

# A Bibliometric Analysis of Studies between 1980 and 2024 on Anxiety in Cardiac Surgery

## 1980-2024 Yılları Arasında Kalp Cerrahisinde Anksiyeteye İlişkin Çalışmaların Bibliyometrik Analizi

### ABSTRACT

**Objective:** This study aimed to analyze articles related to cardiac surgery and anxiety using bibliometric approaches and techniques.

**Method:** This descriptive bibliometric study was conducted using the Web of Science database, covering the years 1980 to 2024. Relevant publications were identified using keywords such as "cardiac surgery," "heart surgery," "coronary artery bypass graft," "heart valve surgery," "coronary artery bypass," "cardiothoracic surgery," and "anxiety." Data were collected on December 17, 2024, and analyzed using VOSviewer 1.6.20 software to visualize research trends, collaborations, and keyword relationships.

**Results:** A total of 1,176 publications were included, comprising 1,034 research articles and 142 review papers. The volume of publications has increased significantly over time, peaking in 2022. The United States emerged as the leading contributor (n = 249), followed by Iran and Australia. The most prominent research areas were cardiovascular systems, cardiology, and nursing. The most frequently used keywords included "anxiety," "depression," and "cardiac surgery." Leading journals publishing in this field included Heart & Lung, Journal of Psychosomatic Research, and Journal of Clinical Nursing.

**Conclusion:** While anxiety in cardiac surgery has been a long-standing topic of study, it remains highly relevant. Nurses play a critical role in addressing anxiety in this context. Multidisciplinary interventional studies are recommended to advance the field further.

**Keywords:** Anxiety, bibliometric analysis, cardiac surgery, patient care, surgical outcomes

### ÖZET

**Amaç:** Bu çalışmanın amacı, bibliyometrik yaklaşımlar ve teknikler kullanarak kalp cerrahisi ve anksiyete ile ilgili makaleleri analiz etmektir.

**Yöntem:** Araştırma, tanımlayıcı ve bibliyometrik bir türde olup, 1980-2024 yılları arasında Web of Science veritabanı kullanılarak yapılmıştır. İlgili yayınlar, "kardiyak cerrahi", "kalp cerrahisi", "koroner arter baypas grefti", "kalp kapak cerrahisi", "koroner arter baypas", "kardiyotorasik cerrahi" ve "anksiyete" anahtar kelimeleri kullanılarak taranmıştır. Kalp cerrahisinde anksiyete ile ilgili yayınlar seçilmiştir. Veriler 17 Aralık 2024 tarihinde toplanmıştır. Veri görselleştirme ve analizi için VOSviewer yazılımı kullanılmıştır.

**Bulgular:** İnceleme kapsamına 1.034 makale ve 142 derlemeden oluşan 1.176 yayın dahil edilmiştir. Analiz, zaman içinde yayınlarda belirgin bir artış olduğunu ve 2022 yılında zirveye ulaştığını göstermektedir. Amerika Birleşik Devletleri, önde gelen katkıda bulunan ülke (n = 249), ardından İran ve Avustralya gelmektedir. Birincil araştırma alanları kardiyovasküler sistemler, kardiyoloji ve hemşireliktir. "Anksiyete", "depresyon" ve "kalp cerrahisi" en sık kullanılan anahtar kelimelerdir. En iyi dergiler Heart & Lung, Journal of Psychosomatic Research ve Journal of Clinical Nursing'tir.

**Sonuç:** Kalp cerrahisinde anksiyete uzun süredir çalışılmasına rağmen, güncelliğini korumaktadır. Kalp cerrahisinde anksiyete konusunda hemşireler önemli katkılar sağlamaktadır. Multidisipliner girişimsel çalışmalar yapılması önerilmektedir.

**Anahtar Kelimeler:** Anksiyete, bibliyometrik analiz, kalp cerrahisi, hasta bakımı, cerrahi sonuçlar

### ORIGINAL ARTICLE KLİNİK ÇALIŞMA

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**Received:** December 27, 2024

**Accepted:** September 16, 2025

**Cite this article as:** Kankaya EA. A Bibliometric Analysis of Studies between 1980 and 2024 on Anxiety in Cardiac Surgery. *Turk J Cardiovasc Nurs.* 2025;16(41):172-180.

