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EFFECTIVENESS OF REFLEXOLOGY ON POST-OPERATIVE OUTCOMES AMONG PATIENTS UNDERGOING CARDIAC SURGERY: A SYSTEMATIC REVIEW

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ABSTRACT

Cardiovascular diseases are the major cause of mortality globally as well as in India. 31% of all death are from cardiovascular diseases. Today cardiac hospitals in India perform over 2 lakhs open heart surgeries per year which is one of the highest worldwide.

Study Design: Systematic review

Aims And Objectives: The review was initiated with an objective to evaluate the effectiveness of reflexology on post-operative outcomes among patients undergoing cardiac surgery.

Background: Nursing care for a cardiac surgery patient is complex and dynamic. Comprehensive nursing care is needed to ensure the complete recovery of the patient after cardiac surgery. The nurse plays a significant role in the peri-operative care of cardiac surgery patients to help them achieve good post-operative outcomes and faster recovery.

Design: Systematic review based on PRISMA guidelines

Methods: A comprehensive literature search was conducted in PubMed, ScienceDirect, Shodhganga, BASE, Science.gov, Google Scholar, ProQuest, ClinicalKey, Semantic Scholar, ERIC and ResearchGate databases for articles published in English language from 1981 January to 2021 January. Despite the fact that there were 590 studies found, only 18 were judged to be eligible for analysis. All of the studies were subjected to a quality review, data extraction, and analysis.

Results: The methodological quality of 18 papers was evaluated. A meta-analysis was not done since the methodology of chosen reviews was heterogeneous. The reviewers classified the primary outcomes as pain, anxiety, exhaustion, sleep quality, physiological parameters, and mechanical ventilation weaning time.

Discussion: The evidence for the usefulness of reflexology on various post-operative outcomes in patients after cardiac surgery is presented in this review. The research in this review have a wide range of methodological features. Greater research using rigorous scientific methods is needed to offer more evidence of reflexology's usefulness.

Conclusion: Despite the fact that reflexology has a number of beneficial outcomes for patients following heart surgery, there are little studies in this field. This emphasises the need for future studies to give greater evidence for the use of reflexology in heart surgery patients to enhance post-operative outcomes and speed recovery.

Relevance To Clinical Practice: Reflexology is found effective in relieving pain, anxiety and fatigue and maintaining physiological parameters and hemodynamic status of patients during the post-operative period. Nurses can perform reflexology to achieve better post-operative outcomes for patients undergoing cardiac surgery.

KEYWORDS: Anxiety, Cardiac Surgery, Pain, Post-Operative Outcomes & Reflexology

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Original Article

1. INTRODUCTION

Cardiovascular diseases are increasing day by day and it is a pre-dominant health problem these days. Cardiac surgery is a lifesaving and life enhancing opportunity to those patients who do not respond appropriately to medical treatment. These patients face significant challenges and experience many physiological and psychological symptoms during the post-operative period. Cardiac surgery patients experience pain, anxiety, stress, muscle tension, variation in blood pressure, heart rate, respiratory rate, cardiac rhythm etc. New approaches and interventions are needed to mitigate these symptoms and to help the patient to achieve better post-operative outcomes.[1]Reflexology is a safe and effective therapeutic intervention to promote wellbeing which could be delivered by nurses to cardiac surgery patients during the post-operative period. Reflexology is found to be effective in reducing pain, anxiety, fatigue, and control of various other physiological and psychological parameters in cardiac surgery patients.[2]

Studies show that reflexology alone or accompanied by other complimentary treatments is beneficial in relieving pain and psychological symptoms of patients who underwent cardiac surgery. It is indicated that foot reflexology can be used by nurses to reduce anxiety and stabilize physiological parameters of cardiac surgery patients. Foot reflexology is found efficient in shortening the length of weaning time in open heart surgery patients. Foot reflexology massage is found to be very effective in improving the quality of sleep of cardiac care unit patients .[3]

