Effects of yoga on anxiety, pain, inflammatory and stress biomarkers in patients undergoing cardiac surgery: A systematic review and meta-analysis

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Abstract

Background*:*

The most common surgical method of managing coronary artery disease is coronary artery bypass grafting (CABG). Stress, anxiety, and pain are commonly identified postoperative symptoms and are closely correlated to patient recovery.

Objective:

The purpose of this review was to investigate the effects of yoga interventions on anxiety, pain, inflammatory and stress biomarkers in CABG surgery patients.

Methods and analysis:

The databases PUBMED, The Cochrane CENTRAL, EMBASE, CINAHL, Scopus, and Web of Science were comprehensively searched from the inception to December 2022. The quantitative research studies that evaluated the effects of yoga on anxiety, pain, inflammatory and stress biomarkers in CABG patients were included. This systematic review and meta-analysis followed the Cochrane guidelines and is reported using the PRISMA checklist. The RevMan 5.4 software was used for the meta-analysis.

Results:

Seventeen studies met the inclusion criteria, representing 1227 patients with a mean age of 58 years. All studies have reported that yoga interventions significantly reduced anxiety, pain, inflammatory and stress biomarkers in the experimental group compared to the control group. According to the GRADE criteria, moderate quality of evidence was found on effects of yoga intervention in CABG surgery patients.

Conclusion:

Yoga has been shown to benefit patients undergoing CABG surgery. It can be used as an adjunctive intervention. However, more rigorous randomized controlled trials are required to generate high-quality evidence for yoga interventions.

Registration: PROSPERO CRD42020175833

Keywords:

anxiety; cardiac surgical procedures; yoga; inflammatory markers; stress biomarkers; pain; postoperative care; quality of life.

Highlights

• This review presents a novel synthesis of evidence regarding yoga effects on inflammatory and stress biomarkers among patients undergoing cardiac surgery.

• This work is the first to provide information regarding a lack of high-quality RCTs among cardiac surgery patients, emphasizing the need for additional quality studies in this area.

Background:

CABG surgery is by far the most common surgical treatment for coronary artery disease (CAD). Stress, anxiety, depression, and pain are commonly identified postoperative symptom and are closely correlated to patient recovery [1]. Patients who undergo heart surgery frequently experience anxiety and pain. These symptoms may necessitate a longer recovery period following surgery [2].

Major heart surgery is an extremely stressful experience for patients, resulting in elevated anxiety levels. Anxiety and stress caused by fear, pain, or discomfort following major heart surgery may have a negative impact on the patient's recovery and coping abilities during the postoperative period [3, 4, 5]. Depression has been identified as an independent risk factor for cardiac events, readmission, a lack of functional abilities and mortality following CABG surgery. The level of psychosocial stress and cardiac functional status prior to surgery can have an impact on the prognosis and quality of life following CABG surgery [6].

CABG surgery is required to ensure survival in advanced disease with an imminent risk of death. However, it has been demonstrated that CABG alone cannot prevent mortality without a change in lifestyle. Along with medication and surgical intervention, lifestyle modification

such as exercise, diet, and yoga-related programmes aid in the prevention and treatment of CAD [7]. Certain factors influence anxiety after surgery, such as surgical outcomes, complications, stress-related problems, pain, and fear of death. Yoga related interventions have been shown to be efficient in anxiety management [8].

Yoga is widely acknowledged as a highly valuable alternative and complementary intervention. Yoga is currently being researched globally due to its growing popularity among the general public. Yoga integrates the mind and body to attain positive health status [9]. A meta-analysis reported that yoga is a useful intervention for improving cardiometabolic health [10]. Yoga is capable of modifying risk factors leading to cardiovascular disease. Yoga has the potential to play a critical role in the prevention of cardiovascular disease [11].

Many studies have been conducted to evaluate the effects of yoga interventions on various physiological and psychological outcomes in patients undergoing CABG surgery. The precise benefits of yoga for patients undergoing cardiac surgery are unknown. No systematic review has previously summarised the effects of yoga on physiological and psychological outcomes in CABG surgery patients. Hence, we have conducted this systematic review and meta-analysis to examine the existing evidence on the effects of yoga interventions on physiological and psychological outcomes in CABG surgery patients.

THE REVIEW

Aim

The purpose of this systematic review and meta-analysis was to examine the existing evidence on the effects of yoga interventions on anxiety, pain, inflammatory and stress biomarkers in CABG surgery patients.