DOI: 10.5543/khd.2025.45822



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### Introduction

Cardiac surgery is a procedure that imposes significant physical and psychological stress on both patients and caregivers.<sup>1-3</sup> The prevalence of anxiety among patients ranges

from 10% to 80%.<sup>4-6</sup> Anxiety experienced during the preoperative and postoperative periods is a critical factor that directly impacts surgical outcomes and recovery processes. Anxiety typically increases before surgery and decreases afterward; however, it has been reported to persist for up to six months in 20% of patients.<sup>7</sup> Anxiety has been shown to result in adverse outcomes in cardiac surgery. A study conducted in Türkiye indicated that high preoperative anxiety significantly impacted postoperative pain and led to poor sleep quality in 90% of patients.<sup>8</sup> Similarly, a prospective cohort study found that preoperative anxiety increased the need for postoperative analgesics in cardiac surgery patients.<sup>9</sup> In another study, preoperative anxiety and depression were associated with a higher incidence of postoperative delirium.<sup>10</sup> Therefore, understanding the effects of anxiety on the surgical process and developing evidence-based approaches to manage it is of great importance.

Several studies have investigated the factors affecting anxiety in cardiac surgery patients. A key finding from one study was that preoperative anxiety levels were higher in female patients compared to male patients, and the presence of family support did not significantly influence this anxiety.<sup>11</sup> Another study revealed that preoperative optimism was associated with lower levels of postoperative anxiety.<sup>12</sup> Various pharmacological and non-pharmacological methods have proven effective in reducing anxiety. One study reported that clonidine and gabapentin were effective in reducing anxiety but did not significantly affect cardiac outcomes.<sup>4</sup> Music therapy,<sup>13</sup> acupressure,<sup>14</sup> and perioperative psychological interventions<sup>15</sup> have been identified as effective methods for reducing anxiety. Additionally, preoperative education and hospital visits have been highlighted in the literature as effective means of alleviating anxiety before surgery.<sup>6,16,17</sup>

The increase in the number of studies on anxiety makes it necessary to determine the general trends in the literature and identify research gaps. At this point, bibliometric analysis is an important research tool that quantitatively evaluates scientific publications and helps to understand the general structure of the field.<sup>18-20</sup> Bibliometric analysis is a research method that quantitatively evaluates scientific publications. This approach uses mathematical and statistical techniques to map the structure of research fields, identify knowledge gaps, and generate new research ideas.<sup>21-23</sup> Performance analysis assesses the contributions of authors, organizations, and countries based on metrics such as publication and citation counts. At the same time, scientific mapping explores relationships between research components such as authors and keywords.<sup>22,24,25</sup> Bibliometric analysis has been demonstrated to facilitate progress in the applied sciences, particularly in identifying research priorities, recognizing knowledge gaps, and comprehending general disciplinary trends.<sup>20,24,26</sup> In recent years, bibliometric studies have been published in prominent journals related to nursing, covering a wide variety of topics, including diabetic foot nursing care, patient safety and surveillance, delirium, and the prevention of inpatient falls.<sup>25,27-31</sup> To conduct such analyses with reliable data, it is necessary to use a comprehensive, high-quality, and internationally recognized data source. In this context, the Web of Science database is preferred because of its comprehensive citation indexes, interdisciplinary coverage, and the ability to

## MAIN POINTS

- The bibliometric analysis of 1,176 publications from 1980 to 2024 revealed that the highest number of publications occurred in 2022. Nursing emerged as the second most important field of research.
- The most significant keywords identified were "cardiac anxiety," "depression," "cardiac surgery," "quality of life," and "pain."
- The top three journals with the highest number of publications and citations in the field of anxiety in cardiac surgery were nursing journals.

analyze relationships between scientific publications in detail. This study aims to comprehensively evaluate the literature, identify the main trends, and reveal research gaps using the Web of Science database for bibliometric analysis of cardiac surgery and anxiety articles. Bibliometric analysis of cardiac surgery and anxiety studies is crucial for comprehensively evaluating the literature in this field, identifying the main trends, and revealing research gaps. This study aims to analyze articles on cardiac surgery and anxiety using bibliometric methodology.

