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REVIEW

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Effectiveness of reflexology on anxiety of patients undergoing cardiovascular interventional procedures: A systematic review and meta-analysis of randomized controlled trials

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Abstract

Aim: To appraise the evidence concerning the effect of reflexology on the anxiety in patients undergoing cardiovascular interventional procedures.

Background: Anxiety, fear, and other unpleasant emotional experiences are common among patients before and after cardiovascular interventional procedures. The higher anxiety may affect prognosis and recovery of patients.

Design: A systematic review and meta-analysis.

Data sources: The MEDLINE, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Cochrane Central Register of Controlled Trials (Cochrane Library), EMBASE, PsycINFO, and Web of Science were searched between 2001–2017.

Review methods: Randomized controlled trials evaluated the effectiveness of reflexology on anxiety among patients undergoing cardiovascular interventional procedures were included. Meta-analysis was done using Revman 5.3.

Results: Ten trials, representing 760 patients with the mean age of 59, fulfilled the inclusion criteria. Reflexology significantly decreased the anxiety of patients undergoing cardiovascular interventional procedures in the treatment group compared with the control group.

Conclusion: Reflexology has some positive effects on anxiety among patients undergoing cardiovascular procedures. It may be a useful complementary therapy and further research is necessary to create reliable evidence.

KEYWORDS

anxiety, cardiac surgical procedures, complementary therapies, coronary angiography, meta-analysis, nursing, percutaneous coronary intervention, reflexology, systematic reviews

1 | INTRODUCTION

Cardiovascular diseases (CVDs) have become the leading health problems in the developing and the developed countries. CVD is the most common cause of morbidity and mortality worldwide. Coronary artery disease (CAD) is the most common among all cardiovascular disease conditions (Sharif, Shoul, Janati, Kojuri, & Zare, 2012). Patients with CAD, who do not respond to routine medical treatment, will have to undergo cardiovascular procedures that include coronary angiography, percutaneous transluminal coronary angioplasty (PTCA), percutaneous coronary intervention (PCI), and coronary artery bypass graft (CABG) surgery (Hillis et al., 2011).

Patients with the higher anxiety before coronary angiography and PCI may have unfavourable physical and psychological experiences (Gallagher, Trotter, & Donoghue, 2010). Fear, anxiety, and other unpleasant emotional experiences are common before coronary angiography and other cardiovascular interventions. Surprisingly, anxiety level before coronary angiography was reported to be higher

than before the cardiac surgery (Moradi & Adib-Hajbaghery, 2015). Patients undergoing coronary angiography experience higher anxiety and depression that may affect their prognosis and recovery (Delewi et al., 2017; Korkmaz, Korkmaz, Yildiz, Gündoğan, & Atmaca, 2017). There is a significant association found between anxiety and slow coronary blood flow (Durmaz et al., 2014; Yalvac et al., 2017).

The anxiety during pre and postoperative period positively correlated with a higher risk of atrial fibrillation, length of hospital stay, and readmission after cardiac surgery (Albert et al., 2009; Tully, Baker, Turnbull, & Winefield, 2008). The higher level of anxiety experienced by patients awaiting cardiac surgical procedures, which can negatively affect their existing disease condition and surgical intervention may lead to longer recovery (Guo, 2015). Anxiety, pain, stress, and sleep problems are usual after a surgical procedure. All these factors may disturb treatment process and quality of life of patients undergoing surgery (Mitchinson et al., 2007). Postoperatively, a better quality of life among patients undergoing cardiac surgery associated with lower anxiety level (Tung, Hunter, Wei, & Wei, 2008).

1.1 | Background

An emphasis has been made on the nonpharmacological interventions and complementary therapies to decrease or eliminate the anxiety in recent years. These therapies comprise a wide range of methods that are noninvasive, relatively simple, and cost-effective and with lesser or no side effects compared with drugs (Lu, Chen, & Kuo, 2011). Reflexology is a systematic practice where applying some pressure on any particular points on feet and hands gives impacts on the health of the related parts of the body (Wang, Tsai, Lee, Chang, & Yang, 2008).

