyle adjustments should be sustained over time in order to reap the greatest benefits (Ghodeshwar et al., 2023).

Stress management and other psychological techniques have been widely adopted by people to deal with the distress associated with cardiac anxiety. Cardiovascular health is further complicated by stress brought on by cardiac anxiety. Chronic stress has a major role in the origin and progression of CVDs by triggering the sympathetic nervous system, which leads to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, alterations in platelet function and blood coagulation, and a state of chronic inflammation. It has an impact on sleep and leads to psychological problems like anxiety, depression, and social isolation.

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It is noteworthy mind that chronic stress can exacerbate the effects of other risk factors on cardiovascular health, such as genetics, obesity and smoking. Relaxation methods like deep breathing exercises and meditation, social and interpersonal support, regular physical activity, and getting expert assistance are all examples of effective stress management strategies that can lessen the negative consequences of ongoing stress on cardiovascular health. (Chinnaiyan et al., 2019).

Countless stress-reduction strategies, including regular exercise, relaxation techniques, support networks, and establishing and sustaining strong social ties, have been demonstrated to improve cardiovascular health. It is crucial to remember that each person may respond differently to these methods, so it could be helpful to try a variety of strategies to see what suits them best (Rainforth et al., 2007). Additionally, participants in the present study reported that using techniques like distraction activities, journaling, positive self-affirmations, and ultimately accepting the condition found it useful for them to manage the distressing effects of cardiac anxiety better. Positive affirmation has been found to improve psychological well-being by enhancing self-esteem, promoting positive thinking, and reducing negative emotions such as stress, anxiety, and depression (Thulasi & Vasantha, 2024) associated with cardiac anxiety.

Distraction techniques can be helpful for managing cardiac anxiety by shifting focus away from racing thoughts and physical sensations associated with anxiety. These techniques involve engaging in activities that occupy the mind and senses, providing a temporary reprieve from anxiety symptoms. One of the main distraction activities adopted by the participants is known as the five senses

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technique. It is also known as the 5-4-3-2-1 grounding technique, a mindfulness exercise that aids in redirecting attention from distressing thoughts and emotions by focusing on the present moment using your five senses (Sato et al., 2013). Other examples of distraction activities reported by the participants include sensory distractions such as listening to calming music, watching movies, and YouTube videos. Moreover, acceptance of the condition is crucial for managing cardiac anxiety, which is the fear of heart problems. Acceptance involves acknowledging the issue and understanding the potential effect of the condition on one's life. Accepting the condition, seeking professional help, and engaging in healthy coping mechanisms can help reduce anxiety and enhance general well-being (Piotrkowska et al., 2021).

Additionally, faith-based and spiritual coping was perceived to be effective in providing some sort of relaxation to the individuals distressed by cardiac anxiety. Religious belief enhancement through trust in divine control and following religious rituals and practices is found to be effective for some participants and provides some mediation power. Further, reliance on spirituality also resulted in perceived relaxation from cardiac anxiety. Studies suggest that spirituality can influence the autonomic nervous system activity, potentially leading to a decrease in sympathetic nervous system activity (associated with stress and anxiety) and an increase in parasympathetic activity (associated with relaxation). This shift in autonomic balance can be a factor in improving health outcomes and potentially mitigating the anxiety associated with heart conditions. Moreover, spirituality can provide a sense of meaning and purpose, helping

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individuals to manage the emotional and psychological issues of heart disease, including anxiety (American College of Cardiology, 2022).

Avoidance of cardio-triggering activities is the management strategy that is used by the majority of individuals with cardiac anxiety. The study revealed that the participants tend to avoid any activities that they see to be triggering cardiac sensations. Hence, they avoid receiving information related to the growing prevalence of cardiac cases and death. Also, they avoid physical activities and exposure to social events and gatherings that trigger their anxiety concerns. There is extensive literature explaining about cardio-protective avoidance behavior of individuals with severe cardiac anxiety. Cardioprotective behavior causes pain and distress to be temporarily but immediately delayed (i.e., avoided) or reduced (escaped). Physical endurance and strength are likely to deteriorate further with time as a result of decreased cardiac-related activities, especially physical exercise. (Eifert et al., 2000b). Self-reported physical health, exercise capacity, and physical activity are all negatively impacted by this type of avoidance, especially when it comes to heart-related issues. The necessity of cardiac anxiety for psycho-cardiological therapy is highlighted by its possible negative predictive value for physical health and physical activity (Schmitz et al., 2022).

Heart-focused sensations are often overrated and interpreted as potentially fatal by those with greater levels of cardiac anxiety. As a result, individuals tend to avoid activities (like physical exercise) that cause cardiopulmonary symptoms because they are afraid of unpleasant cardiac feelings (Eifert et al., 2000b; Kukić & Pokrajac-Bulian, 2022). Additionally, because they are more concerned with

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their heart and may be afraid of putting too much strain on it, people who have cardiac anxiety avoid everyday tasks and use needless medical assistance to reduce their anxiety (Hinkle, 2014). A person's perceived health may predict their cardiac anxiety (Yartz, 2005), which can affect their decision to exercise, even while it does not directly predict their cardiac activities (Heo, 2008).

Interestingly, avoidance is also substantially associated with greater levels of general depression and anxiety, suggesting that avoidance is more than just an adaptive coping reaction, whether it is thought of as a preventive measure or an adaptive coping response. Consequently, avoidance may be a part of a psychological process that has a significant impact on the onset of depression and anxiety in addition to being linked to lower patient-reported physical health (Hamang et al., 2011).

In order to help people who have a strong tendency to avoid situations or activities that they think could cause cardiac symptoms manage their physical inactivity by increasing their physical activity and thereby lowering psychological distress, recent research suggests that psychological interventions that target cardiac anxiety may be more effective (Eriksson-Liebon et al., 2023). Finding individuals whose inactivity stems from cardiac anxiety and who may benefit from psychological intervention is crucial because physical exercise is crucial for preserving heart health (Wolf & Hopko et al., 2008).

Furthermore, while to a lesser degree than those with panic disorder and agoraphobia, those with severe cardiac anxiety do flee or avoid settings when symptoms arise (Beck et al., 1990). Therefore, those who suffer from cardiac

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anxiety attempt to stay away from cardiac-related news, films, conversations, and social gatherings because they think these things may trigger the dreaded physical symptoms. Recurrent discomfort and anxiety attacks are feared by people with cardiac anxiety because of the potential and actual negative social repercussions (Eifert, 1992). Their health-related quality of life is negatively impacted by cardiac anxiety that causes them to avoid social situations (Mourad et al., 2013; Leise et al., 2010; Mourad et al., 2020; Tremblay et al., 2018).

Help seeking and reassurance seeking from medical professionals is another strategy to manage the distressing effects of cardiac anxiety. Since cardiac anxiety is commonly present in both individuals with and without any cardiac diseases, Individuals not having a diagnosed cardiac disease gave heightened attention to and fear about their cardiac sensations due to fear of having a cardiac event. This leads to an increased use of healthcare facilities (Tremblay et al., 2018; Mourad et al., 2016; Marker et al., 2008). Since this psychosomatic condition is associated with significant anxiety, depression, and somatic complaints, it often leads to increased medical consultations (Rashid et al., 2025). However, in those who are not physically ill, cardiac anxiety can often lead to expensive cycles of seeking reassurance (needless doctor visits, medical exams), which are then followed by more concern and anxiety (Aikens et al., 1999). Due to the fear of negative consequences from misinterpreting benign cardiac symptoms, such as palpitations or angina pectoris, individuals who are unable to work and use professional help excessively, including frequent doctor consultations, also known as "doctor shopping", need more medical examinations, specialist referrals, and costly laboratory tests (Eifert et al., 2000b). These factors raise the costs for

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society and the health care system. Most people still experience chest pain and worry that they may have a significant cardiac condition, even after being reassured by medical personnel (Bunz et al., 2016; van Beek et al., 2012). This is because, at most, the comfort only temporarily reduces the worry, but it also probably acts as negative reinforcement, which could make the situation worse (Neal & Morley, 1999; Quigley et al., 2018).

In order to make sure that no oddities have been overlooked, it is further indicated that cardiac anxiety can lead to frequent doctor's appointments and ongoing demands for physical tests, which can ultimately result in invasive diagnostic treatments (Fischer et al., 2012). Despite not having a diagnosis of any organic heart pathology, people in this particular category feel that something is wrong (as evidenced by the symptoms that led them to the emergency room). These diagnostic ambivalences might worsen the situation since these people feel physically upset but are confused if this suffering is due to a medical illness; they also feel powerless. These problems are caused by elevated cardiac anxiety, and the ensuing medical attention and uncertainty around the diagnosis may raise awareness of heart symptoms, which in turn causes elevated cardiac anxiety (van Beek et al., 2014).

Moreover, because people are seeking reassurance from health professionals for common alterations in their heart function, cardiac anxiety poses an equal challenge to healthcare professionals. A reduced quality of life for the impacted patients, costly diagnoses and treatments, medically unnecessary emergency department visits, and provider burden might result from this (Marker

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et al., 2008; Israel et al., 2017). It implies that medical practitioners may reduce the overuse of the healthcare system that is common among people who have cardiac-related fears in the absence of CHD by educating patients about symptoms and assisting them in distinguishing between anxiety and cardiac symptoms (Marker et al., 2008).

Besides, a few defective lifestyle-related coping techniques were used by a limited number of participants by engaging in health risk behaviors. This belief pattern (perceived susceptibility, cognitive distortion) contributed to smoking and unhealthy forms of eating, thereby wearing away adaptive coping. This can temporarily reduce cardiac anxiety but ultimately exacerbate it and act as a threat to CVD. Smoking is considered to be used for negative affect reduction by individuals, which can give temporary relief, but it can lead to harmful effects on them by causing several health complications. Nicotine in cigarettes can temporarily ease stress and anxiety, but it is a major risk factor for cardiac issues and increases anxiety in the long run (Benowitz & Burbank, 2016). A few participants reported that excessive cardiac anxiety resulted in smoking addiction among them. According to earlier research, anxiety seems to be linked to unhealthy habits like smoking (van Beek et al., 2016). Regarding smoking motivations, smoking for negative affect reduction motives was incrementally predicted by both subjective physical health and cardiac anxiety. In particular, daily smokers who experienced higher levels of cardiac anxiety expressed a higher expectation that smoking would lessen negative emotions (Leyro et al., 2010).

Comfort foods high in fat, sugar, and salt can trigger feel-good hormones, providing temporary relief from stress. An unhealthy form of overeating can lead

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to weight gain, diabetes, and heart disease, all of which are linked to anxiety and stress (Sheehan & Herman et al., 2015). Emotional eating, which is defined as the tendency to eat in reaction to feelings, can be used to explain it. It is regarded as one of the main risk factors for persistent weight gain. Due to excessive energy consumption, such overeating can have an impact on mental and overall health (Dakanalis et al., 2023). The participants reported that despite knowing the fact that it is unhealthy, they overeat heavily to reduce the stress associated with cardiac anxiety. It suggested the notion that, according to the health belief model, education improves perceived severity and perceived susceptibility, but if self-efficacy and perceived barriers (like emotional reliance on food) are not addressed, change is unlikely. It can also be substantiated by the theory of planned behavior, that even with positive attitudes toward healthy eating, lack of perceived control (e.g., "I can't help it when I'm anxious and stressed") disrupts intention-behavior alignment.