## Materials and Methods

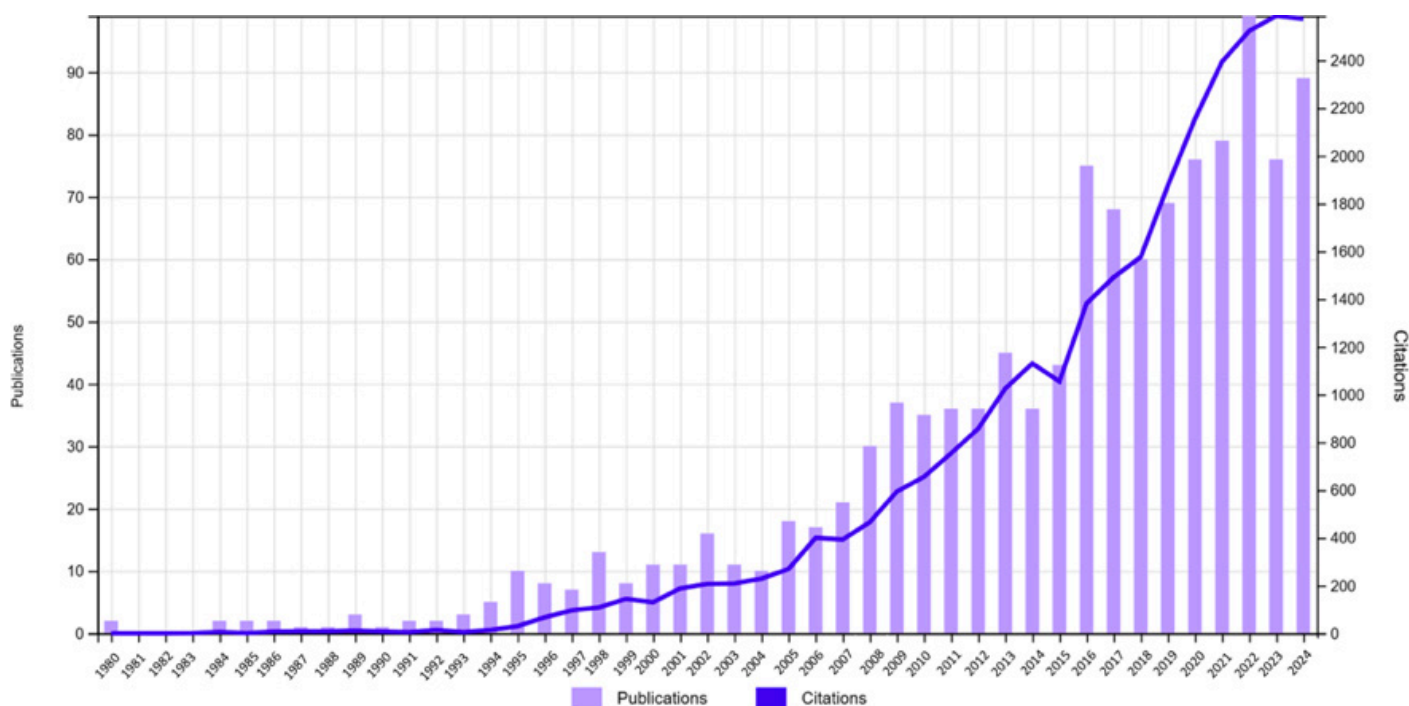
This study used a bibliometric, descriptive research design.<sup>18,19,32,33</sup> The research questions were as follows:

- What is the annual publication trend between 1980 and 2024?
- Which disciplines (e.g., cardiology, nursing, internal medicine) have the most publications?
- Who are the most cited authors, and what are their publications on anxiety in cardiac surgery?
- What are the most frequently used key terms in publications on anxiety in cardiac surgery?
- Which journals have contributed studies on anxiety in cardiac surgery?

Web of Science was selected as the database for this research. The Web of Science database provides broad access to an interdisciplinary and comprehensive scientific data network, including high-quality, reliable publications.<sup>20,34</sup>

Data were collected on December 17, 2024. The dataset was generated by searching the Web of Science database using keywords related to cardiac surgery, including "cardiac surgery," "heart surgery," "coronary artery bypass graft," "heart valve surgery," "coronary artery bypass," and "cardiothoracic surgery." To capture studies addressing anxiety, the keyword "anxiety" was also included. Studies focusing on anxiety in cardiac surgery were selected based on their relevance to the topic and keyword criteria. The dataset includes studies published between 1980 and 2024, with the oldest publication from 1980 and the most recent from 2024. In total, 1,176 publications were identified, consisting of 142 review articles and 1,034 research articles.