Design

This systematic review was conducted according to the Cochrane handbook guidelines [12] and is reported using the Preferred Reporting Items for Systematic Review and Meta-

Analysis (PRISMA) [13]. This systematic review protocol has been registered in the international Prospective Register of Systematic Reviews (CRD42020175833).

Search methods

A focused search strategy was developed to retrieve all relevant studies. Two reviewers independently searched PUBMED, EMBASE, CINAHL, Scopus, the Cochrane CENTRAL, and Web of Science databases from the inception to December 2022 using keywords or search terms related to PICO (patient or population, intervention, control or comparator, and outcomes). The keywords - coronary artery bypass graft surgery, cardiac surgery, cardiac surgical procedures, yoga, pranayama, yogic breathing, anxiety, pain, cortisol, inflammatory markers, Interleukin-6, C-Reactive Protein, stress biomarkers, serum cortisol, salivary cortisol depression, psychological distress, and quality of life were used in the search. The searches were restricted to adult patients and the English language. Table 1 summarises the PubMed search strategies used in this review.

Furthermore, all potential studies were identified by checking the references of the included manuscripts and relevant reviews. After screening the title and abstract, duplicate articles were excluded. To assess the inclusion criteria, all of the remaining original full text articles were checked. This review included studies that met the following selection criteria.

Participants

Adult patients (>18 years old) undergoing CABG surgery in the experimental studies were the participants.

Intervention

Participants in the interventional group must have received yoga intervention. The studies which assessed the yoga intervention for patients undergoing CABG surgery were included.

Control

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

Outcomes

Anxiety, pain, inflammatory and stress biomarkers were the primary outcomes of this review. As secondary outcomes, we included depression, systolic blood pressure, diastolic blood pressure, heart rate, respiration rate, pulmonary functions, oxygen saturation, perceived stress, and quality of life.

Study design

The included study designs were randomized controlled trials (RCT), non-randomized controlled trials, before and after intervention trials, and quasi-experimental trials. The studies compared yoga interventions to standard care were included. We excluded studies that did not use yoga as the primary intervention and patients who had undergone CABG surgery.

Data extraction

The Cochrane data extraction form was used to extract data from included studies. Data were extracted by two independent reviewers and any disagreements were settled through discussion with the senior subject expert. The data extraction form included information about the author, study design, publication year, participant details, details of yoga intervention, outcome measures, data collection instruments, reliability, and study findings.

Quality appraisal

The qualities of included studies were assessed using the Cochrane's risk of bias (ROB) assessment instrument [12]. The random sequence generation, concealment, and allocation, blinding of participants and research staffs, selective reporting of outcomes, incomplete data outcome, and other kinds of bias were the methodological assessment criteria. Each domain was assigned a risk of bias rating of low, unclear, or high. The risk of bias in non-randomised

studies were assessed using the ROBINS-I tool (Risk of Bias In Nonrandomized Studies of Interventions) [14].

Data synthesis

The meta-analysis was carried out to pool RCT results. We conducted a meta-analysis for yoga therapy and the primary outcomes as compared to the control group. Yoga intervention's effects were estimated using the random effects model to calculate weighted mean difference and standardised mean difference with 95% CI. The I^2 statistic test was used to examine the heterogeneity of the included trials. The software RevMan v5.4 was used to analyse and pool all data. To evaluate quality and strength of evidence, the GRADE criteria and guidelines were followed [15].

RESULTS

Search outcome

The search strategy discovered 210 studies through electronic databases and other sources. Seven records of duplicates were removed. After reviewing the titles and abstracts 182 studies were excluded because they did not meet the PICO criteria. After reviewing the full-text four more studies were eliminated as they did not meet the inclusion criteria for this systematic review. The main reasons for exclusion were the trials that did not include yoga as the primary intervention, the study protocol, and not including CABG surgery patients [16-19]. Finally, 17 quantitative studies were included in a narrative synthesis. The study selection process is shown in Figure 1.

Description of included studies

The reviewed studies included 1227 patients with study participants ranging from 20 to 300. The study participants age ranged from 53 to 66 years. Most of the studies included both genders, except two studies that involved only male [23, 31]. Four studies did not provide information about gender [20, 24, 28]. The most of the patients in the involved studies were

men (N = 953, 74%). Patients in all included studies underwent elective CABG surgery. In terms of study design, most of the included studies (N=10, 58%) were RCTs, three were before and after intervention trials, and two were non-randomized controlled trials. Table 2 displays the summary data from the studies reviewed.