Treatment of cardiac anxiety usually involves a combination of psychotherapy and medication. Existing literature that explicitly mentions self-management strategies of cardiac anxiety is limited. The present study provided insights into both adaptive and dysfunctional coping strategies to deal with cardiac anxiety. Although maladaptive coping strategies can give temporary relief, they can cause negative impacts in the long run. Hence, it is crucial for affected individuals to use adaptive self-regulatory coping strategies to manage the distress associated with cardiac anxiety and also help in cardiac risk prevention.

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Appendix A**Informed Consent Form****CENTRAL UNIVERSITY OF KARNATAKA
SCHOOL OF SOCIAL AND BEHAVIOURAL SCIENCES
DEPARTMENT OF PSYCHOLOGY****Informed Consent Form**

I, Ms. Sruthi K S, a PhD scholar at the Department of Psychology, School of Social and Behavioral Sciences, Central University of Karnataka, am conducting my study under the guidance of Prof. Romate John, Professor. The title of the present study is, 'Exploring the psychological factors associated with cardiac anxiety among adults' and the study focuses on exploring the factors influencing and consequences of cardiac anxiety among adults.

If you agree to participate in the study, you would be required to answer some questions where you can express your opinions, thoughts, experiences, and ideas about the topic in discussion. There are no right or wrong answers for anything you would tell in the interview. It is an attempt to understand your views and experiences of cardiac anxiety and related aspects. To aid the process of data analysis of this study, the session will be audio-recorded with your consent and would remain in possession of the researcher.

Since the study is not funded by any agency, no monetary benefits would be given for the participation. However, the findings will add further understanding to the field of Psychology in understanding cardiac anxiety. The interview may not take more than an hour and any experience that you share or any information that you provide will remain confidential. The results of this research study may be presented at scientific meetings or in publications; however, your identity would not disclose at any place. During the course of involvement, you are free to withdraw from the study at any point of time. You are free to contact the researcher

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at Phone: 9605520473 or Mail ID: 22dppsy03@cuk.ac.in to clear any of your doubts.

Thank you for your participation.

Statement of Consent:

I have read the above information. I have asked any questions I had regarding the study procedure and these have been answered to my satisfaction. I,

Mr./Ms. _____, consent myself to participate in this study.

Signature of the participant with date

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY**Appendix B****Socio-demographic Details of the Participant**

1. Do you consent (agree) to participate in this study: Yes/No
2. Name/Initials
3. Contact number
4. Email
5. Age and date of birth
6. Gender
7. Permanent residence: Urban/ Semi-urban/ Rural area
8. Religion
9. Education (Course name & year/semester)
10. Name of the institution
11. State & District
12. Are you diagnosed with any heart-related diseases? If yes, name the disease?
13. Did anyone in your family have any heart-related disease? If yes, who is diagnosed with the heart disease and what is the diagnosis?
14. Have you been diagnosed with any psychiatric or psychological disorders? If yes, specify the disorder
15. Are you taking any treatment for any psychiatric or psychological disorders?
16. Have you been diagnosed with any physical illness other than cardiac diseases?

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Appendix C

Cardiac Anxiety Questionnaire (Eifert et al., 2000)

This tool is to measure cardiac anxiety of the individual which consisted of 18 questions. You can rate your answer on a 5-point scale, which includes never, rarely, sometimes, often, and always. Please read each question and mark the box by the one option that best describes how things have been for you.

Sl. No.	Items	0	1	2	3	4
1	I pay attention to my heartbeat					
2	I avoid physical exertion					
3	My racing heart wakes me up at night					
4	Chest pain/discomfort wakes me up at night					
5	I take it easy as much as possible					
6	I check my pulse					
7	I avoid exercise or other physical work					
8	I can feel my heart in my chest					
9	I avoid activities that make my heart beat faster					
10	If tests come out normal, I still worry about my heart					
11	I feel safe being around a hospital, physician or other medical facility					
12	I avoid activities that make me sweat					
13	I worry that doctors do not believe my symptoms are real					
14	When I have chest discomfort or when my heart is beating fast, I worry that I may have a heart attack					
15	When I have chest discomfort or when my heart is beating fast, I have difficulty concentrating on anything else					
16	When I have chest discomfort or when my heart is beating fast, I get frightened					
17	When I have chest discomfort or when my heart is beating fast, I like to be checked out by a doctor					
18	When I have chest discomfort or when my heart is beating fast, I tell my family or friends					

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Appendix D

Depression Anxiety Stress Scales – Short Form (DASS-21) (Lovibond & Lovibond, 1995)

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0= Did not apply to me at all, 1= Applied to me to some degree, or some of the time, 2=Applied to me to a considerable degree or a good part of time, 3= Applied to me very much or most of the time

Sl. No.	Items	0	1	2	3
1	I found it hard to wind down				
2	I was aware of dryness of my mouth				
3	I couldn't seem to experience any positive feeling at all				
4	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)				
5	I found it difficult to work up the initiative to do things				
6	I tended to over-react to situations				
7	I experienced trembling (e.g. in the hands)				
8	I felt that I was using a lot of nervous energy				
9	I was worried about situations in which I might panic and make a fool of myself				
10	I felt that I had nothing to look forward to				
11	I found myself getting agitated				
12	I found it difficult to relax				
13	I felt down-hearted and blue				
14	I was intolerant of anything that kept me from getting on with what I was doing				
15	I felt I was close to panic				
16	I was unable to become enthusiastic about anything				
17	I felt I wasn't worth much as a person				
18	I felt that I was rather touch				
19	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)				
20	I felt scared without any good reason				
21	I felt that life was meaningless				

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Appendix E

State Trait Anxiety Inventory (Spielberger et al., 1983)

Read each statement and select the appropriate response to indicate how you feel right now, that is, at this very moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1= Not at all, 2=A little, 3= Somewhat, 4= Very much so

Sl. No.	Items	1	2	3	4
1	I feel calm				
2	I feel secure				
3	I feel tense				
4	I feel strained				
5	I feel at ease				
6	I feel upset				
7	I am presently worrying over possible misfortunes				
8	I feel satisfied				
9	I feel frightened				
10	I feel uncomfortable				
11	I feel self confident				
12	I feel nervous				
13	I feel jittery				
14	I feel indecisive				
15	I am relaxed				
16	I feel content				
17	I feel worried				
18	I feel confused				
19	I feel steady				
20	I feel pleasant				

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY**Appendix F****Interview Schedule****Introduction**

Dear Sir/Madam,

I am Sruthi K S, a Ph.D. scholar from the Department of Psychology, School of Social and Behavioural Sciences, Central University of Karnataka, India. As part of my research on the factors influencing cardiac anxiety among adults, I would like to invite you to participate in this study by responding to a set of questions designed to provide valuable insights into this topic.

Your participation is completely voluntary, and I assure you that all information shared will remain strictly confidential and will be used solely for academic research purposes.

Instructions

I kindly request you to respond openly and honestly to each question, drawing from your personal experiences and thoughts. There are no right or wrong answers; what truly matters is your perspective and how you feel about the topics being discussed.

Your participation is crucial to the success of this study, and I sincerely appreciate your willingness to contribute. Should you have any questions or need further clarification about the research, please feel free to contact me at any time.

Thank you for your time and valuable input.

Sincerely,

Sruthi K S

Ph.D. Scholar

Department of Psychology

School of Social and Behavioural Sciences

Central University of Karnataka, India

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY**Part I: Socio-Demographic Details**

1. Name (optional):
2. Sex(please tick):
 - Male
 - Female
 - Non-binary/Other (please specify): _____
3. Date of Birth – DD/MM/YYYY
4. Educational Qualification
(Please specify the highest level of education completed): _____
5. Occupation Details:
 - Current Occupation: _____
 - Designation: _____
 - Total Duration of Service (in years and months): _____
 - Previous Occupations (if applicable): _____
6. Monthly Income (in INR):
 - <10,000
 - 10,000–30,000
 - 30,000–50,000
 - 50,000–1,00,000
 - >1,00,000
7. Religion (please tick):
 - Hindu
 - Islam
 - Christian
 - Sikh
 - Buddhist
 - Other (please specify): _____
8. Marital Status (please tick):
 - Unmarried
 - Married
 - Cohabiting
 - Separated
 - Divorced
 - Widowed

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

9. Permanent Residence (please tick):

- Urban
- Semi-Urban
- Rural

10. Place of Living & Total Duration:

- Current place of residence: _____
- Duration of stay (in years and months): _____

11. State & District of Residence:

- State: _____
- District: _____

12. Perceived Socio-Economic Status:

- Family's income
- Level of education of head of household
- Occupation of head of household

13. Health Awareness:

Are you aware of the following health parameters (based on lab reports or medical check-ups)?

- Height: _____ cm
- Weight: _____ kg
- Blood Pressure: _____
- Blood Sugar: _____
- Cholesterol: _____
- Haemoglobin (Hb): _____

14. History of Major Ailments (other than heart disease):

- Yes (please specify): _____
- No

15. Treatment History:

Are you undergoing, have undergone, or planning any medical treatment or check-ups?

- Yes (please specify): _____
- No

16. Diagnosis of Heart-Related Diseases:

- Yes
- No

If Yes:

- Name of the Disease: _____
- Treatment Received: _____

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

17. Family History of Heart-Related Diseases:

Yes

No

If Yes:

Relationship to Diagnosed Person: _____

Diagnosis: _____

Treatment History (if known): _____

18. Additional Details on Treatment (if any):

Current Treatment (if applicable): _____

Past Treatment (if applicable): _____

19. Other Relevant Health Information (if any):

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY**Part-2****Questions for the interview**

- 1. How would you describe your overall health, specifically regarding your heart health (e.g., blood pressure, cholesterol levels)?**
- 2. Have you ever experienced anxiety or worry related to your heart health? (Yes/No)**
- 3. What is your understanding of cardiac anxiety?**
Probing Questions
 - a. Can you share your experiences with cardiac-related health concerns or anxiety?
 - b. Are there specific situations (e.g., exercise, stress) that make you more aware of your heart?
 - c. Are you aware of variations in your heartbeat?
 - d. Do you notice subtle physical changes (e.g., heart rate, blood pressure)?
 - e. How often do you feel anxious about your heart health, and how long does the anxiety last?
- 4. What do you think contributes to your anxiety about your heart health?**
Probing Questions
 - a. Family history or related factors
 - b. Medical history
 - c. Personal experiences, traumatic events, or lifestyle factors
 - d. Influence of social media or other external sources (e.g., WhatsApp, articles, videos), googling
 - e. How do you perceive your risk of cardiac events like a heart attack or stroke?
- 5. What physical changes or symptoms do you notice when experiencing cardiac anxiety?**
Probing Questions
 - a. Palpitations, chest pain, or shortness of breath
 - b. Do physical health issues contribute to your anxiety or stress your heart?
- 6. Can you describe your thoughts when you experience cardiac anxiety?**
Probing Questions
 - a. Do you experience intrusive thoughts or persistent worries about your heart?

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

- b. Do you ruminate on cardiac concerns or find it hard to distract yourself?