Reflexology can improve the hemodynamic status of patients and is a safe and effective nursing intervention. There was significant increase in patient satisfaction with their hospital stay in patients receiving reflexology after cardiac surgery. Complimentary therapies are found to be beneficial in relieving the physiological and psychological symptoms in cardiac surgery patients. Foot reflexology is a reliable and holistic complimentary treatment method. Literature review revealed that reflexology is widely used even before and after cardiac surgery. It is thought that reflexology application to patients undergoing cardiac surgery on nursing care will contribute to the nursing literature by examining the effect of reflexology on pain, anxiety, fatigue, sleep, and physiological parameters.[2,3]

The role of a nurse in the cardiac post-operative unit is very challenging. Nurses working in cardiac surgical areas should learn and practice different interventions to manage various symptoms of patients and to help them recover fast. There are very less research conducted regarding the effectiveness of reflexology in cardiac surgery patients. The current review was intended with an objective to evaluate the effectiveness of reflexology on post-operative outcomes among patients undergoing cardiac surgery.

2. METHODS

2.1. Design

This review was conducted based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. [4]The reviewers developed a protocol as a template for conducting the review.

2.2. Literature Search Strategy

An extensive literature review was conducted in search of relevant original research studies published between 1981 January to 2021 January. The search strategy followed PICO format. The databases searched include Pub Med, Science Direct, Shodhganga, BASE, Science.gov, Google Scholar, Pro Quest, Clinical Key, Semantic Scholar, ERIC and Research Gate. The search was carried out by using various keywords like reflexology, cardiac surgery, open heart surgery, pain,

post-operative outcomes, reflexology massage, physiological parameters and anxiety using Boolean operators 'AND and OR'. Detailed methods of study excerpts from each database are shown in Table 1.

Table 1: Database Search

Database	Years Searched	No of Studies Retrieved	Total Studies
PubMed	1981-2021 January	103	590
Science.gov		44	
Science direct		54	
Google scholar		251	
ProQuest		22	
Shodhganga		6	
Clinical Key		33	
Semantic Scholar		23	
ResearchGate		46	
Cochrane		8	

2.3. Criteria for Selection of Studies

Studies were included in this review if they fulfilled the following inclusion criteria –

Type of Study

- Original research studies that were published in English between January 1981 to January 2021.
- Randomized Controlled Trials, non-randomized controlled trials, and quasi-experimental studies for cardiac surgery patients that incorporated any form of reflexology.
- Research comparing any type of reflexology to standard care.

Type of Intervention

- The trials looked at the impact of any type of reflexology on one or more post-operative outcomes in individuals who had undergone cardiac surgery.

Type of Participants

- Adult patients over the age of 18 who were undergoing cardiac surgery such as CABG and open-heart surgery were included in the studies.

Type of Outcomes

- Reflexology's effectiveness on primary and secondary outcomes was evaluated.

Primary Outcomes

- Anxiety
- Pain
- Heart Rate
- Blood Pressure
- Respiratory Rate

- Oxygen saturation

Secondary Outcomes

- Fatigue
- Quality of Sleep
- Mechanical Ventilation Weaning Time

2.4. Study Selection

References were gathered from all databases by the primary reviewer, and duplicates were deleted. Any differences amongst the reviewers were handled once the titles and abstracts were checked for eligibility. Databases were used to obtain the full text contents of the probable articles. To eliminate duplication, studies with multiple reports were integrated together.

2.5. Data Extraction

The Cochrane Data Extraction Form (https://dplp.cochrane.org/) was used to create a format. 5 Based on the objectives and inclusion criteria, the review identified studies. The author, year, nation, setting, sample size, details of the intervention, and outcomes were all included on the data extraction form.

2.6. Methodological Quality of Studies

Delphi checklist tool was used to measure quality. The methodological quality of each study was appraised by the reviewers, and any differences were resolved after discussion.