When a reflex point or zone is stimulated, the body cells react by generating a reflex effect on the corresponding nerves, tissues muscles, and organs. Reflexology effects are well-known to liberate the symptoms of stress by increasing blood flow, decreasing tension, calming the mental state, accelerating immunity, and promoting a sense of well-being (Embong, Soh, Ming, & Wong, 2017). Reflexology improves the blood and energy circulation, gives a sense of relaxation and maintains homoeostasis. Endorphin is a body's natural pain-relieving chemical released as a response to reflexology (Embong, Soh, Ming, & Wong, 2015).

Decreasing anxiety has higher clinical importance and is one of the essential goals of comprehensive nursing care. Various techniques, commonly invasive and pharmacological interventions are used to reduce the anxiety of patients. Anxiety stimulates the sympathetic nervous system activities through biochemical and physiological responses and results in the release of epinephrine and norepinephrine. As a consequence, heart rate, respiration rate, blood pressure, and demand for myocardial oxygen are increased. The increased workload of the heart also increases the risk of dysrhythmia and ischaemia (Adib Hajbaghery, Moradi, & Mohseni, 2014).

Nurses are in the vital position to assess patient's needs for these complementary therapies, to analyse strength and quality of evidence to implement evidence-based interventions. Nurses who are caring patients undergoing cardiovascular interventional procedures should aim at decreasing patients' anxiety because anxiety can negatively affect patients' experiences of intensive care, well-being, and recovery. The effect of reflexology proven generally in all the disease conditions, but still, it is not yet clearly understood in patients undergoing cardiovascular procedures.

As per our knowledge, this is the first systematic review and meta-analysis on the effect of reflexology on patients undergoing

Why is this research or review needed?

- Patients undergoing cardiovascular intervention procedures who experience higher anxiety may have adverse physical, psychological consequences and that may affect their prognosis and recovery. There is a significant association between anxiety and slow coronary blood flow.
- An emphasis has been given to nonpharmacological interventions to eliminate or decrease anxiety in recent years.
- Reflexology is one of the nonpharmacological interventions; the effect of reflexology proven in general health conditions. However, the efficacy of reflexology on the anxiety in patients undergoing cardiovascular procedures remains unclear.

What are the key findings?

- Reflexology is significantly associated with decreasing anxiety of patients undergoing cardiovascular interventional procedures.
- However, there is a low quality of evidence due to the unclear risk of bias, inconsistency, and imprecision in some of the trials included in this meta-analysis.
- None of the reviewed trials reported any harmful effects of reflexology intervention.

How should the findings be used to influence policy/practice/research/education?

- Reflexology may serve as a useful complementary therapy for decreasing anxiety of patients undergoing the cardiovascular procedures.
- There is a need for rigorous research to prove the efficacy of reflexology and, the higher methodological qualities of randomized controlled trials are necessary to create a reliable and higher quality of evidence.
- Future research must also focus on scientific reasons behind reflexology interventions in the area of cardiac interventional procedures measuring biomarkers such as endorphins, as exact mechanisms are not yet understood clearly.

cardiovascular interventional procedures. As complementary therapies are given higher importance globally, the findings of this review will provide new insight on the effectiveness of reflexology on anxiety to the scientific community. Therefore, this meta-analysis on the effect of reflexology was decided to conduct and this article provides evidence of the randomized controlled trials describing clinical effects of patients following cardiovascular interventional procedures.

2 | THE REVIEW

2.1 | Aim

This systematic review and meta-analysis aimed to appraise the evidence concerning the effectiveness of reflexology on the anxiety of patients undergoing cardiovascular procedures.

2.2 | Design

This is a quantitative systematic review with meta-analysis examining the effectiveness of reflexology on anxiety among patients undergoing cardiovascular interventional procedures. The guidelines of Cochrane Collaboration were adopted to carry out this systematic reviews and meta-analysis (Higgins & Green, 2011) and reported using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2015).