7. How would you describe your emotional state when experiencing cardiac anxiety?**8. How has cardiac anxiety affected your daily life?****Probing Questions**

- a. Impact on personal, social, or work life
- b. Effect on mental health, QOL
- c. Adjustments in diet, sleep, exercise, or social habits

9. How do you usually cope with anxiety related to your heart health?**Probing Questions**

- a. What strategies do you use to manage cardiac anxiety?
- b. Do you feel capable of making lifestyle changes to reduce your anxiety?
- c. Do you fear losing control or being unable to cope with symptoms?

10. How do your family and friends respond when you share your concerns about your heart?**Probing Question**

- a. How do you manage work or family responsibilities while experiencing cardiac anxiety?

11. What have been your experiences with healthcare providers regarding cardiac anxiety?**Probing Questions**

- a. Have you faced any barriers to getting adequate care?
- b. Do you delay medical appointments or procedures due to anxiety?

12. What are your biggest fears about your heart health?**Probing Question**

- a. Do you worry about having a heart attack or sudden cardiac death?

13. How has COVID-19 influenced your cardiac anxiety, if at all?

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

Appendix G

Thematic Analysis Table with Overarching Themes, Themes, Sub-themes and Codes

Sl. No.	Overarching theme	Themes	Sub-themes	Codes
1	The Unfolding of Cardiac Anxiety	Fragile Sense of Bodily Trust	Health perceptions & cognitive distortions	Perceived susceptibility of cardiac diseases and deaths Lack of sense of control Negative automatic thoughts
			Emotional distress	Grief and emotional loss Feeling of loneliness Self-reported anxiety Stress Health anxiety/illness: anxiety Distressed past traumatic experience: Fear of getting cardiac diseases and death
			Limited health literacy	Lack of awareness Misconceptions Superstitious beliefs
			Hypervigilance towards cardiac sensations	Use of health-monitoring devices
			Symptom validation struggle	Perceived dismissal of symptoms Distress over lack of symptom recognition

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

Lifestyle Patterns that Amplify Vulnerability	Unhealthy lifestyle	Sedentary lifestyle Overweight or obesity Unhealthy dietary habits
	Perceived danger in physical exertion	Engagement in heavy physical activities
Relational Worlds that Shape Anxiety	Family influence on health beliefs and emotional regulation	Influence of parenting and early upbringing Repeated cardiac-related discussions during family gatherings Family restrictions in emotional expressions
	Lack of emotional and informational support	Non-supportive family Knowledge gaps in family Peer comparison and judgement Negative prior experience of sharing with friends
Embodied Vulnerabilities	Genetic predisposition	Family history of cardiac diseases and deaths
	Physical health issues	Influence of cardiac risk factors among family Chest pain and musculoskeletal issues

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

				Issues of gastritis Variations in heartbeat
			Post-COVID cardiac vigilance	Fear from controversial vaccine related information Perceived post- COVID health complications
		Information that Harms Rather than Helps	Cardiac death cases in newspapers Distressing cardiac content on social media Googling symptoms	
		Environments and Moments that Spark Fear	Environmental factors	Influence of climate change After effects of environmental shifts High sensitivity to sound/sensory input
			Instant triggers	Distinct cardiac sensations Alarming Smartwatch notifications
2	The Dynamics of Resilience and Support	Psychological Resources for Resilience	Perceived control and self-efficacy Reflective thinking and health awareness	Internal locus of control Sense of self-efficacy Positive self- introspection Positive influence of formal psychology education Health literacy Self-awareness and intentional self-care

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

		Optimistic belief system	Positive beliefs Less perceived vulnerability to cardiac threats
	Informed and Rational Health Engagement	Reliance on scientific and medical expertise	Access to health professionals within the family Reliance on scientific literature and expert knowledge
		Digital health literacy	Critical awareness of misinformation and fake content Checking genuineness of cardiac-related sources and content creators Awareness of online exaggeration and sensationalism Positive influence of social media
	Supportive Interpersonal Networks	Family support Open sharing with family/friends and reassurance seeking	
	Gender-Based Perceptions	Secure home environment Perceived lower vulnerability among women	
3	Manifestations of Internal Conflict	Psychological Toll: Living on Mental High Alert	Emotional Distress and Mental Health Impact Suicidal thoughts

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

		Negative emotional states Death anxiety
	Diminished Psychological Vitality	Impaired quality of life Impaired sleep quality
Functional Impairment in Life Domains	Erosion of Daily Role Functioning	Persistent sadness Unrealized Goals and Emotional Impact of Procrastination Lack of concentration on studies Academic procrastination Sleeping issues during exam season Wasting study time Difficulty in managing academic responsibilities Issues with studying and exams preparations Wastage of time at work Difficulty in managing the work tasks Frequent absenteeism at the workplace Lack of confidence in doing tasks Lack of concentration on tasks Work procrastination Reduced job satisfaction

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

	Strain on Social and Relational Engagement	<p>Reduced social interactions</p> <p>Social withdrawal</p> <p>Family life issues</p> <p>Sexual life issues</p> <p>Peer relationship issues</p> <p>Communication issues</p> <p>Issues with household activities</p> <p>Restricted interactions with family members</p>
Anxiety's Effect on the Body	<p>Cardiovascular Symptoms</p> <p>Respiratory Symptoms</p> <p>Neurological Symptoms</p> <p>Autonomic Nervous System Symptoms</p>	<p>Palpitation, Chest pain, Burning sensations in the chest, Feeling heaviness in the chest, Feeling some hole in the chest (perceived sensation)</p> <p>Feeling of heart in the chest, Heavy feelings of pulses in the wrist, Edema</p> <p>Breathing difficulties</p> <p>Panting, Suffocation, Increased breathing rate, Loud/Noisy breathing, Sense of being choked, Feeling of something being stuck in the throat</p> <p>Dizziness, Headache, Feeling blank, Shaking of legs, Unable to move, Unable to talk, Body pain, Neck pain, Pain in both hands</p> <p>Sweating, Shivering, Cold sensation on hands, Temperature</p>

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

				variations in different body parts, Fatigue, Dryness of mouth
4	A Dual-Path Journey: Adaptation vs. Avoidance	Adaptive Self-Regulatory Coping	Health-Oriented Lifestyle Modifications	Dietary improvements Adoption of regular exercise or physical activity Healthy sleep routine
			Stress Management and Other Psychological Techniques	Meditation and breathing techniques Distraction activities Journaling Acceptance of the condition Self-affirmations
			Engagement in Recreational and Digital Activities	Listening to music Watching movies Watching YouTube videos
			Emotional Relief Through the Presence of Loved Ones	Spending quality time with loved ones
			Faith-Based and Spiritual Coping	Religious belief enhancement Trust in divine control Religious rituals and practices Meditation power Reliance on spirituality for relief
			Body-Based Self-Soothing Strategy	Tapping on the chest

PSYCHOLOGICAL FACTORS IN CARDIAC ANXIETY

Avoidance of Cardio-Triggering Activities	Avoidance of Direct Cardiac-related Triggers	Avoidance of cardiac related discussions Avoidance of cardiac related videos and news
	Avoidance of Social Exposure	Avoidance of public speaking Avoidance of presentations
	Avoidance of Physical Exertion	Avoidance of physical activities Avoidance of adventures
Help-Seeking and Reassurance	Medical consultation and tests	Doctor shopping Multiple tests and assessments
	Talking to trusted others	Reassurance seeking from health-care providers Reassurance seeking from loved ones
	Use of health monitoring devices	Use of a smartwatch Use of an oximeter Use of stethoscope
Health-Risk Behaviors as Coping	Smoking	
	Unhealthy Form of Eating	



Risk Factors and Consequences of Cutaneous Allodynia among Individuals with Migraine: A Scoping Review

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Abstract

Purpose of Review Cutaneous allodynia is a frequent complaint among individuals with migraine and serves as a critical marker of central sensitization, which plays a pivotal role in migraine pathophysiology. This can exacerbate migraine severity and diminish quality of life. Understanding the risk factors associated with cutaneous allodynia is essential, as it can help identify individuals at higher risk of developing this condition and guide early intervention strategies. Identifying its consequences provides critical insights into disease progression, treatment response, and disability. Hence, this scoping review aimed to determine the risk factors and consequences of cutaneous allodynia in individuals with migraine.

Recent Findings A total of 47 studies were included from the 2116 retrieved studies. Most of the studies adopted a cross-sectional design ($n=29$). Other designs included cohort ($n=8$), longitudinal ($n=4$), experimental ($n=2$), qualitative (exploratory) ($n=2$), and observational ($n=1$) research designs. Most participants were individuals diagnosed with migraine aged 18–65 ($n=40$), and some studies included the pediatric population ($n=5$). The study highlighted various risk factors such as psychological, migraine-associated, neurophysiological, biological, socio-demographic, and lifestyle-related factors. The identified consequences were classified as mental health, physical health, neurophysiological, migraine-associated, and treatment-related consequences.

Summary The evaluation of risk factors and consequences of cutaneous allodynia among individuals with migraine significantly highlighted the multidimensional risk factors of cutaneous allodynia and its debilitating effects on the lives of the affected individuals. These factors are significant for designing targeted, multifaceted interventions for managing cutaneous allodynia and thus provide an essential step in effective migraine management.

Keywords Cutaneous allodynia · Migraine · Risk factors · Consequences · Scoping review

Introduction

Migraine is the most common primary headache disorder [1]. The Global Burden of Disease (GBD) study ranked migraine as the fourth leading cause of years lived with disability (YLD) [2]. It affects approximately 14% of women and 6% of men each year worldwide [1]. Migraine is increasingly understood as a multifactorial brain disorder, and research highlights its association with stress-related physiological dysregulation [3]. One of the most debilitating manifestations of this dysregulation is cutaneous allodynia (CA), which significantly impacts individuals with migraine [4]. CA can also be explained as a sensory hypersensitivity and a well-described symptom of migraine in which individuals perceive pain due to a stimulus that does not normally provoke pain [5].

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Clinical studies reveal that the prevalence of CA exceeds 50% in individuals with migraine, with higher rates among females and individuals aged 18–36 years [5–7]. While the exact etiology of CA remains unclear [8], central sensitization, an altered regulation of nociceptive pathways, is thought to play a critical role in its development [9]. Despite its clinical importance, research on CA is still scattered and predominantly focused on biological mechanisms [4, 10], with little consideration given to its psychological contributors [1]. Further consideration must also be given to the broader effects of CA, including its influence on treatment compliance, sleep quality, and general patient well-being [11].

The latest narrative review revealed considerable heterogeneity in CA presentation, with only some individuals with migraine developing this condition, underscoring the importance of identifying specific risk factors and underlying mechanisms [12]. Despite the significant impact of CA on individuals with migraine, including its association with psychological disturbances, sleep disorders, and reduced functional capacity, awareness of its broader consequences remains limited. As a result, individuals often receive treatment targeting secondary symptoms rather than CA itself, which results in asymptomatic treatment contributing to suboptimal care, long-term medication dependency, and persistent functional impairment. These challenges underscore the necessity of adopting a more integrated, biopsychosocial approach that includes mapping the full spectrum of CA's risk factors and effects to migraine management.

To the authors' knowledge, no comprehensive review has synthesized the risk factors and consequences of CA in migraine. While several primary studies [7, 12, 13] have examined specific aspects, these investigations are methodologically diverse and their findings lack cohesion, reducing their applicability in clinical practice. Given CA's role in exacerbating migraine burden and impairing the effectiveness of acute therapies, such as triptans, a systematic mapping of the literature is critical [14]. In this context, a scoping review offers the most suitable methodological framework for examining the breadth and depth of available evidence, identifying knowledge gaps, particularly within the existing literature characterized by heterogeneity in study design and focus [14–16].