Quality appraisal

The Cochrane's ROB tool was utilized to judge the risk of bias in the RCTs. [12] The unclear risk of bias in randomization, concealment and allocation was 40%. The blinding of personnel and participants was found to have a high risk of bias in 40% of the trials, and the blinding of outcome assessment was found to have a 60% high risk of bias. Incomplete outcome data had 10% of high risk of bias. There was no evidence of reporting bias in any of the trials. Regarding the quality assessment of Non RCTs, the seven studies included in this review were judged to have low to serious concerns of bias. Figure 2 & 3 depicts the risk of bias assessment of RCTs and Non RCTs respectively.

Effects of yoga intervention on anxiety

Nine studies evaluated the efficacy of yoga interventions on anxiety in CABG surgery patients [20,22,25,29,30,34,35,36]. All the studies concluded that patients who received yoga therapy experienced a significant reduction in anxiety compared to those who did not receive this intervention.

The meta-analysis on effect of yoga interventions on anxiety included four RCTs [20,24,30,34], and the remaining studies were not eligible for inclusion due to methodological heterogeneity. A random effects model analysis revealed that anxiety was significantly reduced in the interventional group (SMD = -1.86, 95% CI). CI: - 3.49 to - 0.24, I2 = 98%), with a statistically significant difference between groups (Z = 2.25, P =0.02) (Figure 4).

Effects of yoga therapy on pain

Four studies evaluated the effects of yoga therapy on postoperative pain in CABG patients [25,31,32,36] All four studies concluded that patients who received yoga therapy experienced a significant reduction in pain when compared to those who did not receive the intervention.

Effects of yoga therapy on inflammatory and stress biomarkers

Three studies evaluated the efficacy of yoga interventions on different biomarkers that includes inflammatory markers (Interleukin-6, C-Reactive Protein), stress biomarkers (serum cortisol, salivary cortisol & alpha-amylase) and in CABG surgery patients. A RCT reported that yoga intervention significantly decreased cortisol levels ($p=0.028$) but no difference in alpha amylase levels ($p=0.193$) [27]. A RCT found a small decrease in IL-6 and C-reactive protein but no significant differences found between groups ($p<0.05$) [28]. Another clinical trial concluded that patients who received yoga therapy had lower serum cortisol levels than those who did not [30].

Secondary outcomes

The respiration rate, heart rate, systolic blood pressure, diastolic blood pressure, systemic vascular resistance, oxygen saturation, pulmonary functions, depression, and quality of life were the secondary outcomes assessed in this review. To assess the effects of yoga interventions on secondary outcomes, a narrative synthesis was performed. The effects of yoga interventions on secondary outcomes were investigated in nine studies. Eight of the nine studies found that yoga interventions had a positive effect on secondary outcomes [20,24,26,31-35] Table 4 shows a summary of secondary outcome data.

Publication bias

There was no discernible asymmetry in the funnel plot, and the funnel plots revealed no publication bias (Figure 5). However, minimum number of trials were involved in the meta-analysis.

Psychometrics

The data collection tools used to assess outcome measures in the selected studies had adequate validity and reliability. Table 2 contains information about the data collection tool and its reliability values.

Quality of evidence

The level of evidence for the outcomes was moderate due to inconsistency imprecision, and an unclear risk of bias. To provide quality and strength of evidence, the GRADE criteria [12] was used, and outcomes are summarized in the "Summary of findings" (Table 3). The magnitude of the effect was classified as large (0.8 or higher), medium (around 0.5), or small (around 0.2).

Discussion

Anxiety, pain, and depression are associated with the recovery of CABG surgery patients. Preventive strategies for optimising and balancing cardiac health are required. Yoga is regarded as a promising intervention for alleviating psychological distress. No systematic review has previously summarised the efficacy of yoga interventions on physiological and psychological outcomes in CABG surgery patients.

Therefore, we carried out this systematic review to evaluate the efficacy of yoga interventions on physiological and psychological outcomes in patients following CABG surgery. The primary goal of this review was to assess whether yoga therapy can influence anxiety, inflammatory and stress biomarkers or not. The research studies included in this

systematic review and meta-analysis were published from the inception and December 2022. This review included research studies from both the developing and the developed nations.

The systematic review included seventeen studies, and the meta-analysis included four RCTs. This meta-analysis yielded favourable results. A random effects model analysis revealed that yoga therapy significantly reduced anxiety in patients undergoing CABG surgery. The narrative synthesis concluded that yoga therapy had positive results in all 17 studies (100%). None of the included studies found yoga therapy to be harmful.