2.7. Risk of Bias

The Cochrane risk of bias assessment tool was used to assess the risk of bias. Random sequence creation, allocation concealment, blinding of personnel, blinding of outcome, incomplete outcome, selective reporting, and other criteria were used to evaluate each review. According to the tool, studies were classified as high risk, low risk, or unknown risk.

2.8. Data Synthesis

Methodological and intervention variables, as well as outcomes, were estimated. Methodologically and statistically, the research that were considered were diverse. The age groupings ranged from 18 to 75 years old. According to Khosrow et al.,2019; Abbaszadeh et al.,2017, the sample size ranged from 40 to 120. Each trial had a different type of reflexology, length, and outcome. Pain, anxiety, physiologic markers, exhaustion, and mechanical ventilation weaning time were the key outcome factors. The instruments used to collect data were likewise unique. The physiologic parameters and hemodynamic status were assessed using an electronic monitor and routine patient monitoring. The level of agitation was measured using the Richmond Agitation Sedation Scale. 7 Instruments such as the Visual scale, Brief rating scale, and State trait anxiety assessment were used to assess anxiety. 8,9,14,21,23 The Visual Analog Scale, Mc Gill pain questionnaire, and numerical rating scale were used to assess pain. 9,11,13,14,15,20,22 Richard's Campbell sleep scale 22 was used to assess sleep quality, while the Visual Analog scale was used to assess fatigue. 9,11,14

- **Ethics approval and consent to participate**

This review is carried out following the ethical guidelines. PRISMA checklist is used for reporting.

- **Consent for publication**

Not applicable

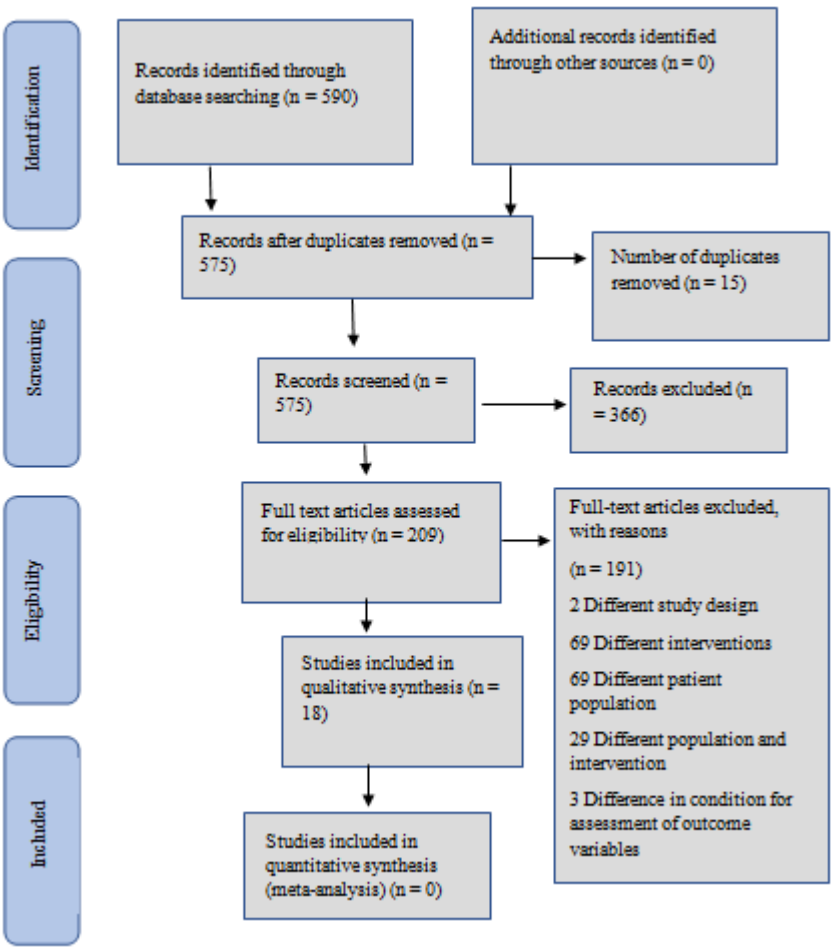
- **Availability of data and material**

The data that support the findings of this study are available on request from the corresponding author.