By consolidating scattered findings, this scoping review aimed to identify risk factors and consequences of CA across diverse domains, paving the way for improved clinical strategies and advancing the understanding of this challenging condition. Such an understanding will aid in refining therapeutic interventions, improving patient outcomes, and laying the groundwork for evidence-based, holistic multidisciplinary approaches to migraine management, incorporating pharmacological and non-pharmacological approaches.

Methods

The present review followed the Preferred Reporting Items for Systematic reviews and Meta-analyses-extension for Scoping Review guidelines (PRISMA-ScR) [15] (with no prior protocol registration).

Eligibility Criteria

Peer-reviewed qualitative and quantitative studies published in English from inception till November 2024, reporting the risk factors and consequences of CA among individuals with migraine were included in the study. The scoping review considered studies with any migraine form with CA. Headaches other than migraine, including tension-type headaches, medication overuse headaches and any neurological diseases other than migraine were excluded. The studies having participants with a history of head and neck traumas, parasympathetic nervous system injuries, or use of opiates or other analgesic drugs for reasons other than migraine and other pain conditions/pain syndromes (Fibromyalgia), and head injury were excluded. However, books, letters, conference abstracts, editorials, commentaries, discussion papers, opinion pieces, policy and government documents, reviews, and other grey literature were not considered. Animal studies and studies that used animal models, such as mouse/mice/rat/rodent models, were excluded.

Information Sources & Search Strategy

The databases used were Web of Science, APA PsycNet, PubMed, and ScienceDirect. A manual search was also done using Google Scholar to get additional relevant data. To incorporate all of the pertinent studies of this review, the search criteria were deliberately kept broad and sensitive. The search terms used were “Cutaneous allodynia” OR “Allodynia” AND “Migraine” OR “Migraineurs.” More subject-specific articles were generated by combining the previously stated synonyms with the appropriate use of the Boolean operators “AND,” “OR,” and “NOT.” References to identified articles were screened for any additional relevant papers.

Selection and Data Extraction

The reference management software Zotero was used to upload and manage the results. After removing the duplicate in the software, the data was saved to Microsoft Office Excel for title and abstract screening. The titles and abstracts of retrieved documents from all the databases were thoroughly checked and screened against the inclusion criteria by two independent reviewers. The two authors selected

and analyzed the full texts of potentially relevant studies. Any disagreements and doubts about the process in each review stage were settled via group discussion among the authors. The reasons for excluding the articles in each stage were also recorded. The PRISMA flow chart summarises the search and selection process (Fig. 1). Data extracted included the author’s name, year of publication, location of study, study design, participants, sample size, risk factors, and consequences of CA among individuals with migraine.

Charting, Collating, and Reporting the Results

A data charting form was prepared to aid the data extraction process. Table 1 shows the categories of information extracted from each study. Findings were grouped into different categories after carefully reading the final selected articles. These groupings were determined based on the research question/objective and the logical presentation of the findings. The categories included psychological, migraine-associated, neurophysiological, biological, socio-demographic, lifestyle-related, treatment-related, mental health, and physical health-related factors. Quality assessments were not done since they are typically not conducted in scoping reviews, as their purpose is not to synthesize or weigh evidence on a topic.

Analysis

The extracted data were mapped to reflect the review’s aims, in this case, the risk factors and consequences of CA among individuals with migraine. The results are presented in tabular form, accompanied by a narrative summary.

Selection of Sources of Evidence

The detailed search results are reported in Fig. 1. The initial database search identified 2116 records. Out of that, 638 are from PubMed, 472 are from Web of Science, 1001 are from ScienceDirect, two are from APA PsycNet, and three are from Google Scholar. Five hundred twenty-three duplicates were removed after exporting to Zotero software. After the duplicate removal, the data was saved to an MS Excel sheet for screening. One thousand five hundred and ninety-three studies were retained for further screening based on title and abstract, and 1288 studies that did not satisfy the eligibility criteria were removed. Then, 305 studies were retrieved for full-text analysis after the title and abstract screening. Due to the unavailability of full-text articles, 23 records were removed. Therefore, a total of 282 records were screened in full-text form. Two hundred and thirty-five studies were excluded during this phase due to various reasons such different reviews like literature reviews, systematic reviews, narrative reviews ($n=36$), Non-English language articles

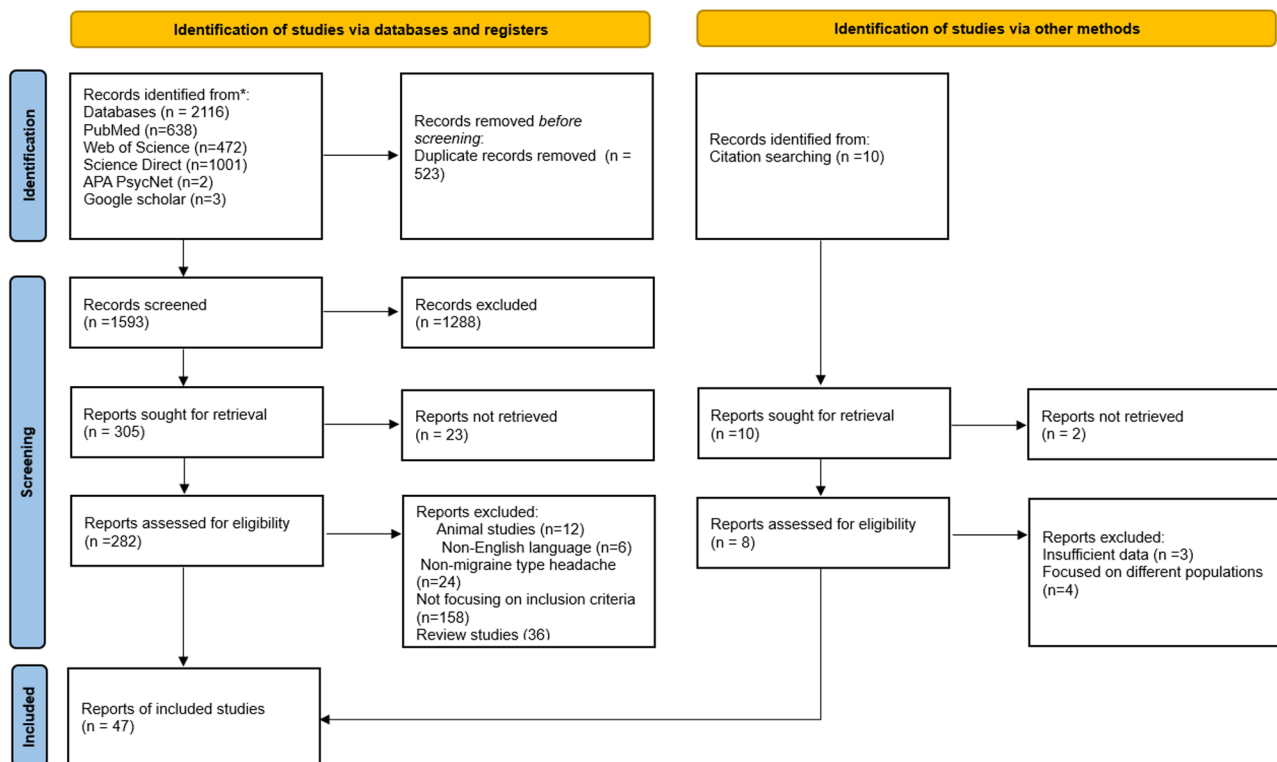


Fig. 1 PRISMA flow diagram illustrating the selection of studies

Table 1 Summary of the characteristics and results of the included publications ($n=47$)

Sl No	Author/s & Year	Location	Research design	Participants	Sample size	Risk factors	Consequences
1	Raieli et al., 2005 [17]	Italy	Qualitative	Children with migraine aged 6–18	96 children with migraine	Central sensitization mechanism	Severe intensity of pain, and negative evolution of migraine
2	Pijpers et al., 2023 [18]	Netherlands	Cohort study	Individuals with migraine aged 18–65 years	173 individuals with migraine	Central sensitization mechanism	Affect treatment response in chronic migraine
3	Burstein et al., 2000 [19]	USA	Experimental study	Women and men with an age range from 18 to 70 years	42 individuals with migraine	Central sensitization mechanism	-
4	Lovati et al., 2012 [20]	Italy	Cross-sectional study	Individuals who regularly attend a centre for blood pressure control for 24-hour blood pressure checking	235 individuals with migraine	-	Progression/chronification of migraine, and more physiologic blood pressure daily rhythm
5	Minguez-Olaondo et al., 2020 [21]	Spain	Prospective cohort study	Adults aged 18 to 65 years.	80 individuals with migraine, 39 non-migraine controls.	Usage of migraine prophylaxis, proportion of abdominal fat, presence of sleep disorders, being female, comorbid depression, medication overuse, increased body mass index scores and the number of migraine days	-
6	Lovati et al., 2015 [22]	Milan, Italy	Cohort study	Individuals with migraine	673 individuals with migraine (492 individuals with episodic migraine and 181 individuals with chronic migraine)	Osmophobia	-
7	Mathew et al., 2016 [23]	USA	Cross-sectional study	Individuals with chronic migraine	44 individuals with migraine	Female gender, chronic migraine, and central sensitization	Overall disability, migraine chronification, and influencing therapeutic decision-making (abortive and preventive treatment strategies)
8	Altay& Celenay, 2023 [24]	Turkey	Cross-sectional online survey	Individuals with migraine between the ages of 18 and 65	144 individuals with migraine	-	Kinesiophobia, gastrointestinal system symptoms like indigestion, abdominal pain, and constipation
9	Kalita et al., 2009 [6]	Asian countries	Cohort study	Individuals with migraine without aura age ranges from 15 to 60 years	182 individuals with migraine	Frequency of migraine attacks, duration of migraine, and functional disability	-
10	Aguggia & Saracco, 2010 [25]	Italy	NA	NA	NA	-	Migraine chronification

Table 1 (continued)