The VOSviewer 1.6.20 software package was used during the analysis phase, as it allows direct processing of Web of Science data to produce visual outputs and graphical representations.



**Figure 1. Number of publications and citations by year (1980-2024).**

VOSviewer was chosen due to its strong functionality and ability to facilitate the exploration of developments, relationships, and emerging concepts in the literature. Widely recognized as an essential tool for bibliometric research, VOSviewer offers advanced features for visualization, mapping, and multidimensional analysis, enabling detailed examination of datasets.<sup>24, 25, 28, 34</sup>

### Ethics

Ethics committee approval was not required, as the study was a bibliometric analysis using the Web of Science database.

### Results

Between 1980 and 2024, a total of 1,176 studies on anxiety in cardiac surgery patients were published. Of these, 1,034 (87.92%) were research articles, and 142 (12.08%) were review articles. An increase in the number of publications on cardiac surgery and anxiety over the years was observed. The highest number of studies was published in 2022 ( $n = 99$ ), while the year with the most citations was 2023, with 2,583 citations. Excluding self-citations, the total number of citations for the 1,176 studies was 18,575, with these citations appearing in 23,896 articles. The average number of citations per study was 23.54 (Figure 1).

When research areas were analyzed, "cardiovascular systems and cardiology" ranked first with 321 publications, followed by "nursing" with 244 (20.74%) publications and "general internal medicine" with 154 (13.09%) publications (Figure 2).

The top ten contributors to research on anxiety in cardiac surgery were: Tully P. ( $n = 16$ ), Baker RA ( $n = 14$ ), Berg SK ( $n = 10$ ), Ai AL ( $n = 10$ ), Murphy BM ( $n = 9$ ), Le Grande MR ( $n = 9$ ), Medoff-Cooper B ( $n = 8$ ), Steptoe A ( $n = 8$ ), Arora RC ( $n = 8$ ), and Jahangiri M ( $n = 7$ ). The 10 most-cited studies and their first authors in

cardiac surgery and anxiety are listed in Table 1. According to the most recent bibliometric analysis, Kalkman et al. in 2003<sup>35</sup> had received 411 citations, Druss et al. in 2000<sup>36</sup> had received 407 citations, Arthur et al. in 2000<sup>37</sup> had received 328 citations, Carli et al. in 2010<sup>38</sup> had received 324 citations, Rosenberger et al. in 2006<sup>39</sup> had received 279 citations, Brander et al. in 2007<sup>40</sup> received 262 citations, Karsdorp et al. in 2007<sup>41</sup> received 253 citations, Treggiari et al. in 2009<sup>42</sup> received 248 citations, Clark et al. in 1995<sup>43</sup> received 242 citations, and Tedstone et al. in 2003<sup>44</sup> received 228 citations.

The primary languages of publication were English (95.40%;  $n = 1,122$ ), German (1.78%;  $n = 21$ ), Portuguese (0.76%;  $n = 9$ ), Spanish (0.42%;  $n = 5$ ), and Turkish (0.34%;  $n = 4$ ). Researchers from 79 different countries contributed studies on anxiety in cardiac surgery. The countries with the most significant contributions were the United States ( $n = 249$ , citations = 8,428), Iran ( $n = 94$ , citations = 1,001), Australia ( $n = 89$ , citations = 3,224), Canada ( $n = 89$ , citations = 2,942), China ( $n = 87$ , citations = 1,176), the United Kingdom ( $n = 86$ , citations = 2,840), Germany ( $n = 85$ , citations = 2,159), Türkiye ( $n = 75$ , citations = 705), the Netherlands ( $n = 51$ , citations = 2,141), and Italy ( $n = 50$ , citations = 611).