3. RESULTS

3.1. Search Process

There were 590 items found in the literature search. After the duplicates were removed, 574 articles were kept for title and abstract screening. Only 209 articles remained for full text screening after initial screening eliminated 365 items. 191 studies were excluded from the total of 209 for a variety of reasons, including different study designs (n = 2), different interventions (n = 69), different patient populations (n = 69), different populations and interventions (n = 29), and different conditions for assessing outcome variables (n = 3). Only 18 articles were eventually included in this review, as 16 were systematic reviews, two were meta-analyses, and one was an ongoing experiment. (See figure 1).



3.2. Characteristics of Studies and Sample

There were a total of 18 studies in all. Between 2006 and 2018, they were published. The studies' sample sizes ranged from 40 to 120 people. Thirteen research were conducted in Iran, two in Egypt and Turkey, and one in Thailand.

They ranged in age from 18 to 80 years old in terms of sample characteristics. The majority of the research included both men and women. Only males were included in one study, while only females were included in the other. 15 Patients in all of the studies had elective cardiac surgery, such as coronary artery bypass grafts and open-heart procedures. The experimental group received reflexology in all of the studies analysed, while the control group received regular treatment. In the bulk of the trials, the post-operative outcomes were different. The sample characteristics of the examined studies are shown in table 2.

Table 2: Characteristics of Included Studies

References, Country	Study Type	Aim	Sample Size	Age Group	Surgery Type	Reflexology Type	Outcome Measures
Ebadi et al.[6] 2014 Iran	RCT	To investigate the efficacy of foot reflexology on physiological parameters and mechanical ventilation weaning time in patients undergoing open-heart surgery.	96	18-75 years	Open heart surgery	Foot reflexology massage	Physiological parameters and weaning time
Allahbhakshian et al.[7] 2017 Iran	RCT	To examine the effects of foot reflexology on agitation and extubation time of male patients following coronary artery bypass graft surgery.	120 male patients	Age group not mentioned	CABG	Foot reflexology massage	Agitation, extubation time
Abbaszadeh et al.[8] 2017 Iran	RCT	To investigate the effect of foot reflexology on anxiety and physiological parameters in patients after CABG surgery.	120	18-65 years	CABG	Foot reflexology	Physiological parameters and anxiety
Elif et al.[9] 2020 Turkey	RCT	To examine the effect of Reflexology on pain, anxiety, fatigue, sleep and physiological parameters in patients undergoing Coronary Artery Bypass Graft Surgery	70	18-65 years	CABG	Reflexology	Pain, fatigue, anxiety, sleep and physiological parameters

Kandemir et al.[10] 2015 Turkey	NRCT	To determine the effects of reflexology on physiological parameters and mechanical ventilation weaning time	85	18-75 years	Open heart surgery	Foot reflexology	Physiological parameters and mechanical ventilation weaning time
Bagheri et al.[11] 2015 Iran	RCT	To determine the effect of foot reflexology massage on pain, fatigue and physiological parameters in patients with CABG	100	18 years and older	CABG	Foot reflexology massage	Pain, fatigue and physiological parameters
Shahnaz et al.[12] 2014 Iran	RCT	To investigate the effect of foot reflexology massage on the physiological indexes and weaning time in patients undergoing open heart surgery	90	18-75 years	Open heart surgery	Foot reflexotherapy	Physiological indexes and weaning time
Saeed et al.[13] 2013 Iran	RCT	To determine the effect of foot reflexology on the pain of the patients under open heart surgery during chest tube removal	90	Not mentioned	Open heart surgery	Foot reflexology	Pain during chest tube removal
Masoumeh et al.[14] 2011 Iran	RCT	To examine the effects of foot reflexology massage on anxiety, pain and fatigue in patients following CABG surgery	80	Not mentioned	CABG	Foot reflexology massage	Anxiety Pain and fatigue
Khosrow et al.[15] 2019 Iran	RCT	To investigate the effects of foot reflexology on post-sternotomy pain and physiological parameters in patients undergoing CABG	40 women	40-80 years	CABG	Foot reflexology	hemodynamic parameters and pain
Elsayed et al.[16] 2018 Egypt	Quasi experimental	To investigate the effect of foot reflexology on physiological indicators and mechanical ventilation weaning time in open-heart surgery patients	80	18-75 years	Open heart surgery	Foot reflexology	Physiological indicators and mechanical ventilation weaning time