Sl No	Author/s & Year	Location	Research design	Participants	Sample size	Risk factors	Consequences
11	Lovati et al., 2010 [26]	Italy	Cross-sectional study	Individuals with migraine	175 individuals with migraine 73 individuals without migraine	Impaired Sleep quality and sleep disturbances	Impaired sleep quality
12	Tietjen et al., 2009 [10]	USA	Cross-sectional multicenter study	Individuals taking treatment from headache clinics	1413 individuals with migraine	Female gender, current anxiety, depression, higher BMI, current smoking, migraine with aura, longer duration of migraine, severe headache-related disability, and several chronic pain conditions	-
13	de Tommaso et al., 2014 [27]	Italy	Cohort study	Primary headache outpatients	1670 individuals with headache	Self-reported sleep duration	Short sleep
14	Han et al., 2021 [28]	Korea	Cross-sectional study	Individuals aged ≥ 19 years	2501 individuals with migraine	Frequency and intensity of headache, depression, and anxiety	-
15	Sciriuocchio et al., 2019 [29]	Italy	Cross-sectional study	Individuals with pediatric migraine	190 individuals with migraine	Pain catastrophizing	-
16	Chu et al., 2012 [30]	USA	Longitudinal study	Individuals with Episodic migraine	11,388 individuals with episodic migraine	-	Increased triptan use
17	Levinisky, Zeharia & Eidlitz-Markus, 2019 [31]	Israel	Retrospective cohort study	Adolescents and children within the first 6 months of migraine onset, aged 3–18 years	119 individuals with migraine	Migraine with aura, female gender, photophobia, awakening pain, and a genetic tendency that may contribute to the appearance of allodynia in the pediatric age group	-
18	Ashkenazi et al., 2010 [32]	USA	Cross-sectional study	Adults with episodic migraine aged 18–65 years	60 individuals with episodic migraine	Phonophobia	-
19	Bevilaqua-Grossi et al., 2010 [33]	Brazil	Cross-sectional study	Individuals with migraine with age ranged from 18 to 65	Individuals with migraine	Temporomandibular disorders	-
20	Chong et al., 2016 [34]	USA	Cross-sectional study	Individuals with migraine	55 individuals with migraine, 58 individuals without migraine (healthy controls)	Smaller midbrain volumes	More volume loss in specific brainstem regions (midbrain, medulla and cerebellar peduncles)
21	Lipton et al., 2008 [7]	USA	Cross-sectional study	Severe headache sufferers	24,000 individuals with migraine	Female gender, duration of migraine attack, frequency of migraine attack, disability, and increased BMI	-
22	Kao et al., 2014 [35]	Taiwan	Cross-sectional study	Individuals with migraine	434 individuals with migraine	-	Clinically significant anxiety and depression
23	d'Agostino et al., 2010 [36]	Italy	Cross-sectional study	Individuals with migraine	410 individuals with migraine	Female sex, chronic migraine, harm avoidance, depression, and anxiety traits	Migraine progression
24	Louter et al., 2014 [37]	Netherlands	Cross-sectional study	Individuals with migraine	2533 individuals with migraine	-	Depression

Table 1 (continued)

Sl No	Author/s & Year	Location	Research design	Participants	Sample size	Risk factors	Consequences
25	Seher et al., 2019 [38]	USA	Longitudinal study	Individuals with migraine	16,789 individuals with migraine	Gender-female	-
26	Lovati et al., 2007 [39]	Italy	Cross-sectional study	Outpatients who are regularly evaluated for headaches Clinic	221 individuals with migraine	Frequency of attacks and presence of aura episodes	-
27	Park, seo & Lee, 2015 [40]	Republic of Korea	Cross-sectional study	Individuals with migraine (with or without aura)	220 individuals with migraine	-	Suicidality
28	Lovati et al., 2013 [41]	Italy	Cross-sectional study	Individuals with migraine	456 individuals with migraine	Photophobia	-
29	Raieli et al., 2015 [42]	Italy	Retrospective cohort Study	Children suffering from primary headache	230 children with primary headache	Physical activity, nausea, and phonophobia	-
30	Vitali-Silva et al., 2023 [43]	Ireland	Cross-sectional study	Young women with migraine, with or without aura	486 individuals with migraine	Presence of aura, menstrually related migraine, greater disability, depression, anxiety, and exposure to a combined hormonal contraceptive	-
31	Mendonca et al., 2016 [44]	Portugal	Cross-sectional study	Individuals with episodic migraine	98 individuals with episodic migraine	-	Anxious and depressive symptoms
32	Seo & Park, 2019 [11]	Republic of Korea	Cross-sectional study	Individuals with migraine	312 individuals with migraine	Chronic migraine, medication overuse headache, family history of migraine, longer disease duration, earlier age at onset, higher headache intensity, and aggravation by physical activity	Anxiety, depression, fatigue, insomnia, headache-related disability, and significantly reduced quality of life.
33	Kim & Park 2016 [45]	Republic of Korea	Cross-sectional study	Individuals with migraine age ranged from 15 to 75	332 individuals with migraine	Depression, migraine-associated features, female gender, headache intensity, medication overuse headache, photophobia, phonophobia, current MDD, and current GAD	-
34	Polk et al., 2020 [3]	USA	Cross-sectional study	Young adults with migraine	147 individuals with migraine	-	Stress, headache-related disability, fear of pain, and reduced self-efficacy
35	Mathew, Kailasam & Seifert, 2004 [46]	USA	Cross-sectional study	Individuals with migraine	295 individuals with migraine	Duration of illness and frequency of migraine attacks	Chronicity of migraine
36	Dodick et al., 2019 [13]	USA	Cross-sectional study	Adults with migraine	15,133 individuals with migraine	Headache frequency and intensity, smoking, income, race, medication overuse in men, employment, and the frequency of migraine attacks in women	Depression, anxiety symptom severity, and acute medication overuse

Table 1 (continued)

Sl No	Author/s & Year	Location	Research design	Participants	Sample size	Risk factors	Consequences
37	Benatto et al., 2017 [47]	Brazil	Cross-sectional study	Individuals with Episodic and chronic migraine, age ranging from 18 to 55	80 individuals with episodic migraine and 80 individuals with chronic migraine	chronic migraine, duration of the disease	-
38	Yalin et al., 2017 [48]	Turkey	Cross-sectional study	Individuals with episodic and chronic migraine	344 individuals with migraine	Longer headache duration, higher attack frequency in female gender, and migraine with aura type	-
39	Zhang & Chen, 2018 [49]	China	Experimental study	Individuals with migraine aged 18–70 years	71 individuals with migraine	Female gender, frequency of migraine attacks per month, and duration of illness,	-
40	Guvenc, Cilliler & Comoglu, 2013 [50]	Turkey	Cross-sectional study	Individuals with migraine with and without aura whose age is above 18 years	186 individuals with migraine	Female gender, menstrually related migraine, nausea, and phonophobia	-
41	Louter et al., 2013 [51]	Netherlands	Longitudinal study	Individuals with migraine	3029 individuals with migraine	Female gender, lifetime depression, low age at onset, high frequency of migraine attacks, and high number of migraine days	Chronicification of migraine and call for preventative treatment strategies.
42	Raibin & Markus, 2022 [52]	Israel	Cross-sectional study	Adolescents and children with migraine, age ranges from 7–18 years, and their mothers	98 individuals with migraine	Genetic and environmental factors, such as maternal behavior	-
43	Bigal et al., 2008 [53]	USA	Cross-sectional study Longitudinal study	Individuals with migraine	16,573 individuals with S with migraine	Headache frequency, female sex, major depression, and increased BMI,	Depression
44	Baykan et al., 2016 [5]	Turkey	Cross-sectional study	Individuals with migraine	5323 individuals with migraine	Duration, severity, disability of migraine attacks, photophobia, phonophobia, osmophobia, premonitory signs, individuals with migraine with aura or a family history of migraine, and are more sensitive to hormonal changes.	Disability of migraine attacks
45	Yilmaz, Kale, & Ozge, 2024 [54]	Turkey	Observational study	Individuals with migraine	762 individuals with migraine	Gender (female), pain/sensitivity in the teeth and/or gums during migraine attacks	-
46	Imai & Matsumori, 2024 [55]	Japan	Cohort study	Individuals with migraine without aura (MwoA)	939 individuals with migraine without aura	Headache impact	Headache impact, pain intensity, and GAD
47	Montisano et al., 2024 [56]	Italy	Exploratory study	Individuals with migraine	126 individuals with chronic migraine	Central sensitization	Migraine progression and inadequate response to acute treatment

Note- NA: The information is not available in the article; '-': Not a focus of the study

Abbreviations: BMI- Body mass index, GAD- Generalized anxiety disorder, MDD- Major depressive disorder, USA- United States of America

($n=6$), studies done on animal models mice/rodent/rat/mouse/animal models ($n=12$), studies focused on nonmigraine type headache ($n=24$) and those were not fit to the inclusion criteria ($n=158$). Through manual citation searching, 10 records were identified, one study was finalized, and others were removed because of insufficient data and a focus on different populations, such as individuals having different headaches, namely tension-type headaches and medication overuse headaches. Thus, 47 studies were identified, including 46 records from database searches and one from manual searches.

Description of Included Documents/Study Characteristics

Most included articles were from the USA ($n=12$) and Italy ($n=12$). Five studies were conducted in Turkey, four in the Republic of Korea, three in the Netherlands, and two in Brazil and Israel. Spain, Taiwan, Ireland, Portugal, China, and Japan provided one study each. The study design included cross-sectional ($n=29$), cohort ($n=8$), longitudinal ($n=4$), experimental ($n=2$), qualitative (exploratory) ($n=2$), and observational ($n=1$) research designs. The studies were published in 2016 ($n=6$), 2019 ($n=5$), 2010 ($n=4$), 2014 ($n=4$), 2024 ($n=3$), 2023 ($n=3$), 2015 ($n=3$), 2013 ($n=3$), 2020 ($n=2$), 2012 ($n=2$), 2008 ($n=2$), 2009 ($n=2$), 2017 ($n=2$), 2018 ($n=1$), 2005 ($n=1$), 2000 ($n=1$), 2007 ($n=1$), 2004 ($n=1$), and 2021 ($n=1$). Almost all the participants were individuals diagnosed with migraine, aged 18–65 ($n=39$), and some studies included the pediatric population ($n=5$). The sample size ranges from 42 to 24,000 individuals with migraine.

Risk Factors of CA among Individuals with Migraine

The risk factors identified from the current review are psychological, migraine-associated, neurophysiological, biological, socio-demographic, and lifestyle-related (Table 2).

Psychological Risk Factors

Psychological factors are emotional, cognitive, and behavioral elements that influence an individual's response to stress, pain, and other health-related challenges. In the context of CA among individuals with migraine, these factors, including depression, anxiety, pain catastrophizing, harm avoidance, kinesiophobia, and sleep disturbances, play a critical role in modulating pain perception and central sensitization, thereby intensifying the experience of pain.

The present scoping review identified several psychological risk factors that contribute to the development of CA among individuals with migraine. Major depression has

been repeatedly emphasized as an essential risk factor [53], with studies also reporting depression and lifetime depression as significant contributors [21, 28, 36, 45, 51]. Anxiety-related factors also emerged as critical contributors, with anxiety traits characterized by a predisposition to experience elevated levels of anxiety [28, 36] and generalized anxiety disorder (GAD), a clinically diagnosed condition characterized by excessive and persistent worry [45], both being linked to an increased risk of CA. These results highlight the role of anxiety in both trait and disorder forms, which can make people more sensitive to pain and more prone to CA. Another risk factor that has been identified as having an impact on the pain experience of these individuals is pain catastrophizing, which is defined as an exaggerated adverse reaction to either expected or actual pain [29]. According to d'Agostino et al. [36], harm avoidance is another psychological characteristic that has been identified, which is a tendency linked to excessive worry and fear. Sleep disorders and other sleep disruptions, such as impaired sleep quality or self-reported reduced sleep duration, were commonly mentioned [21].

Migraine-Associated Risk Factors

Migraine-associated or illness-associated factors refer to migraine's characteristics and clinical features that influence the risk and severity of associated conditions like CA.