When examining the organizations contributing to the research, 1,561 organizations were identified. The top 10 organizations were: University of Melbourne ( $n = 23$ ), Flinders University of South Australia ( $n = 19$ ), Université de Montréal ( $n = 17$ ), University of Toronto ( $n = 16$ ), University of Adelaide ( $n = 16$ ), Monash University ( $n = 15$ ), Flinders Medical Centre ( $n = 13$ ), University College London ( $n = 13$ ), Copenhagen University Hospital ( $n = 13$ ), and University of Tehran Medical Sciences ( $n = 13$ ) (Figure 3).

Table 1. Top ten most cited publications and authors

	Author(s)	Title	Year	Journal name	Total citations
1	Kalkman et al. <sup>35</sup>	Preoperative prediction of severe postoperative pain	2003	<i>Pain</i>	411
2	Druss et al. <sup>36</sup>	Mental disorders and use of cardiovascular procedures after myocardial infarction	2000	<i>JAMA-Journal of the American Medical Association</i>	407
3	Arthur et al. <sup>37</sup>	Effect of a preoperative intervention on preoperative and postoperative outcomes in low-risk patients awaiting elective coronary artery bypass graft surgery – A randomized, controlled trial	2000	<i>Annals of Internal Medicine</i>	328
4	Carli et al. <sup>38</sup>	Randomized clinical trial of prehabilitation in colorectal surgery	2010	<i>British Journal of Surgery</i>	324
5	Rosenberger et al. <sup>39</sup>	Psychosocial factors and surgical outcomes: An evidence-based literature review	2006	<i>Journal of the American Academy of Orthopaedic Surgeons</i>	279
6	Brander et al. <sup>40</sup>	Pain and depression influence outcome 5 years after knee replacement surgery	2007	<i>Clinical Orthopaedics and Related Research</i>	262
7	Karsdorp et al. <sup>41</sup>	Psychological and cognitive functioning in children and adolescents with congenital heart disease: A meta-analysis	2007	<i>Journal of Pediatric Psychology</i>	253
8	Treggiari et al. <sup>42</sup>	Randomized trial of light versus deep sedation on mental health after critical illness	2009	<i>Critical Care Medicine</i>	248
9	Clark et al. <sup>43</sup>	Microemboli during coronary artery bypass grafting – Genesis and effect on outcome	1995	<i>Journal of Thoracic and Cardiovascular Surgery</i>	242
10	Tedstone et al. <sup>44</sup>	Posttraumatic stress disorder following medical illness and treatment	2003	<i>Clinical Psychology Review</i>	228

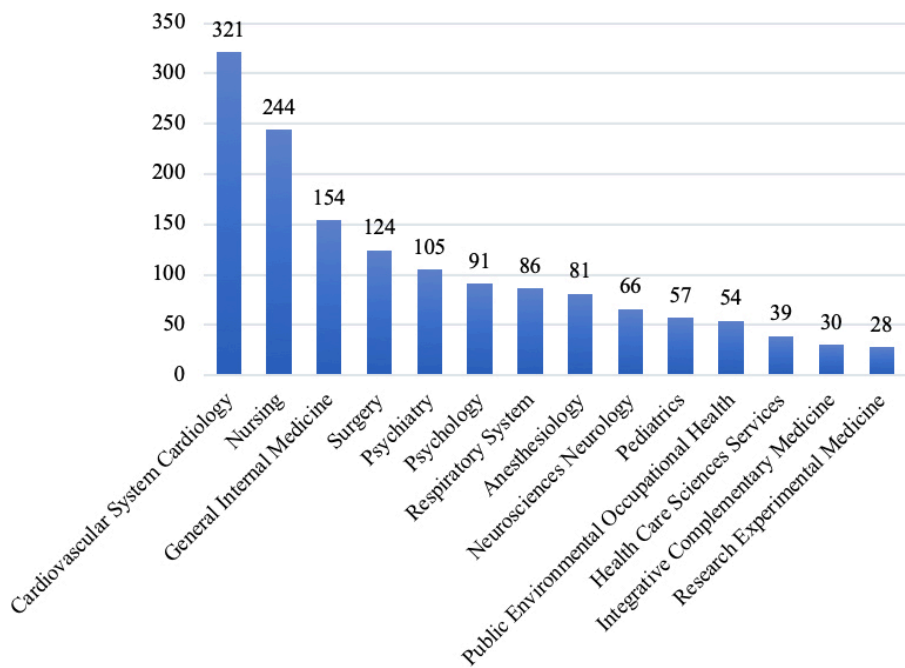


Figure 2. Investigation of research areas by year (1980-2024).