Mahnaz et al.[17] 2012 Iran	RCT	To compare the effect of metatarsus and ankle reflexology massage on patients' state anxiety after coronary artery bypass graft surgery	90	26-65 years	CABG	Metatarsus and ankle reflexology massage	state anxiety
Suthathip et al.[18] 2006 Thailand	Quasi experimental	To compare the effect of preoperative information, preoperative information combined with foot reflexology with aromatherapy, and conventional nursing care on unpleasant symptoms in open heart surgery patients	45	Not mentioned	Open heart surgery	Preoperative information, foot reflexology, aromatherapy	Unpleasant symptoms
Sheikhy et al.[19] 2016 Iran	RCT	To evaluate the effect of soles of feet reflexology massage on feeling of comfort in open heart surgery patients.	70	Not mentioned	Open heart surgery	Foot reflexology massage	Comfort level
Fayza et al.[20] 2015-16 Egypt	Quasi experimental	To assess the effect of foot reflexology practice on acute pain and anxiety of critically ill patients after post cardiothoracic surgery	60	30-50 years	Cardiothoracic surgery	Foot reflexology massage	Pain and anxiety
Hossein et al.[21] 2013-14 Iran	RCT	To evaluate the effect of foot reflexology massage on patients' anxiety during chest tube removal after open heart surgery.	88	Not mentioned	Open heart surgery	Foot reflexology massage	Anxiety during chest tube removal
Hoseini et al.[22] 2018 Iran	RCT	To compare the effect of acupressure and reflexology on sleep condition following coronary artery bypass graft surgery.	60	Not mentioned	CABG	Acupressure, reflexology	Sleep quality
Vaisi et al.[23] 2012 Iran	RCT	To investigate the effect of foot reflexology massage on the amount of state anxiety of patients after coronary artery bypass graft	88	Not mentioned	CABG	Foot reflexology massage	anxiety

3.3. Quality Assessment

The methodological quality of each study was evaluated separately. The included studies' methodological quality (Table 3) were assessed using the Delphi Checklist Criteria. High-quality studies had a score of 5 or higher. None of the 18 studies received the highest quality rating of 9. A methodological study score of 7 was found in eight of the analysed research. Fourteen studies were deemed to be of good quality. The majority of the studies that were examined were randomised, had specific patient characteristics, and included or excluded criteria. Other research, with the exception of four, did not reveal treatment allocation, and none of the studies contained an intent-to-treat analysis. Only one study included a blinded outcome assessor, while eight studies had blinded care providers and study participants.