Migraine-associated factors have a prominent influence on the development of CA. Severe pain intensity [11, 13, 17, 28, 45, 55], high migraine attack frequency [6, 7, 13, 21, 39, 46, 48, 49, 51, 53], and prolonged migraine attack duration [5–7, 10, 11, 47–49] were frequently identified. Migraine severity [7, 5] and subtypes such as migraine with aura [5, 10, 31, 39, 43, 48] also elevated the risk. Furthermore, chronic migraine or transformed headaches [10, 11, 23, 36, 45, 47] were critical contributors. Menstrually related migraine [43, 50] was a significant hormonal factor. Other migraine-associated symptoms, such as photophobia [5, 31, 41, 45], phonophobia [5, 32, 42, 45, 50], and osmophobia [5, 22], further contributed. Increased risk was associated with medication overuse headache [11, 21, 45], aggravation by physical activity [11, 42], and awakening pain [31]. Additional predictors were the use of migraine prophylaxis [21], migraine-associated symptoms [7, 45], and an earlier age at onset [11].

Neurophysiological Risk Factors

Neurophysiological factors pertain to the functional mechanisms of the nervous system that affect pain processing and sensory perception.

Table 2 Classification of risk factors of cutaneous allodynia among individuals with migraine

	Risk factors
Psychological factors	Major depression Depression/Lifetime depression Anxiety & anxiety trait Pain catastrophizing Harm avoidance GAD Presence of sleep disorders Impaired Sleep quality/Self-reported duration of sleep
Migraine-associated factors	Severe intensity of pain (headache) Attack frequency Duration of a migraine attack Severity of migraine Migraine with aura Chronic migraine/ Transformed headache Menstrually related migraine Photophobia Phonophobia Medication overuse headache Aggravation by physical activity Migraine-associated symptoms Use of migraine prophylaxis Osmophobia and premonitory signs Awakening pain Earlier age at onset
Neurophysiological factors	Central sensitization mechanism Temporomandibular disorders
Other Biological factors	Increased body mass/Increased BMI Index A higher proportion of abdominal fat values Smaller midbrain volumes Genetic factor-maternal migraine Family history of migraine The onset of allodynia in pediatric age group may be influenced by a genetic predisposition.
Socio-demographic factors	Female gender Income, race in men, and employment in women
Lifestyle-related factors	low age at onset Current smoking Maternal behavior

Note: GAD- Generalized anxiety disorder, BMI - Body mass index

A central sensitization mechanism has been well-documented as a major contributor to CA [17–19, 23, 56]. By amplifying pain signals in the central nervous system, this mechanism makes people more sensitive to stimuli that should not typically cause pain. The hypersensitivity seen in these individuals is thought to be caused by central sensitization of trigeminal neurons in the second-order brainstem [19]. Another neurophysiological risk factor has also been found to be temporomandibular disorders (TMDs). There was a higher likelihood of moderate or severe CA linked to headaches in people with TMD.

Other Biological Risk Factors

Biological factors primarily involve genetic, physiological, and structural components that influence the disease susceptibility of CA.

Various biological risk factors related to the development of CA among individuals with migraine. Increased body mass index (BMI) was consistently identified as a significant risk factor [7, 10, 53]. Relatedly, a higher proportion of abdominal fat values [21] emerged as an independent risk factor for CA, suggesting that central adiposity may play a role in the pathophysiology of CA [21]. Structural brain differences were also noticed. A higher risk of CA was linked to smaller midbrain volumes, suggesting possible neuroanatomical vulnerabilities [34]. Furthermore, genetic considerations became a significant issue, especially concerning pediatric allodynia. CA in children was substantially correlated with maternal migraine, indicating a possible genetic or familial component [52]. The importance of genetic predisposition in the development of CA was further supported by the discovery that a family history of migraine was a significant risk factor [5, 11]. Further research into hereditary factors is necessary because studies have shown that

Table 3 Classification of consequences of cutaneous allodynia among individuals with migraine

	Consequences
Mental health consequences	Current anxiety, depression/ clinically significant depression, and anxiety/ Anxious and depressive symptoms Suicidality in individuals with migraine Significantly reduced quality of life. Stress, reduced self-efficacy/reduced perceived headache-related self-efficacy. Fear of pain Kinesiophobia Insomnia GAD Sleep quality/short sleep
Physical health consequences	Fatigue Gastrointestinal system symptoms like indigestion, abdominal pain, and constipation in individuals with migraine More physiologic blood pressure daily rhythm Several chronic pain conditions
Neurophysiological consequences	There is a more significant loss of volume in some areas of the brainstem (midbrain, medulla, and cerebellar peduncles)
Migraine-associated consequences	Negative evolution of migraine Progression/chronification of migraine Moderate and severe headache intensity Headache-related disability
Treatment-related consequences	Treatment response in chronic migraine Making therapeutic decisions on preventative and abortive care Increased triptan use Medication overuse May warrant preventive treatment strategies Inadequate response to acute treatment

Note: GAD-Generalized anxiety disorder

this genetic inclination may contribute to the start of CA, especially in pediatric populations [31].

Socio-Demographic Risk Factors

Socio-demographic factors encompass the social and demographic characteristics that influence CA among individuals with migraine.

Several studies have shown a substantial association between female gender and a higher prevalence of CA, citing it as a significant risk factor [7, 10, 21, 23, 31, 36, 38, 45, 48–51, 53, 54]. Furthermore, it was discovered that socio-economic characteristics such as income and race had a significant effect on men's risk of developing CA. In contrast, employment status significantly impacted women's risk [13]. Additionally, a more substantial chance of developing CA was linked to a lower age at migraine onset, highlighting the influence of early-life events in determining the risk profile [51].

Lifestyle-Related Risk Factors

Lifestyle-related factors encompass behaviors and habits that can influence the development and severity of migraine and associated conditions like CA.

According to Tietjen et al. [10] and Dodick et al. [13], current smoking was identified as a significant risk factor for CA. The development of CA was also influenced by

maternal behaviors, especially in pediatric populations. This highlights the significance of early environmental and behavioral factors in determining vulnerability [52].

Consequences of CA Among Individuals with Migraine

The identified factors were classified into the following categories: mental health, physical health, migraine-associated, neurophysiological, and treatment-related consequences (Table 3).

Mental Health Consequences

Mental health consequences refer to the psychological impacts that result from the chronic pain and discomfort caused by CA in individuals with migraine, leading to symptoms such as anxiety, depression, and significantly reduced quality of life, etc.

The mental health of individuals with migraine is significantly impacted by CA, with depression and anxiety being among the most common adverse consequences. Those with CA have been found to have clinically significant levels of depression, anxiety, and the presence of anxious and depressive symptoms [10, 11, 13, 28, 35, 37, 43, 44, 53]. According to Park et al. [40], CA can cause increased suicidality in individuals with migraine due to the emotional disturbances associated with this condition. CA is also linked to a markedly lower quality of life [11], increased stress, and

decreased self-efficacy in handling headache-related difficulties [3]. It is also reported that CA causes kinesiophobia [24] and fear of pain [1] among affected individuals. Additional effects of CA include sleep disruptions, such as insomnia [11], poor sleep quality, and short sleep duration [26, 27], which exacerbate the condition's adverse effects on mental health. The reciprocal association between mental health issues and migraine-associated CA is further highlighted by the reports of GAD in individuals with CA [55].

Physical Health Consequences

Physical health consequences refer to the bodily symptoms and conditions that arise as a result of chronic pain and CA in individuals with migraine.

CA seriously compromises physical well-being and increases the overall disease burden of individuals with migraine. A notable reported outcome is fatigue, which negatively impacts energy levels and day-to-day functioning [11]. Its effects extend beyond the neural system, as evidenced by the prevalence of gastrointestinal symptoms, such as constipation, indigestion, and stomach discomfort, among individuals having migraine with CA [24]. Further illustrating CA's systemic impact on body processes, people with the condition also have more physiological blood pressure rhythms [20]. Additionally, CA is linked to the onset and aggravation of several chronic pain disorders, suggesting that it plays a part in increasing pain sensitivity and fostering a more comprehensive chronic pain phenotype [10].

Neurophysiological Consequences

Neurophysiological consequences refer to changes in the brain and nervous system that occur as a result of chronic pain and CA in individuals with migraine.

More significant volume loss in particular brainstem areas, such as the midbrain, medulla, and cerebellar peduncles, is one of the neurophysiological changes linked to CA. This suggests possible structural effects on pathways in the central nervous system [34].

Migraine-Associated Consequences

Migraine-associated consequences refer to the unique consequences and worsening of the condition that directly result from chronic migraine and related symptoms like CA.

CA contributes to several migraine-specific effects and has a substantial impact on the course and intensity of migraine. It has been linked to migraine's detrimental evolution, which includes the progression and chronification of the illness. The overall burden of migraine is increased for CA sufferers because they are more likely to experience

a transition from episodic to chronic migraine [17, 20, 23, 25, 36, 37, 46, 56]. Additionally, individuals with CA report moderate to severe headache intensity more often, which emphasizes its involvement in exacerbating clinical symptoms of migraine [28].

Treatment-Related Consequences

Treatment-related consequences refer to the challenges and complications that arise from managing chronic migraine and its associated symptoms, particularly in the context of CA.

CA has a substantial impact on migraine management and treatment results, posing unique challenges for patients and healthcare providers. It may complicate the efficacy of therapeutic approaches for chronic migraine by influencing treatment response [18] because it has been linked to a poor response to acute migraine therapies [56]. According to Mathew et al. [23] and Louter et al. [51], making therapeutic decisions is crucial, especially when choosing preventative and abortive treatment approaches. Careful medication management is necessary to prevent aggravating CA since individuals with the illness have been found to use triptans more frequently and to be more likely to abuse their medications [13, 30].

Discussion

The present scoping review provides a comprehensive understanding of the various risk factors and consequences based on synthesizing existing literature on CA among individuals with migraine. The risk factors were psychological, migraine-associated, neurophysiological, biological, socio-demographic, and lifestyle-related. The consequences were categorized as mental health, physical health, migraine-associated, neurophysiological, and treatment-related.

Psychological risk factors emerged as a significant contributor to CA among individuals with migraine. The identification of a connection between CA, anxiety, depression, and harm avoidance indicates a role for the serotonergic system and individual predisposition in the development of CA in individuals with migraine [57]. Pain catastrophizing is involved in CA [27] because it seems to be a mental feature of a clinical phenotype, such as an increased manifestation of central sensitization symptoms and psychopathological traits [29]. Further, individuals with allodynic migraine experienced sleep disturbances more frequently than individuals with non-allodynic migraine [26]. Disrupted sleep due to sleep issues like restless legs syndrome, insomnia, sleep apnoea, and excessive daytime sleepiness resulted in poorer sleep quality [27], and treatments for sleep disorders

are significantly associated with CA [21]. Furthermore, there is a bi-directional relationship between CA and sleep quality. Poor sleep quality may favor CA onset, possibly influencing central sensitization mechanisms in the central nervous system, and, in turn, CA may impair sleep [26]. The hypothesis of a bidirectional relationship should be investigated further to get a clear understanding of it. Collectively, these psychological risk factors emphasize the need for a holistic approach to the assessment and management of individuals having migraine with CA, integrating psychological support and interventions to address these underlying vulnerabilities.