2.3 | Search methods

A comprehensive search strategy was developed using the search or key terms connected to PICO (population or patient, intervention, comparator or control, and outcomes) and two authors independently searched MEDLINE, CINAHL (Cumulative Index to Nursing and Allied Health Literature), CENTRAL (Cochrane Central Register of Controlled Trials – The Cochrane Library), EMBASE, PsycINFO, and Web of Science between 2001–2017. We explored for randomized controlled trials (RCTs) that used reflexology as an intervention for patients following the cardiovascular procedures.

The following combinations of MeSH (Medical Subject Heading) terms or keywords were used: reflexology, foot reflexology, zone therapy, anxiety, coronary angiography, percutaneous coronary intervention, cardiac surgery, CABG surgery, cardiac surgical procedures, and randomized controlled trial. A manual search of references from all relevant trials that fulfilled inclusion criteria as well as related systematic reviews, meta-analyses, and review articles was also conducted. Duplicate records and trials were excluded by screening the titles and abstracts. All the remaining original full-text articles were screened to assess the inclusion criteria.

2.3.1 | Participants

The trials included adult (aged above 18 years) patients undergoing the cardiovascular interventional procedure that includes coronary angiography, percutaneous coronary intervention, coronary artery bypass graft, and open heart surgery. The patients who had a random allocation to either a treating group that received reflexology or a control group that received the usual care.

2.3.2 | Interventions

Patients in the experimental group had to receive reflexology interventions. The trials evaluated the effect of reflexology or reflexotherapy interventions among patients undergoing cardiovascular interventional procedures were included.

2.3.3 | Comparison

The control group who received regular or routine postoperative care of the hospital.

2.3.4 | Outcomes

Anxiety was the primary outcome analysed in this systematic review and meta-analysis. We assessed biophysiological parameters that include pain, heart rate, respiration rate, systolic blood pressure, diastolic blood pressure, oxygen saturation (SpO2), satisfaction, mean arterial pressure, and quality of life (QOL) as secondary outcomes.

2.3.5 | Study design

Randomized controlled trials (RCTs) that were published in English and included reflexology interventions for patients undergoing cardiovascular interventional procedures.

2.4 | Search outcome

The search strategy identified 4,526 studies through electronic databases. Fifty-two duplicate records were excluded. After assessing the titles and abstracts, 4,454 studies were omitted, as they did not meet the criteria of the review according to PICO. After assessing the full text, another ten articles were excluded, as they did not match the inclusion criteria of the systematic review and meta-analysis. The reasons for excluding trials were non-RCTs; the study did not include reflexology as an intervention and involved patients undergoing cardiovascular procedures as mentioned in inclusion criteria. Although an RCT evaluated the effect of reflexology on anxiety during minimally invasive varicose vein surgery, we decided to exclude as the trial did not meet inclusion criteria (Hudson, Davidson, & Whiteley, 2015). Finally, ten trials were involved in qualitative and narrative synthesis. Five trials were included in the meta-analysis. The flow diagram of study selection process is presented in Figure 1.

2.5 | Quality appraisal

The Cochrane risk of bias tool was used to assess the risk of bias of included trials (Higgins & Green, 2011). No trial demonstrated

selection bias, as there were 100% low risk of bias and 60% of the unclear risk of bias noted in the allocation concealment and performance bias was about 25%. All the trials demonstrated 100% of low risk in attrition bias (incomplete outcome data) and low risk of bias in the selective reporting. The details regarding the percentages across all included trials and judgements about each risk of bias item are presented in Figure 2.

2.6 | Data extraction

Two authors independently extracted the data from trials included and dissimilarity was resolved by discussing with a third reviewer. A data extraction form, which included author, year of publication, country, design, sample size, gender and mean age of patients, details of the intervention, outcomes, instruments, reliability, and trial findings were used.