The journals with the highest number of publications and citations in the field of anxiety in cardiac surgery were: Heart & Lung (n = 28, 1,150 citations), followed by Journal of Psychosomatic Research (n = 20, 880 citations), Journal of Clinical Nursing (n = 20, 569 citations), Cardiology in the Young (n = 19, 400 citations), Journal of Cardiovascular Nursing (n = 18, 352 citations), European Journal of Cardiovascular Nursing (n = 16, 334 citations), Psychology, Health & Medicine (n = 14, 326 citations), BMJ Open (n = 12,

178 citations), Journal of Thoracic and Cardiovascular Surgery (n = 12, 617 citations), and Journal of Advanced Nursing (n = 11, 386 citations). Other journal names are shown in Figure 4.

A total of 1,957 keywords were identified in the publications on anxiety in cardiac surgery. The most frequently used keywords were "anxiety" (n = 318), "depression" (n = 219), "cardiac surgery" (n = 186), "quality of life" (n = 71), "pain" (n = 56), "congenital





**Figure 3. Institutions contributing to the literature.**

heart disease" (n = 46), "delirium" (n = 45), "coronary artery bypass graft surgery" (n = 45), "surgery" (n = 42), "coronary artery bypass graft" (n = 39), "nursing" (n = 37), "cardiac rehabilitation" (n = 36), "stress" (n = 34), "coronary artery bypass" (n = 31), "coronary artery bypass grafting" (n = 31), "coronary heart disease" (n = 28), "CABG" (n = 27), "coronary artery disease" (n = 25), "patient education" (n = 21), "risk factors" (n = 19), "cardiac surgical procedures" (n = 18), "thoracic surgery" (n = 18), "open-heart surgery" (n = 18), "postoperative pain" (n = 18), "systematic review" (n = 17), "meta-analysis" (n = 16), "randomized controlled trial" (n = 15), "preoperative anxiety" (n = 15), "mental health" (n = 14), "critical care" (n = 14), "cardiovascular disease" (n = 14), "rehabilitation" (n = 14), "parents" (n = 13), "self-efficacy" (n = 13), "mortality" (n = 13), "cortisol" (n = 12), "postoperative delirium" (n = 12), "coping" (n = 12), and "music" (n = 12). These keywords and their clusters are shown in Figure 5.