A considerable number of studies have reported that several migraine-associated risk factors were significantly associated with an increased risk of CA. CA was found to be associated with phonophobia, photophobia, and osmophobia [5, 19, 45], resulting in associated avoidance of those stimuli or exacerbation of migraine symptoms [45], especially when migraine is untreated [47]. Further, CA is more prominent in migraine with aura type. Cortical spreading depression (CSD), a wave of cortical cellular hyperexcitability, is assumed to be the source of migraine aura [58], and some research has suggested that CSD may trigger the trigeminovascular system [59]. It is interesting to note that CA was linked to many aura types, suggesting that CA may indicate a close relationship between central sensitization and CSD events [5]. Moreover, the impact of hormonal factors on the central sensitization and cutaneous pain thresholds may be the cause of the increased incidence of CA in women and its association with menstrual migraine [50]. The usage of migraine prophylaxis likely represents the notion that the affected patients experienced migraine attacks more frequently, which explains this association [21].

Central sensitization mechanism is presumed to occur sequentially in second and third-order neurons, which results in an analogous spatial distribution of CA with cephalic and extracephalic symptoms [18]. By intensifying pain pathways and encouraging sensitization, temporomandibular disorders, which involve dysfunction or pain in the temporomandibular joint and related musculature, may be a factor in the development of CA [33]. These findings highlight the critical role of neurophysiological mechanisms in the pathogenesis of CA. Future research should focus on neuroimaging and electrophysiological studies to map the progression of central sensitization and identify specific neural circuits involved. Longitudinal studies could assess the temporal relationship between migraine, TMDs, and CA to establish causality.

Individuals having migraines with more significant symptoms of allodynia have smaller midbrain volumes, and those with lower heat pain threshold have smaller medulla and cerebellar peduncles. The structure of the brainstem

may indicate the degree of CA and migraine hypersensitivity, and the brain stem most likely contributes to altered sensory processing in migraine [34]. Further, a few studies have highlighted the role of genetic factors in reducing the pain threshold. For example, migraine and maternal allodynia are linked to pediatric allodynia. The decreased pain threshold could be caused by environmental and genetic epigenetic variables [52]. Children with migraine under the age of seven years may already exhibit CA, which could be explained by the relationship between maternal and pediatric allodynia [42]. Epigenetic changes in CA may explain an association between maternal and pediatric allodynia. There are numerous processes in epigenetics, including miRNA expression, histone acetylation and methylation, and DNA methylation. All of these have an impact on behaviors associated with chronic pain and are engaged in alterations at different locations of the central nervous system during chronic pain states. Persistent pain and pain perception are related to epigenetic modifications in the neurological system [60]. Furthermore, among individuals with migraine, CA increased with body mass index; it has been postulated that this relationship stems from higher concentrations of proinflammatory cytokines and neuropeptides in obesity [523]. These findings highlight the complex interplay of biological factors in the development and progression of CA, underscoring the importance of integrating these considerations into prevention and management strategies.

CA is quite prevalent, at approximately 90%, among females with chronic migraine. A study reported a female predominance in pediatric individuals having migraine with CA also [23]. Another study stated that the higher prevalence of CA in female patients is consistent with the fact that women have a lower tolerance for pain from noxious stimuli than males do, as the pathophysiology of CA is linked to a lower pain threshold [61]. The discovery that human estrogen receptors are found in the trigeminovascular nucleus of the trigeminovascular system [62], is very significant since it is reportedly implicated in the pathophysiology of CA [63, 64]. Moreover, females may be more vulnerable to CA due to changes in sex hormones that act in brain regions involved in the sensitization [31].

Very few studies addressed some of the lifestyle-related factors that contributed to the development of CA. According to Tietjen et al. [10] and Dodick et al. [13], current smoking was identified as a significant risk factor, possibly because of its effects on the neurological and vascular systems. Additionally, maternal behavior may contribute to a reduced pain threshold. One possible explanation for the association between CA in mothers and their offspring is that the mother's reduced pain sensitivity affects how children perceive pain [52]. These results highlight the importance

of addressing modifiable lifestyle factors when designing strategies for preventing and treating CA.

The present review has reported the various consequences of CA among individuals with migraines. Similar to psychological risk factors, depression, anxiety, and stress emerged as consequences of CA that impacted the overall mental health and well-being of the affected individuals [3, 10, 37, 43, 44]. Although the underlying mechanism is unclear, neurotransmitters or neuroendocrine systems may modulate central sensitization, pain perception, and psychiatric disorders. For instance, depression may influence the hypothalamic-pituitary-adrenal (HPA) axis, which may be involved in pain processing [35]. Further, in individuals with migraine, CA is essential in determining suicidality as a psychiatric problem. Clinicians should, therefore, constantly observe the occurrence of suicidality in individuals with migraine who visit outpatient clinics. Psychiatric interviews, including suicidality, are time-consuming to perform in a busy professional setting. In this case, the first step in further assessing suicidality will be to ask the patients about CA [40]. Moreover, the existence of migraine-related CA may have a detrimental effect on the quality of sleep since patients may have problematic sensations in the face, skull, and even extracephalic regions, which can lead to insomnia and nighttime awakenings [26].

Individuals with migraine reported lower headache self-efficacy as CA symptoms worsened. This finding might have significant ramifications for initiatives to modify behavior and implement adaptive coping strategies for individuals with migraine who are suffering from CA [3]. For this particular group of people, behavioral therapies that improve self-efficacy in addition to pharmacotherapy [65] may be beneficial. Additionally, a few studies reported that kinesiophobia and fear of pain worsen psychological distress by creating barriers to activity and fuelling a vicious cycle of avoidance and inactivity [3, 24]. Central sensitization is thought to be effective in developing kinesiophobia [66]. Nevertheless, there are limited studies investigating the connection between the occurrence or severity of CA and kinesiophobia in individuals with migraine [47]. Therefore, additional research is required to investigate the factors influencing kinesiophobia in individuals with migraine. These findings highlight the profound psychological burden of CA, necessitating integrated care approaches that focus on both physical and mental health consequences.

Similar to mental health consequences, CA results in some physical health consequences, as reported by a limited number of studies. CA can lead to several chronic pain conditions [10]. The results showed that irritable bowel syndrome (IBS), fibromyalgia (FM), and chronic fatigue syndrome (CFS) are among the co-morbid chronic pain conditions that are more likely to occur among this population.

Subjects with primary headaches, especially allodynic ones, appear to maintain a more physiologic blood pressure daily rhythm than those without allodynic headaches, even though the presence of CA was not linked to hypertension or a greater frequency of loss of dipping [20].

Relatively, a considerable number of studies reported some consequences related to migraine-associated factors. CA acted as one of the potentially remediable risk factors for the chronification from episodic to chronic migraine [23, 25]. Progression may be caused by mechanisms producing the migraine attacks or by the activation generated by the attacks. Since CA is not included in the criteria for migraine in the International Classification of Headache Disorders, its existence is frequently not systematically evaluated in clinical practice. The existence of CA may be a predictor of migraine chronification, even though it is not currently included in the diagnostic criteria for migraine [23]. Another significant consequence is headache-related disability as assessed by Migraine Disability Assessment Questionnaire (MIDAS) scale in most of the reported studies. Therefore, it is essential to investigate the connections between cutaneous severity and migraine-related disability since this will shed light on the pathophysiology of migraine and allow physicians to consider these factors when evaluating migraine treatment [24].

CA may raise the risk of a poor response to immediate care, highlighting the significance of tailored approaches to enhance therapeutic results for this subgroup of individuals with migraine [56]. Extracerebral allodynia, a sign of thalamic involvement, had the most prognostic value for treatment failure [19, 64, 67]. Hence, it is predicted that in individuals with chronic migraine, thalamic involvement, in particular, will be a predictor of therapy nonresponsiveness [18]. These results highlight the difficulty of treating CA-complicated migraine and the need for individualized, comprehensive approaches.

Limitations and Future Recommendations

Unlike the evidence on risk factors identified, the literature on the consequences of CA was limited, especially in the behavioral domains. Hence, future research can explore other potential consequences of CA. Further, the risk factors and consequences were primarily identified based on the results of regression or correlation analysis done in the primary studies. However, the objective of the present scoping review was confined to a narrative presentation of the available risk factors and consequences of CA. Hence, further studies may statistically analyze these results to estimate the overall effects of the individual risk factors and consequences of CA. Specifically, conducting a comprehensive meta-analysis could be particularly beneficial in synthesizing

the existing evidence, validating effect sizes, and clarifying the strength and direction of relationships between risk factors and consequences of CA. Future research incorporating longitudinal designs is needed to confirm the identified risk factors and consequences and further explore the complex interplay of these variables. Such studies will help better understand the temporal relationships between risk factors and the progression of CA. Only English-language articles were included in the study, which might have left out pertinent research in other languages. Only open-access studies were selected, which may lead to selection bias. The selected studies are heavily focused on adult individuals with migraine, and only a few were conducted on pediatric individuals with migraine. Hence, more studies are required to understand the causes and consequences of CA among the pediatric migraine population and to enhance the generalizability of the current findings.

Conclusions

This scoping review has identified a wide range of risk factors and consequences of CA among individuals with migraine. The key risk factors identified were psychological, migraine-associated, neurophysiological, biological, socio-demographic, and lifestyle-related. These factors are significant for designing targeted, multifaceted interventions for managing CA. The review also highlighted the essential consequences of CA, such as mental health, physical health, migraine-associated, neurophysiological, and treatment-related consequences. Notably, the psychological and migraine-specific factors emerged as both risk factors and consequences of CA among individuals with migraine. Clinicians should be aware of the dual role of these factors, indicating the need for integrated care models that address both the physical and psychological dimensions of migraine management. Given the substantial burden that CA imposes on individuals with migraine, it is essential to focus on these factors in both prevention and management strategies. Furthermore, the review highlights the significance of early detection of CA in individuals with migraine, which may guide the development of more personalized care plans to prevent the development of chronic pain and associated difficulties.

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The study focused specifically on the various predictors of cutaneous allodynia among migraineurs in a representative sample of US adults.

Author Contributions K.S.S. was involved in conceptualization, methodology, investigation, formal analysis, data curation, writing-original draft, writing-review and editing, and visualization. E.R. was involved in conceptualization, methodology, formal analysis, writing-review and editing, supervision, and validation. A.G. was involved in methodology, data curation, formal analysis, writing-original draft, writing-review and editing, and supervision. J.G.J. was involved in formal analysis, writing-original draft, writing-review and editing. R.J. was involved in writing-review and editing, validation, and supervision. All authors reviewed the manuscript.

Data Availability Data is provided within the manuscript or supplementary information files.

Declarations

Ethics Approval and Consent to Participate Not applicable.

Human and Animal Rights and Informed Consent All reported studies/experiments with human or animal subjects performed by the authors have been previously published and complied with all applicable ethical standards (including the Helsinki Declaration and its amendments, institutional/national research committee standards, and international/national/institutional guidelines).

Competing Interests The authors declare no competing interests.

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This is to certify that Ms. **SRUTHI K S**, **CENTRAL UNIVERSITY OF KARNATAKA** has presented a paper on the title **RELATIONSHIP BETWEEN SLEEP HYGIENE AND ACADEMIC PERFORMACE AMONG UNIVERSITY STUDENTS** in the Two-day International Conference on Psychological Skill Acquisition organized by the Post-Graduate Department of Psychology and Internal Quality Assurance Cell, Kuriakose Elias College Mannanam in collaboration with College Development Council, M.G. University held on 3rd and 4th of March 2023

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Date of Issue: 03-06-2023

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This is to certify that *Prof./Dr./Mr./Ms.* SRUTHI K.S

presented a paper titled INTERVENTIONS TO MANAGE CARDIAC ANXIETY

AMONG INDIVIDUALS WITH CARDIO-VASCULAR DISEASES AND NON-CARDIAC CHEST PAIN: A SYSTEMATIC REVIEW

in the Three Day AMALIT International Conference organised by Department of Psychology and IQAC, Amal College of Advanced Studies, in collaboration with Kerala State Higher Education Council, Government of Kerala, on 30th, 31st January and 01st February 2025.