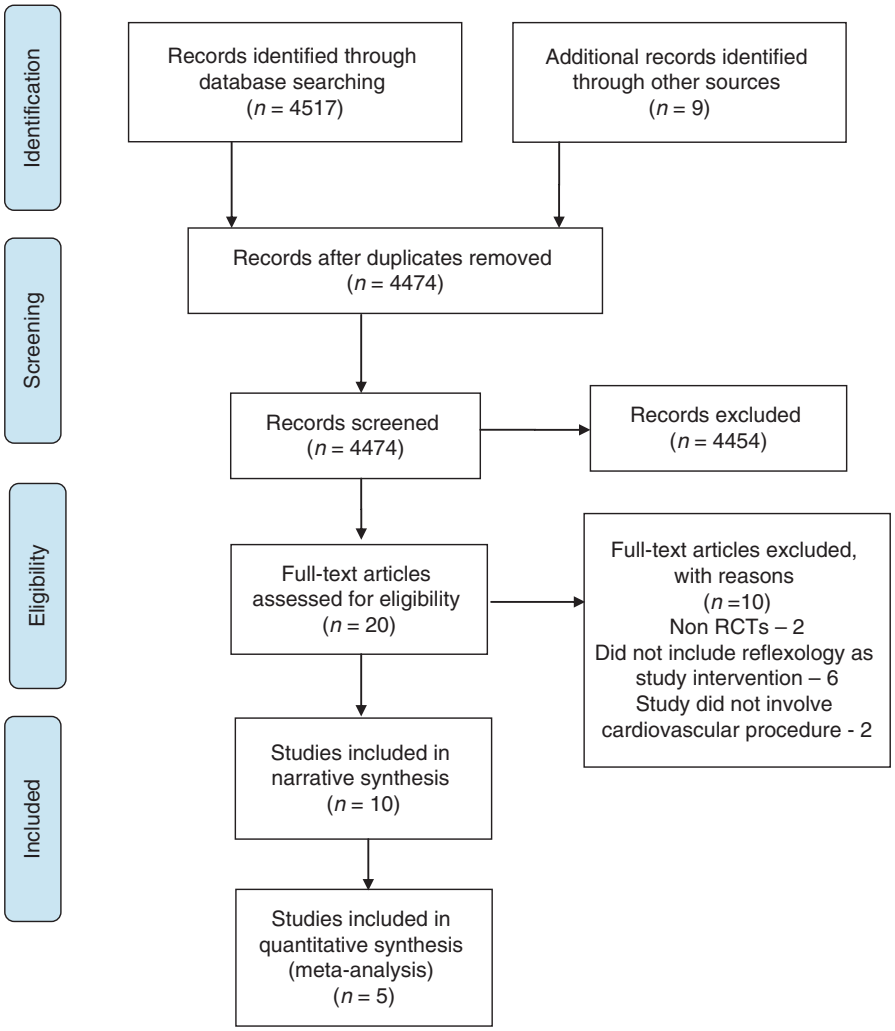

FIGURE 1 Flow diagram of study selection [Colour figure can be viewed at wileyonlinelibrary.com]

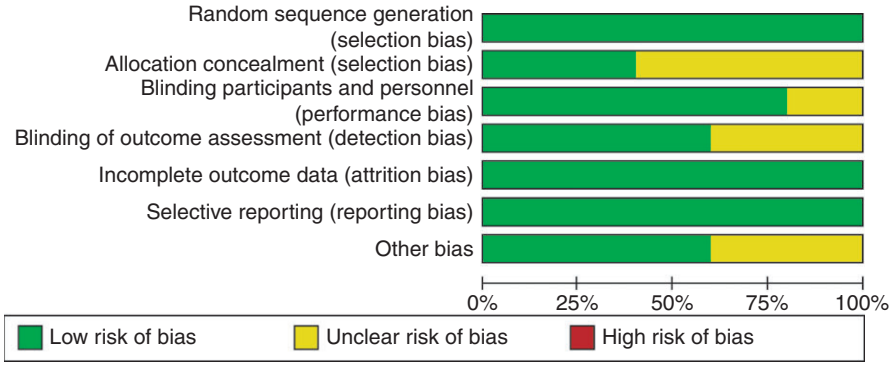

FIGURE 2 Risk of bias graph [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 1 Summary of data from all included RCTs