The findings of this systematic review are consistent with previous published systematic reviews that found yoga therapy to be beneficial; however, its effectiveness in CABG surgery remains unanswered. This systematic review and meta-analysis is the first of its kind that has assessed the effects of yoga interventions among patients who have had CABG surgery. Previously published systematic reviews on the effects of yoga interventions focused on cardiovascular disease conditions rather than patients following CABG surgery [37-40]

We found moderate quality of evidence that yoga interventions benefit the patients and provides support for nurses and health practitioners to provide yoga as adjuvant therapy for patients recovering from CABG surgery. Though, these results should be understood with caution due to the moderate quality of evidence in the examined outcome. Higher-quality, methodologically sound RCTs are required to generate strong evidence of yoga therapy in patients undergoing CABG surgery.

Implications for research

Only few RCTs have assessed the effects of yoga interventions in cardiac surgery patients. Therefore, more research studies are needed to explore and prove the benefits of yoga interventions. To generate strong evidence, RCTs conducted specifically for cardiac surgery patients must have high methodological quality. Future research must emphasise the scientific rationale behind yoga interventions by examining appropriate inflammatory and stress

biomarkers, as the scientific mechanism of yoga interventions effect on human physiology are not well understood.

Implications for clinical practice

Yoga therapy may be a beneficial adjuvant intervention that reduces pain and anxiety before and after cardiac surgery. Although yoga interventions alone may not be sufficient to improve recovery, this systematic review results adds to the body of research on yoga interventions in cardiac surgery. Yoga therapy can be used as an alternative therapy by nurses for patients following cardiac surgical procedures. Nurses and other healthcare providers can use yoga as adjuvant therapy for decreasing anxiety, pain, and promoting relaxation. Given the findings of this meta-analysis, yoga interventions can be implemented more widely to support and promote recovery among cardiac surgery patients.

Strength and limitations

To our best knowledge, this is the first systematic review and meta-analysis of yoga therapy in patients undergoing CABG surgery. The fact that this study examined the effects of yoga interventions on inflammatory and stress biomarkers aids in understanding the scientific rationale behind this intervention. This meta-analysis should address some limitations such as language bias and heterogeneity in the yoga interventions. Because only research studies published in English were included, there may have been a language bias. Yoga interventions varied across the included studies in the articles included in the systematic review. The yoga interventions provided in the included studies were not identical and there were variations in the types, duration, and frequency. The evidence was of moderate quality due to inconsistency, imprecision, and an unclear risk of bias. Because many of the studies were non-randomized controlled trials, meta-analysis for additional outcome measures was not possible.

Conclusion

Yoga therapy has been shown to reduce anxiety and improve inflammatory and stress biomarkers in patients undergoing cardiac surgery. However, the effects of yoga interventions in patients following CABG surgery are difficult to conclude due to the moderate quality of evidence. But, given the importance of this safe and beneficial intervention, yoga can be used as an adjunctive intervention for patients undergoing cardiac surgery. There is a need for rigorous and well conducted RCTs to generate high quality evidence.

Financial Support

We did not receive any financial support from any funding agencies for conducting this review work.

Conflict of interests

The authors declare that they have no conflicts of interests.

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Table 1 PubMed Search Strategy

ID	Search Terms
#1	"cardiac surgical procedures" (MeSH) OR (cardiac surgery) OR "coronary artery bypass" (MeSH) OR (coronary artery bypass grafting) OR (open heart surgery)
#2	"yoga" (MeSH) OR "breathing exercises" (MeSH) OR "complementary therapies" (MeSH) OR "mind-body therapies"(MeSH)
#3	"anxiety" (MeSH) OR (fear) OR "psychological distress" (MeSH) OR (emotional stress) OR "pain" (MeSH) OR (discomfort) OR “biomarkers” (MeSH)
#4	Search #1 AND #2 AND #3