Dr. Mohamed Basheer KP
Principal



Dr. Umesh U
Coordinator

Dr. Shihabudheen N
Coordinator, IQAC

Chapter 6

Summary and Conclusion

This study was an attempt to understand and explore various factors associated with cardiac anxiety among adults. It employed a qualitative exploratory research design, integrating a semi-structured questionnaire followed by a reflexive thematic analysis. By addressing the stated objectives of the study, this exploration offered a comprehensive understanding of the perception of risk factors, protective factors, consequences of cardiac anxiety among adults and the management and coping strategies employed by the adults for dealing with cardiac anxiety. This chapter presents a synthesized summary of the study, highlights the significant findings, acknowledges the limitations, states the implications and provides recommendations for future studies.

Summary

Anxiety, which is induced by fear of cardiac diseases or cardiac malfunction, is called cardiac anxiety (CA) (Leissner et al., 2022). When cardiac anxiety develops, it has the potential to be detrimental to one's quality of life and recovery because it is associated with increased attention to cardiac stimuli, catastrophic worries and interpretations, avoidance of cardiac stimuli and physical exercise, and safety-seeking behaviors. Though cardiac anxiety is a major issue prevalent among health-anxious and psychosomatically concerned populations, there is a significant absence of its academic exploration, particularly focusing on general adults. There is a great need to investigate how anxiety related to heart health influences

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perceived symptoms, changes in lifestyle, and psychological distress (Rishad et al., 2025).

The extensive review of literature conducted for this study also revealed that the etiology of cardiac anxiety among adults is multifaceted, involving various psychological factors, such as health-related anxiety, perceived vulnerability to heart problems, and coping mechanisms. However, the review identified a gap in the literature on the interplay of these psychological factors and their impact on cardiac anxiety among adults. Previous research has also shown that people with cardiac anxiety are more likely to seek out specialised services and medical assistance, but psychological assistance is rarely acknowledged as being necessary. In this scenario, it is essential to understand the influence of psychological factors in cardiac anxiety, as psychiatric comorbidities like depression and generalised anxiety also occur along with cardiac anxiety among individuals. A deeper comprehension of these factors could aid in identifying individuals in need of psychological assistance as well as diagnosing the comorbidity that underlies cardiac anxiety (Pokrajac-Bulian et al., 2022). Though quantitative evaluation of the various predictors and consequences of cardiac anxiety has been conducted in the past, there is limited information available on the condition and its associated factors through quantitative studies. Therefore, this study adopted a qualitative exploratory study design to explore the risk factors, protective factors, consequences, and management strategies of cardiac anxiety among adults.

The study was conducted among 34 adults from Kerala who belonged to the age group of 18 to 28 years with cardiac anxiety. All of them were individuals without cardiac diseases or a history of cardiac diseases. The participants were

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selected through a screening test using the CAQ. A survey form was prepared, including the socio-demographic details, cardiac anxiety questionnaire, and other screening tests for exclusion, and shared through social media and mutual networking among adults in Kerala. Additionally, it was circulated among colleges students from various colleges in Kerala. The researcher approached 1004 individuals in the age group of 18-39 years for screening purposes and included a total of 755 participants for screening. To recruit the participants, a purposive sampling was used.

The individuals who scored a high level of cardiac anxiety in the list of 755 participants and gave consent to participate in the interview were selected to participate in semi-structured interviews, which aimed to explore the factors, consequences, and management strategies of cardiac anxiety among adults. As a commonly used data collection procedure in qualitative studies, this study also chose semi-structured interviews. Upon completion of the data collection, the study performed a reflexive thematic analysis to identify key themes. In qualitative research, thematic analysis is a common strategy used to find data trends. After the evaluation of the data, the study divided factors into several themes, which were further divided into subthemes.

Through the analysis, four overarching themes emerged, and a varying number of themes emerged under each overarching theme. The first overarching theme was the unfolding of cardiac anxiety. The themes that emerged under this include a fragile sense of bodily trust, lifestyle patterns that amplify vulnerability, relational worlds that shape anxiety, embodied vulnerabilities, information that harms rather than helps environments and moments that spark fear. The second

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overarching theme was the dynamics of resilience and support. The key themes that emerged under this overarching theme include psychological resources for resilience, informed and rational health engagement, supportive interpersonal networks, and gender-based perceptions. The third overarching theme that emerged from the analysis is the manifestations of an internal conflict. The themes that emerged from this are psychological toll: living on mental health alerts, functional impairments in life domains, and the effect of anxiety on the body. The final overarching theme was a dual-path journey: adaptation vs. avoidance. The themes that emerged from this include adaptive self-regulatory coping, avoidance of cardio-triggering activities, help-seeking, reassurance and health-risk behaviors as coping.

Conclusions

The reflexive thematic analysis revealed several significant insights. Compared to other anxiety constructs, cardiac anxiety has received less empirical attention; yet, it is a clinically significant type of interoceptive fear and hypervigilance. It has been found that the onset and maintenance of cardiac anxiety are broadly caused by multidimensional factors such as psychological, lifestyle, behavioral, biological, situational, media-related, and interpersonal factors. The analysis revealed that cognitive distortions, faulty health perceptions, negative emotional states, lack of adequate health literacy, unhealthy lifestyles, lack of supportive systems, genetic predisposition, and post-COVID-related perceptions are the major risk factors that significantly influence the occurrence and exacerbation of cardiac anxiety. This led to the suggestion that the presence of an internal locus of control, self-efficacy, reflective thinking, health literacy,

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optimistic beliefs, social support, etc., can act as protective factors against cardiac anxiety that lessen the effects of risk factors, minimise its intensity, and foster positive outcomes.

The analysis further found that elevated cardiac anxiety leads to devastating consequences. It observes that this situation can seriously affect the mental health and overall well-being of individuals, resulting in the weakening of their psychological vitality. Together, these can cause functional impairments in various life domains such as personal, interpersonal, academic, occupational, and social life. The inferences suggest a chronic distress pattern related to functional impairment and health in individuals who perceive they have heart disease; this implies a high psychosomatic component of symptom experience. Importantly, cardiac anxiety is manageable through various self-management strategies such as lifestyle modifications, stress management techniques, psychological techniques, engagement in recreational and digital activities, social support systems, faith-based and spiritual coping, appropriate help seeking and reassurance, and cardio-protective avoidance behaviors. It has also been found that for temporary relief from the distressing effects of cardiac anxiety, the participants often use certain maladaptive coping mechanisms, and as a result, they engage in certain health risk behaviors. The findings underscore the importance of early detection and psychological evaluation of individuals who complain of cardiac symptoms without objective medical evidence. The study suggests that an interdisciplinary team, involving primary care, cardiology and psychology, aligned with a biopsychosocial model, can improve their care and reduce the chances of unnecessary medical interventions.

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Limitations

The following limitations must be considered when interpreting the findings of the current study. The study used a self-report tool to measure cardiac anxiety during the screening process. Although the tool is valid, respondents' recall biases and social desirability bias might have affected the results. A cause-and-effect relationship has not been established for the risk factors, protective factors, and consequences of cardiac anxiety identified by the present study. Female and student participants dominated the sampling included in this study, and male participants and employees were the fewest. Hence, the sample did not have adequate representation of young adults from such socio-demographic categories. The data were not evaluated for gender or socioeconomic differences.

Recommendations for Future Studies

Based on the key findings derived from this study, the researcher has identified a set of recommendations that can lead to future studies as an extension. Scholars may consider longitudinal designs to clarify the temporal dynamics of cardiac anxiety and the emergence of its associated factors that evolve, stabilise, or intensify, especially in response to life transitions or health changes. Such endeavours shall determine new patterns. There is a scope for quantitatively evaluating and validating risk factors, protective factors, and consequences of cardiac anxiety identified in the present study. Based on the inferences from this study, future research can focus on developing intervention modules and their efficacy in managing cardiac anxiety can be tested. Furthermore, investigating the full range of biological markers of cardiac anxiety can shed light on the interaction between physiological arousal and symptom perception. Since the data for this

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study were confined to only Kerala, there is scope for future research in the same direction, employing a large sample from all over India and varying demographic variables. There is also a scope for engaging in similar studies in multicultural environments to examine similarities and differences across communities. A similar study that may be extended to different age groups, such as middle-aged and older age groups, who are more vulnerable to cardiac diseases, will help obtain more relevant data and insights. Since the study focused only on the non-clinical population, there is a scope for future qualitative studies that focus exclusively on the population of cardiac patients or the NCCP. Given the unique features and consequences identified in the study, future research studies can also make efforts to refine assessment tools for measuring cardiac anxiety to promote early psychological referral.

Implications

The present study is the first of its kind employing a qualitative research design to explore various dimensions of risk factors, protective factors, consequences, and self-management strategies for cardiac anxiety among adults. It helped to differentiate cardiac anxiety from other clinical conditions and highlight the significance of its recognition and timely psychological referral. It also laid the groundwork for future empirical studies, facilitating interdisciplinary dialogue and highlighting the relevance of cardiac anxiety within the broader health and psychosocial research contexts. For example, the applicability of this study extends beyond the domain of psychology as it offers valuable insights for public health and cardiac care. Therefore, the findings derived from this study will be helpful for researchers, clinicians, and policymakers across these interdisciplinary domains.

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The finding also supports the integration of psychological screening into routine medical care, particularly within cardiology and primary care settings. Given the overlap between somatic symptoms and anxiety disorders, the study recognises the importance of professionals, such as health psychologists, behavioral medicine specialists, and general practitioners, being engaged in early identification and referral processes. Such collaboration can improve patient outcomes and reduce unnecessary medical investigations, as noted by Rishad et al. (2025).

The multi-dimensional risk factors, protective factors, and consequences identified through this study can be utilized to design targeted, person-centred, multi-dimensional interventions that can reduce the symptom burden, enhance coping and resilience, and foster cardiac health. For example, this study highlighted how cardiac anxiety fosters a vicious cycle of hypervigilance, maladaptive behaviors (e.g., avoidance, reassurance seeking), and emotional distress. Hence, psychological interventions like CBT, psychoeducation, and emotion regulation training can help restructure maladaptive thoughts, improve symptom tolerance, and interrupt this vicious cycle, thereby preventing chronicity and promoting better psychological and physiological outcomes.

Furthermore, recognising the dual influence of media exposure, both in amplifying health-related fears and fostering awareness, adds critical depth to how individuals interpret and manage their cardiac-related concerns in the digital era. By mapping the wide-ranging psychological, behavioral, social, and lifestyle influences, the study informs clinicians, mental health professionals, and public health policymakers on how to design preventive strategies, early screening protocols, and integrative care models that address both the roots and ripple effects

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of cardiac anxiety. Insights given by the study about the genetic predisposition-related risk factors have implications for the genetic counselling of these individuals.



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