Table 3: Methodological Quality Assessment of Selected Studies Using Delphi Checklist

References	Randomisation	Allocation concealment	Similarity of groups at baseline	Inclusion and exclusion criteria	Blinding outcome assessor	Blinding of care provider	Blinding of patient	Point estimates	Intention to treat analysis	Total score
Ebadi et al.	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	7
Allahbhakshian et al.	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	7
Abbaszadeh et al.	Yes	Yes	Yes	Yes	No	No	No	Yes	Unclear	5
Elif et al.	Yes	No	Yes	Yes	No	No	No	Yes	Unclear	4
Kandemir et al.	No	No	Yes	Yes	No	Yes	No	Yes	Unclear	4
Bagheri et al.	Yes	Yes	Yes	Yes	Unclear	No	No	Yes	Unclear	5
Shahnaz et al.	Yes	Yes	Yes	Yes	Unclear	No	Yes	Yes	Unclear	6
Saeed et al.	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Unclear	7
Masoumeh et al.	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	7
Khosrow et al.	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Unclear	7
Elsayed et al.	Yes	Yes	Yes	Yes	No	No	No	Yes	Unclear	5
Mahnaz et al.	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	7
Suthathip et al.	Yes	No	Yes	Yes	No	No	No	Yes	Unclear	4
Sheikhy et al.	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	7
Fayza et al.	No	No	Yes	Yes	Yes	No	No	Yes	Unclear	4
Hossein et al.	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Unclear	7
Hoseini et al.	Yes	Yes	Yes	Yes	No	No	No	Yes	Unclear	5
Vaisi et al.	Yes	Yes	Yes	Yes	Unclear	No	Yes	Yes	Unclear	6
Scoring key: Yes = 1, No = 0, Unclear = 0, Maximum total score-9										

3.4. Risk of Bias Assessment

To determine the risk of bias in each study, the Cochrane Collaboration Tool 5 was employed. It was discovered that fifteen studies have reported on the production of random sequences. In thirteen trials, the risk of bias in allocation concealment was shown to be low. Eight research reported that workers and participants were blinded. Other sources of bias were not identified in any of the investigations. Table 4 summarises the risk of bias assessment in detail.

Table 4: Risk of Bias Assessment of Selected Studies

Study	Random Sequence Generation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data	Selective Reporting	Other Bias
Ebadi et al.[6]	+	+	+	?	?	+	?
Allahbhakshian et al.[7]	+	+	+	?	?	+	?
Abbaszadeh et al.[8]	+	+	-	?	?	+	?
Elif et al.[9]	+	-	-	?	?	+	?
Kandemir et al.[10]	-	-	-	?	?	+	?
Bagheri et al.[11]	+	-	-	?	?	+	?
Shahnaz et al.[12]	+	+	-	?	?	+	?
Saeed et al.[13]	+	+	+	?	?	+	?
Masoumeh et al.[14]	+	+	+	?	?	+	?
Khosrow et al.[15]	+	+	+	?	?	+	?
Elsayed et al.[16]	+	+	-	?	?	+	?
Mahnaz et al.[17]	+	+	+	?	?	+	?
Suthathin et al.[18]	+	-	-	?	?	+	?
Sheikhy et al.[19]	+	+	+	?	?	+	?
Fayza et al.[20]	-	-	-	?	?	+	?
Hossein et al.[21]	+	+	+	?	?	+	?
Hoseini et al.[22]	+	+	-	?	?	+	?
Vaisi et al.[23]	+	+	-	?	?	+	?
Key – (+Yes), (-No), (? Unclear)							

3.5. Intervention Details

Most of the studies used foot reflexology as intervention. One study had comparison of metatarsal and ankle reflexology. One study compared acupressure with reflexology.[22]In another study pre-operative information was combined with foot reflexology and aromatherapy.[18]The duration of reflexology intervention was 15-20 minutes in most of the studies. Reflexology was performed for three consecutive days in most of the studies.

3.6. Outcome Measurements and Effectiveness

Most studies focused on pain, anxiety, physiological parameters, quality of sleep, agitation, fatigue, mechanical ventilation weaning time or extubation time as one of the outcome measures. More prominence was given to physiological parameters,

pain and anxiety among the outcome measures**.**

Primary Outcomes

Twelve research looked at the usefulness of reflexology in assessing pain and anxiety in heart surgery patients. In the majority of the investigations, the Visual Analog Scale was employed to assess anxiety and pain. Two studies used State trait anxiety inventory and one study used Brief rating scale to assess anxiety. All the studies reported that reflexology significantly reduced pain and anxiety and stabilized physiological parameters of cardiac surgery patients.