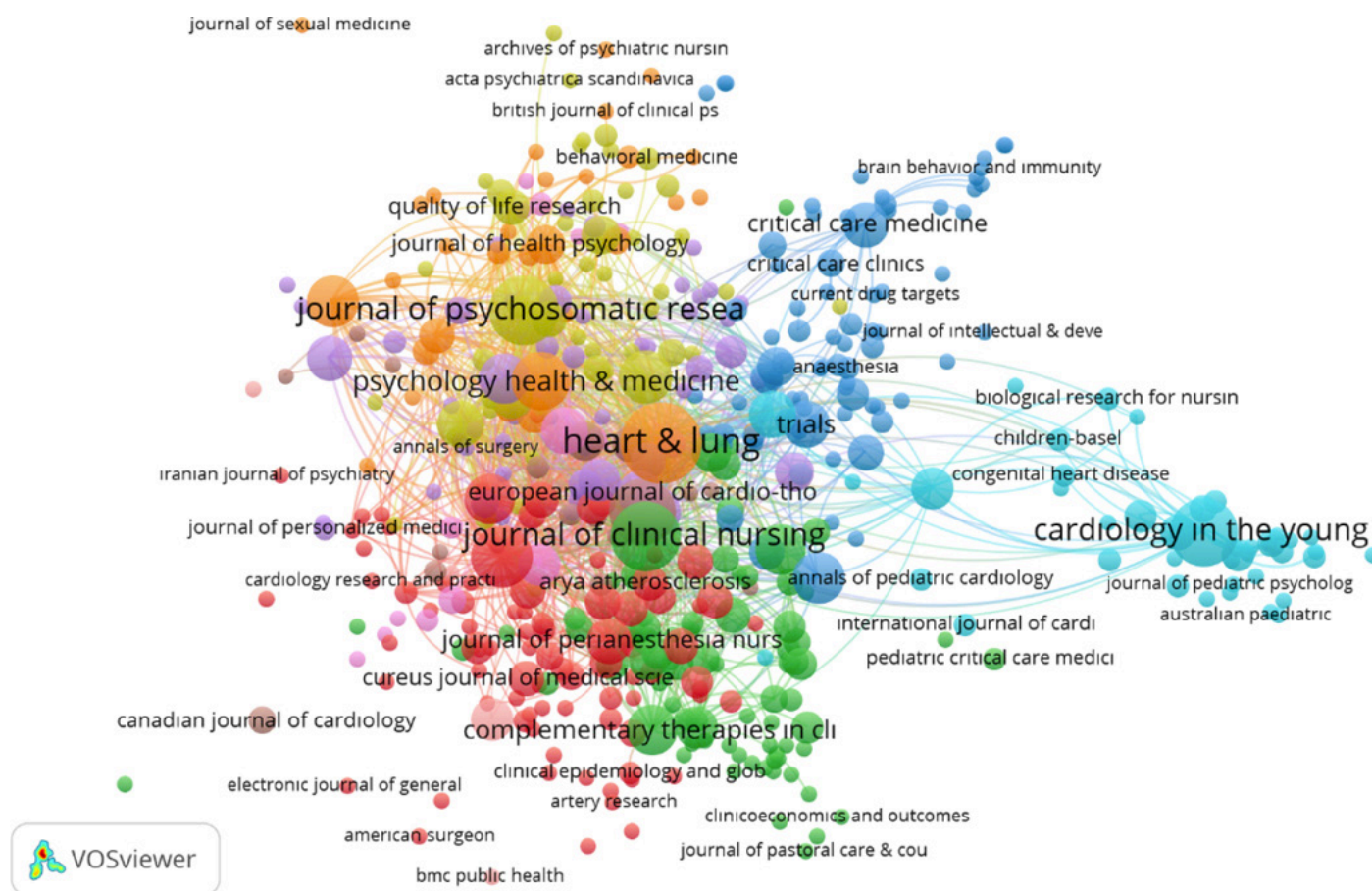
The journals included in the bibliography of studies on cardiac surgery and anxiety were as follows: Journal of Psychosomatic Research (n = 20, 880 citations), European Journal of Cardiovascular Nursing (n = 16, 334 citations), Heart & Lung (n = 28, 1,150 citations), Journal of Behavioral Medicine (n = 9, 285 citations), Journal of Cardiovascular Nursing (n = 18, 352 citations), Journal of Clinical Nursing (n = 20, 569 citations), Psychology, Health & Medicine (n = 14, 326 citations), BMJ Open (n = 12, 178 citations), International Journal of Cardiology (n = 10, 389 citations), Cochrane Database of Systematic Reviews (n = 3, 320 citations), Journal of Thoracic and Cardiovascular Surgery (n = 12, 617 citations), Journal of Advanced Nursing (n = 11, 386 citations), Journal of Perianesthesia Nursing (n = 8, 110 citations),

Annals of Thoracic Surgery (n = 9, 408 citations), British Journal of Health Psychology (n = 5, 97 citations), Psychosomatic Medicine (n = 5, 360 citations), PLOS One (n = 6, 165 citations), Journal of Health Psychology (n = 6, 181 citations), International Journal of Nursing Studies (n = 7, 353 citations), and Journal of Geriatric Cardiology (n = 2, 203 citations).

## Discussion

This study examined the literature on cardiac surgery and anxiety from 1980 to 2024, focusing on publication trends, keyword distributions, and contributions from countries and organizations. The majority of publications and citations in this field occurred in 2022 and 2023, respectively. These findings highlight that anxiety continues to be a significant issue in cardiac surgery. The ongoing interest in this topic reflects that anxiety remains a critical focus for researchers, and current interventional studies indicate that solutions are actively being sought.<sup>13,45-48</sup>

A review of research areas revealed that "cardiovascular systems and cardiology" (321 publications), "nursing" (244 publications, 20.74%), and "general internal medicine" (154 publications, 13.09%) were the top three fields. These results underscore the multidisciplinary nature of the topic, with contributions spanning various healthcare disciplines. Nursing, in particular, plays a significant role in this area of research, as nurses are directly involved in patient care both before and after surgery, providing critical support to reduce anxiety. Patient education, emotional support, and addressing psychological needs are essential components of nursing care. The analysis of journals



**Figure 4. Most published and cited journal clusters in the field of anxiety in cardiac surgery.**

with the highest number of publications and citations in the field reveals that high-impact nursing journals, such as *Heart & Lung* and the *Journal of Clinical Nursing*, are among the top three. This finding further validates the essential role of nurses in managing anxiety in cardiac surgery patients.