Author, year, design location	Sample size/ group	Gender	Type of procedure	Age in years		Intervention		Outcomes measures	Instrument		Study findings
				Limit	Mean	Type of reflexology	Duration and frequency		Name	*r* value	
Babajani et al., 2014; RCT, Iran	88 EG: 29 CG: 29 Placebo: 30	Male: 88 Female: 00	Open heart surgery	40–80 years	61	Foot reflexology	20 min and single session	Pain	NRS	0.94	A significant decrease in pain ($p < 0.05$)[a]
Bagheri-Nesami et al., 2014; RCT, Iran	80 EG: 40 CG: 40	Male: 40 Female: 40	CABG	Age above 18 years	58	Foot reflexology	20 min and four sessions	Anxiety	SAI VAS	0.96	A significant reduction in anxiety ($p < 0.05$)[a]
Ebadi et al., 2015; RCT, Iran	88 EG: 34 CG: 32 Placebo: 30	Male: 47 Female: 45	Open heart surgery	25–75 years	59	Foot reflexology	20 min and single session	HR, RR, SBP, DBP, MAP, SpO2 and ventilation weaning time	Dtex electronic monitor	—	There was a significant shorter duration of weaning time in the experimental group ($p < 0.05$)[a] but no difference in physiological parameters ($p > 0.05$)[a]
Gunnarsdottir & Jonsdottir, 2007; RCT, Iceland	9 EG: 5 CG: 4	Male: 08 Female: 01	CABG	Age above 18 years	65	Foot reflexology	20 min and single session	Anxiety	SAI	0.93	No significant decrease in anxiety ($p < 0.05$)[b]
Heidari et al., 2017; RCT, Iran	90 EG: 45 CG: 45	Male: 35 Female: 15	Coronary angiography	Age above 18 years	58	Hand reflexology	20 min and single session	Anxiety	SAI	0.82	A significant decrease in anxiety scores at $p = 0.001$ (independent *t* test)
Khaledifar et al., 2017; RCT, Iran	75 EG: 25 CG: 25 Placebo: 25	Male: 38 Female: 37	Coronary angiography	Age above 18 years	66	Foot reflexology	30 min and single session	Anxiety, HR, RR, SBP, and DBP	SAI	0.97	A significant reduction in anxiety scores ($p < 0.001$)[a]
Mei et al., 2017; RCT, China.	100 EG: 50 CG: 50	Male: 73 Female: 27	Coronary angiography	40–79 years	63	Hand reflexology	15 min and three sessions	Anxiety, HR, SBP, DBP and Quality of Life	HAMA SF -36	0.93	There was a significant decrease in anxiety ($p < 0.05$)[b] but no difference in HR, SBP, DBP, and Short-form health survey.
Mobini-Bidgoli et al., 2017; RCT, Iran	80 EG: 40 CG: 40	Male: 45 Female: 35	Coronary angiography	NR	61	Hand reflexology	20 min and single session	Anxiety	SAI	0.92	A significant difference in anxiety scores between the experimental and control group ($p = 0.003$) (independent *t* test).

(Continues)

TABLE 1 (Continued)

Author, year, design location	Sample size/ group	Gender	Type of procedure	Age in years		Intervention		Outcomes measures	Instrument		Study findings
				Limit	Mean	Type of reflexology	Duration and frequency		Name	*r* value	
Moeini et al., 2011; RCT, Iran	50 EG: 25 CG: 25	Male: 35 Female: 15	CABG	Age above 18 years	57	Foot reflexology	30 min and single session	HR, RR, SBP, and DBP	-	-	There was a significant decrease in SBP and DBP in the treatment group ($p < 0.05$) (independent and paired *t* test).
Molavi Vardanjani et al., 2013; RCT, Iran	100 EG: 50 CG: 50	Male: 100 Female: 00	Coronary angiography	NR	54	Foot reflexology	30 min and single session	Anxiety	SAI	0.86	There was a significant reduction in anxiety scores ($p = 0.0001$)[b]

RCT: randomized controlled trial; EG: Experimental group; CG: control group; PG: placebo group; CABG: Coronary artery bypass graft; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HR: Heart rate; RR: Respiration rate; MAP: Mean arterial pressure; SpO2: Oxygen saturation; NRS: Numerical Rating Scale; NR: Not reported; SAI: State Anxiety Inventory; HAMA: Hamilton Anxiety Rating Scale; SF-36: Short-Form Health Survey; SF-MPQ: Short-form McGill Pain Questionnaire; *r*: reliability value of data collection tool.
[a]Analysis of Variance (ANOVA).
[b]Mann–Whitney *U* test.