Secondary Outcomes

Secondary outcomes assessed following cardiac surgery included fatigue, agitation, quality of sleep and mechanical ventilation weaning time. Reviews reported that reflexology was effective in reducing agitation and extubation time of cardiac surgery patients.

3.7. Validity and Reliability

The validity and reliability of data collection tools utilised in the examined studies to measure various outcome variables were judged to be sufficient.

4. DISCUSSIONS

The results of an exhaustive systematic evaluation of research publications published between 1981 and 2021 revealed that reflexology improves post-operative outcomes for heart surgery patients.

There are numerous health advantages of reflexology. Despite the fact that it has been proved to be quite effective, it is not routinely used in therapeutic settings. Reflexology appears to have potential benefits in lowering pain, improving relaxation, and reducing psychological symptoms such as anxiety and sadness, according to a review of trials conducted around the world. 6-23 the quality of reflexology studies was varied, according to the reviewers, necessitating the necessity for higher-quality research.

The majority of the studies examined were carried out in Iran and other Western countries. As a result, the conclusions reached as a result of the review may not be immediately applicable to other countries. In addition, research is needed to assess the effectiveness of reflexology, taking into account the many sociocultural and behavioural aspects that may influence cardiac surgery patients.

4.1. Areas for Further Research

Very few studies were conducted to evaluate the effectiveness of reflexology among cardiac surgery patients. Research can be conducted to explore the benefits of reflexology on various outcomes. Comparison studies with higher methodological qualities are needed to explore the effects of reflexology.

4.2. Implications for Clinical Practice

Cardiac surgery is a life-threatening situation for most of the patients. Nursing care for a cardiac surgery patient should be well planned, comprehensive and systematic. Reflexology is an effective therapeutic intervention which can be practiced by nurses to ensure better health outcomes for patients undergoing cardiac surgery. Practice of reflexology can result in favourable outcomes such as reduction of pain and anxiety, stabilization of hemodynamic status and faster recovery.

5. LIMITATIONS

Only studies published in English were considered for the review, which could lead to publication bias. Furthermore, the search was restricted to only a few databases. Other issues to be concerned about include study heterogeneity in terms of demographic characteristics, intervention type, outcome variables, and sample size. As a result, generalising the conclusions drawn from this study should be done with caution.

6. CONCLUSIONS

Reflexology is a reliable and holistic complimentary treatment method, which can be implemented by nurses in the care of cardiac surgery patients. When the literature was reviewed, it was found that reflexology was practiced effectively before, during and after cardiac surgery. There is a great need for more research studies in this area to provide a strong evidence base for reflexology. Also, very less studies are conducted in this area in countries like India.

7. ABBREVIATIONS

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PICO - P – Patient, problem or population, I – Intervention, C – Comparison, control or comparator, O – Outcome(s)

CABG – Coronary Artery Bypass Graft

8. DECLARATIONS

8.1. Ethics Approval and Consent to Participate

This review is carried out following the ethical guidelines. PRISMA checklist is used for reporting.

8.2. Consent for Publication

Not applicable

8.3. Availability of Data and Material

The data that support the findings of this study are available on request from the corresponding author.

8.4. Code Availability

No software or custom code is applicable as the entire content is presented using MS word without any encryption.

8.5. Competing Interests

The authors declare that they have no competing interests.

8.6. Funding

The authors received no monetary aid for the research and/or publication of this article.

8.7. Authors' Contributions

JJ designed the study, searched literature, analysed the data and prepared the review. DL designed, analysed and reviewed the manuscript. Both the authors read and approved the final manuscript.

9. ACKNOWLEDGEMENT

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