The study also analyzed the geographical distribution of research on anxiety in cardiac surgery, identifying contributions from 79 countries. The United States led with 249 publications and 8,428 citations, followed by Iran, Australia, Canada, China, the United Kingdom, Germany, Türkiye, the Netherlands, and Italy. These results emphasize the global interest in the topic and the importance of international collaboration. The United States' leading position in both publication volume and citation count can be attributed to its strong academic infrastructure and interdisciplinary collaboration mechanisms. Many clinical trials in this field have been conducted in the U.S., reflecting its leadership in cardiovascular medicine and nursing. Iran, Australia, and Canada have also made significant contributions, with high citation rates. Türkiye, with 75 publications and 705 citations, shows potential for increased interdisciplinary research and greater focus on publishing in high-impact journals.

An analysis of the 1,957 keywords used in publications on anxiety in cardiac surgery revealed that the most frequently used terms were "anxiety" (318), "depression" (219), and "cardiac surgery" (186). These findings highlight that psychosocial factors and

the effects of surgical procedures on patients are central to this body of research. Other prominent keywords, including "nursing" (37), "quality of life" (71), and "pain" (56), reinforce the critical role of nursing in patient care. Nurses contribute significantly to patient education, psychosocial support, and pain management, emphasizing the importance of patient-centered approaches in this area of research.<sup>16,46,49</sup> Keywords related to surgical procedures, such as "coronary artery bypass graft surgery," "postoperative pain," and "open-heart surgery," were also frequently mentioned. These terms suggest that research often focuses on surgical techniques, complications, and their management, reinforcing the need for multidisciplinary approaches to anxiety in cardiac surgery.<sup>2,16,45</sup> Keywords reflecting psychosocial and biological processes, such as "stress," "cortisol," and "self-efficacy," highlight the importance of understanding the impact of anxiety on patients. Studies examining stress and cortisol responses are particularly valuable for gaining insight into the comprehensive effects of surgery on patients. Additionally, the keyword "music" reflects a growing interest in alternative interventions to improve patient experiences during postoperative recovery.<sup>13,48</sup>

## Limitations

This study's analyses were conducted exclusively using the Web of Science database. The exclusion of other significant sources, such as Scopus, YOK Thesis Center, and TR Index, limited the



**Figure 5. Keywords used in the field of anxiety in cardiac surgery and their clustering.**

scope of the analysis and excluded potential findings from these databases. This represents a limitation of the study.

## Conclusion

This study examines the prevalence and impact of anxiety in patients undergoing cardiac surgery using data from the Web of Science database between 1980 and 2024. Bibliometric analyses in this field reveal a significant increase in research on the prevalence and management of anxiety in recent years. Nursing journals dominate the field, with the highest number of publications and citations related to anxiety in cardiac surgery. Keyword analysis indicates that the most frequently studied topics include the risk factors for anxiety and its management strategies, with a particular emphasis on nursing interventions such as education and psychological support. Recent keyword trends also highlight a growing interest in innovative approaches, such as digital therapies, for managing anxiety.<sup>49-53</sup> These innovations should be further explored through comprehensive meta-analyses and international comparisons to develop more effective strategies. It is recommended that international and multidisciplinary research be conducted to investigate the use of innovative methods in managing anxiety among cardiac surgery patients.

**Ethics Committee Approval:** Ethics committee approval was not required, as the study was a bibliometric analysis using the Web of Science database.

**Informed Consent:** Written informed consent was not required.

**Conflict of Interest:** The author declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

**Funding:** The author declared that this study received no financial support.

**Use of AI for Writing Assistance:** No artificial intelligence (AI)-enabled technologies (such as Large Language Models [LLM], chatbots, or image generators) were used in the creation of this study.

**Peer-review:** Externally peer-reviewed.

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