2.7 | Synthesis

The primary outcome measure (anxiety) was compared between patients who received reflexology intervention and the patients in the control group who were in usual care in each study. The meta-analysis was performed to pool results of RCTs. The effect sizes for reflexology interventions were estimated for the continuous outcome with 95% confidence intervals pooling mean difference and standardized mean difference. The heterogeneity in the included trials was analysed using I^2 value. We carried out meta-analysis for reflexology intervention and primary outcome as matched with the control group. The effects of reflexology intervention were calculated using a random-effects model to compute weighted mean differences and standardized mean differences with confidence intervals of 95%. All the data were analysed and pooled using the software RevMan v5.3. The GRADE approach and guidelines (Guyatt et al., 2013) were adopted to provide quality and strength of the evidence and outcome measures are presented in the "Summary of findings" (Table 2). The magnitude of effect was rated in the categories: small (effect size around 0.2), medium (effect size around 0.5), and large (effect size of 0.8 or higher).

3 | RESULTS

3.1 | Patients characteristics

The reviewed trials involved 760 patients and the number of study participants ranged from 09–100. The mean age of the complete study participants was 59 ranged from 48–66 in years. In most of the trials, both genders were included except two trials (Babajani, Darzi, Ebadi, Mahmoudi, & Nasiri, 2014; Molavi Vardanjani et al., 2013) that involved only male gender. Most of the participants in the involved trials were male patients ($N = 509$, 66%). In all included trials, patients followed elective cardiovascular intervention procedures. The types included were coronary angiography, PCI, CABG, and open heart surgery. In all studies, the intervention of reflexology was implemented only in the treatment group and the usual or regular care provided to the control group. The summary data of the reviewed trials are presented in Table 1.

3.2 | Effect of interventions

The primary outcome analysed in this meta-analysis was anxiety. We calculated differences in the effect of reflexology between posttest scores for both reflexology and control groups. The details of the primary outcome, quality of evidence, and magnitude of effect are presented in the Summary of Findings in Table 2. The details regarding secondary outcomes are presented in Table 3.

3.2.1 | Effect of reflexology in coronary angiography

Five RCTs involving 419 patients revealed the effectiveness of reflexology intervention in coronary angiography (Heidari, Rejeh, Heravi-

TABLE 2 Summary of findings

Reflexology compared to usual care for patients undergoing cardiovascular procedures						
Patient or population: Patients undergoing cardiovascular procedures **Setting: Cardiovascular units** **Intervention: Reflexology** **Comparison: Usual care or control group**						
	Anticipated absolute effects[a] (95% CI)					
Outcomes	**Risk with usual care**	**Risk with Reflexology**	**Relative effect (95% CI)**	**No. of participants (studies)**	**Certainty of the evidence (GRADE)**	**Comments**
Anxiety in coronary angiography assessed with: State Anxiety Inventory and Hamilton Anxiety Rating Scale. The lower score is better and clinically relevant	The mean anxiety scores ranged across control groups from 11.8 to 48.5	The mean anxiety in the intervention group was 1.31 lower (2.48 lower to 0.13 lower)	SMD −1.31, 95%, CI: −2.48 to −0.13, Z = 2.43.	419 (5 RCTs)	⨁⨁◯◯ LOW[a,b,c]	Large effect size, statistically significant at p = 0.03. SMD of 1.31 lower represents the higher difference between the groups and may be clinically relevant

Note. GRADE Working Group grades of evidence.
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.
CI: confidence interval; SMD: standardized mean difference; RCT: randomized controlled trials.
[a]The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).
[b]No clear description of allocation concealment, or blinding of research personnel in some of the studies in the meta-analyses.
[c]Inconsistency because the I^2 statistic value is more than 50%.

TABLE 3 Effect of reflexology intervention on secondary outcomes

Secondary outcomes	HR	RR	SBP	DBP	MAP	SpO2	Pain	Satisfaction	QOL
Babajani et al., 2014	=	=	=	=	=	=	↓	=	=
Ebadi et al., 2015	NS	NS	NS	NS	NS	NS	=	=	=
Khaledifar et al., 2017	↓	↓	↓	↓	=	=	=	=	=
Mei et al., 2017	NS	NS	NS	NS	=	=	=	=	NS
Moeini et al., 2011	NS	NS	↓	↓	=	=	=	=	=

RCT: randomized controlled trial; HR: heart rate; RR: respiration rate; QOL: Quality of Life; MAP: mean arterial pressure; SBP: systolic blood pressure; DBP: diastolic blood pressure; SpO2: oxygen saturation; NS: No statistical significant difference in the reflexology and control group; ↓: Significant decrease with the reflexology group; ↑: Significant increase with the reflexology group; =: Not included as a study outcome in the analysed trials.

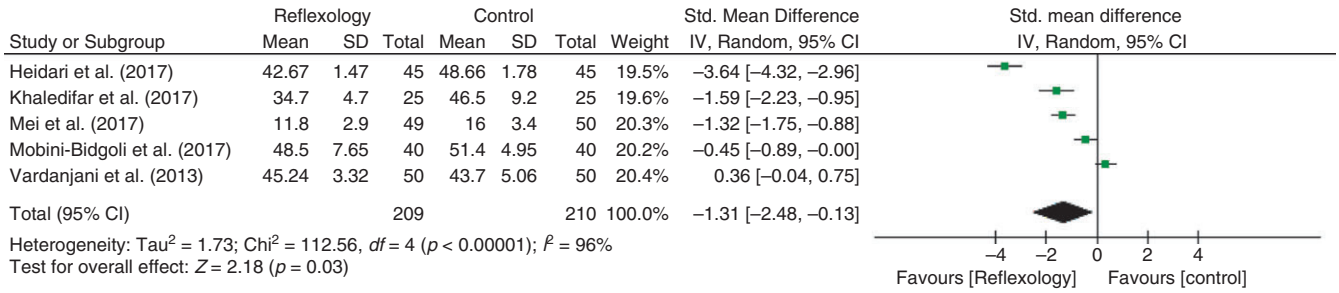

FIGURE 3 Effect of reflexology on anxiety in coronary angiography [Colour figure can be viewed at wileyonlinelibrary.com]

Karimooi, Tadrisi, & Vaismoradi, 2017; Khaledifar, Nasiri, Khaledifar, Khaledifar, & Mokhtari, 2017; Mei, Miao, Chen, Huang, & Zheng, 2017; Mobini-Bidgoli, Taghadosi, Gilasi, & Farokhian, 2017; Molavi Vardanjani et al., 2013). A meta-analysis with a model of random effects revealed that reflexology significantly decreased anxiety (SMD = −1.31 (large effect size), confidence interval [CI] 95%: −2.48, −0.13) and statistically, there was a significant difference between the reflexology and the control group (Z = 2.18, p = 0.03) (Figure 3). There is a low quality of evidence due to the unclear risk of bias, considerable heterogeneity and inconsistency because the I^2 statistic value is 96% (Table 2).

3.3 | Secondary outcomes

The secondary outcomes included in this study were heart rate, respiration rate, mean arterial pressure, pain, systolic and diastolic blood pressure, oxygen saturation (SpO2), satisfaction, and Quality of life. A narrative synthesis was carried out to assess the effectiveness of reflexology on the secondary outcomes. Five trials assessed the effect of reflexology on secondary outcomes.

Out of six trials, three showed a positive effect of the reflexology on secondary outcomes (Babajani et al., 2014; Khaledifar et al., 2017; Moeini, Kahangi, Valiani, & Heshmat, 2011) and two (trials) did not show the positive effects (Ebadi, Kavei, Moradian, & Saeid, 2015; Mei et al., 2017). A summary of secondary outcome data is shown in Table 3.

3.4 | Publication bias

As there were only a few trials involved in this meta-analysis, the potential for publication bias is not assessed in this systematic review and meta-analysis.

3.5 | Psychometrics

The reliability of instruments used to evaluate outcome measures in included trials was found to be reliable and adequate. The names of instruments and reliability values of respective instruments are presented in Table 1.

3.6 | Quality of the evidence

Overall, there was low quality of evidence for the estimated primary outcome due to the unclear risks of bias, inconsistency, and considerable heterogeneity. There was no higher quality evidence on the primary outcome (Table 2).

4 | DISCUSSION

There is evidence available that the reflexology intervention can lead to positive health outcomes among patients in general health conditions (Song et al., 2015) however, lesser is known about the effect among patients following cardiovascular interventional procedures. This research used a meta-analysis of RCTs to explore the effectiveness of reflexology interventions for patients undergoing cardiovascular procedures.

In this meta-analysis, the primary objective was to evaluate whether reflexology interventions can decrease anxiety or not. A comprehensive and systematic review of randomized controlled trials published up to 2017 was performed to appraise the present evidence about the effectiveness of reflexology intervention among

patients following cardiovascular interventional procedures. The trials included in this meta-analysis were from both the developing and the developed countries.

Ten trials were identified and analysed. Five RCTs were involved in the meta-analysis that produced positive results (Heidari et al., 2017; Khaledifar et al., 2017; Mei et al., 2017; Mobini-Bidgoli et al., 2017; Molavi Vardanjani et al., 2013). The meta-analysis showed that reflexology significantly decreased the anxiety of patients undergoing cardiovascular procedures. In the narrative synthesis, out of 10 trials, nine (90.9%) concluded that the reflexology had positive results while one (Gunnarsdottir & Jonsdottir, 2007) reported no positive results. None of the reviewed trials reported any harmful effects of reflexology intervention. The summary of all included trials, details of interventions, outcome measures, and their results are presented in Table 1.

The findings of our systematic review and meta-analysis are in agreement with previous systematic reviews, which concluded that reflexology has positive benefits; however, reliable evidence in patients undergoing the cardiovascular procedures remains unanswerable. Our study has explored benefits of reflexology specifically for patients undergoing cardiovascular interventional procedures compared with previous systematic reviews evaluated in general disease and health conditions (Ernst, 2009; Lee, Han, Chung, Kim, & Choi, 2011; Song et al., 2015).

This meta-analysis shows that there is some evidence that the reflexology benefits patients positively following cardiovascular procedures. This result provides preliminary support for healthcare professionals and nurses to implement reflexology interventions for patients undergoing cardiac interventional procedures. However, these results have to be interpreted with caution considering the low quality of evidence in outcome measure analysed (Table 2). There is a high demand for well-designed and higher quality randomized controlled trials to develop reliable evidence of reflexology interventions in improving positive outcomes among patients undergoing cardiac interventional procedures.

The use of reflexology intervention among patients following cardiac interventional procedures may be a favourable intervention. Although reflexology alone may be inadequate to improve the positive health outcome and increase health status, we consider that the findings of this review are important contributions to the scope of research on reflexology among patients following cardiovascular procedures and urge need for implementation that increases behavioural, clinical, and proper use of comprehensive health care.

A few limitations in this systematic reviews and meta-analysis should be addressed. There may be language bias as the RCTs published only in English were involved. As only a few studies were included in the meta-analysis, the publication bias was not assessed. Other limitations are there was low quality of evidence due to the unclear risk of bias, inconsistency, and considerable heterogeneity among included trials.

5 | CONCLUSION

Due to relatively small sample size and low quality of included trials in this review, it is difficult to conclude on the effect of reflexology on anxiety among patients undergoing cardiovascular interventional procedures or implications for clinical practice. Very few higher quality RCTs evaluated the effectiveness of reflexology among patients following cardiovascular procedures. Hence, rigorous research is needed to prove the efficacy of reflexology, and higher methodological qualities of RCTs are necessary for creating strong evidence among patients following cardiac interventional procedures. Future research must focus on the scientific rationale of reflexology estimating biomarkers such as endorphins, as the scientific mechanism is not yet understood clearly.

CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE [http://www.icmje.org/recommendations/]:

- Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data.
- Drafting the article or revising it critically for important intellectual content.

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