Table 2: General characteristics of included studies

Author & Year, Design	Sample Size /Group	Gender	Age in Years		Intervention		Outcomes Measures	Instrument		Study Findings
			Limit	Mean	Type of yoga	Duration & Frequency		Name	Reliability	
Aditi et al., 2016, RCT [20]	60 EG:30 CG:30	Male: 48 Female: 12	40-70	59	Yogic breathing practices & Shavasana	10 minutes, Seven sessions	Anxiety, SBP, DBP, HR, RR	BAI	0.75	A Significant difference in the anxiety, HR, RR, DBP and SBP ($p < 0.05$)
Amaravathi et al., 2018, RCT [21]	73 EG:37 CG:36	Male: 73	35-65	NR	Yogic breathing practices & Asanas	30 minutes, Everyday	Anxiety, Depression, Stress, QoL	WHO QOL, HADS, PSS	0.87, 0.87, 0.85	A Significant difference in the perceived stress and no difference in the anxiety and QOL ($p < 0.05$)
Azeez et al., 2021, RCT [22]	40 EG:20 CG:20	Male: 24 Female: 16	20-60	48	Yogic breathing practices & Shavasana	60 minutes, Five sessions	Anxiety	SAI	0.90	A significant difference in the state anxiety ($P<0.0001$)
Azeez et al., 2022, RCT [23]	40 EG:20 CG:20	NR	20-60	NR	Preoperative Pranayama	5 Days of 60 minutes session	Intravenous opioid consumption	NA	NA	There was significant difference in intravenous opioid use and mechanical ventilation time ($P<0.05$)
Centrella-Nigro et al., 2017, A quasi-experimental study [24]	80 EG:40 CG:40	Male: 49 Female: 31	41-90	66	Yogic breathing practices, Asanas, & Meditation	60 minutes, 36 sessions for three months	Stress, Quality of life	Dartmouth QOL Scale, PSS	0.61 0.70	A significant improvement in quality of life and decrease in perceived stress ($p<0.05$).

Chandrababu et al., 2019, A Non-RCT [25]	48 EG:24 CG:24	Male: 35 Female: 15	21-70	59	Alternative nostril breathing exercises	15 minutes, 3 sessions	Anxiety, Pain	SAI, VAS-P	0.90 0.93	There was a significant decrease in anxiety ($p<0.05$) and no difference in pain ($p<0.05$).
Eraballi et al., 2018, RCT [26]	197 EG:102 CG:95	Only male: 197	35-65	53	Yogic breathing practices, & Asanas	20 minutes, Six sessions at hospital and daily practice at home.	Quality of life.	WHO QOL – BREF	0.66-0.87	A significant improvement in quality of life in experimental group ($p<0.05$).
Fakharirad et al., 2020, RCT [27]	20 EG:10 CG:10	NR	40-75	63	Yogic breathing practices, & Asanas	60 minutes, 24 sessions for two months	Alpha amylase and salivary cortisol	ELISA kit	NR	A significant effect on cortisol ($p=0.028$) and no difference in alpha amylase ($p=0.193$)
Fathollahi et al., 2020, RCT [28]	20 EG:10 CG:10	NR	40-75	62	Yogic breathing practices, & Asanas	60 minutes, 24 sessions per week for two months	Interlukin-6, C-Reactive Protein	Centrifugation method	NR	A small decline in IL-6 and CRP but no significant differences between the groups ($p<0.05$)
Gurkan et al., 2013, Before after intervention trial [29]	30 EG:30 CG:00	Male: 13 Female: 17	40-78	59	Yogic breathing practices, Asanas, & Meditation	60 minutes, 24 sessions per week for three months	Anxiety, and self-care abilities	STAI, Self-Care Abelites	NR	A significant decrease in anxiety and increase in selfcare abilities ($p<0.05$)
Kiran et al., 2017, RCT [30]	147 EG:73 CG:74	Male: 113 Female: 34	NR	55	Rajyoga Meditation	30 minutes, One session	Anxiety, Serum cortisol	VAS – A ELISA	NR	A significant decrease in anxiety and serum cortisol ($p <0.05$)
Manikumar et al., 2018,	30 EG:30 CG:00	NR	51-60	NR	Yogic breathing practices, &	30 minutes, Seven sessions	Pain,	VAS-P	NR	Improved peak exploratory flow rate and decreased pain level.

Before after intervention trial [31]					Nadishodhan Pranayama		Peak exploratory flow rate			
Mohan et al., 2018, Case control study [32]	60 EG:30 CG:30	Male: 45 Female: 15	35-65	61	Alternative nostril breathing exercise	10 minutes, Four sessions	HR, RR, SBP, DBP, SVR, PVR, Pain and SPO2	VAS, Swan–Ganz catheter	NR	A significant decrease in SBP, DBP, RR, SVR and Pain ($p<0.05$)
Padhy et al., 2020, Case control study [33]	60 EG:30 CG:30	Male: 54 Female: 06	30-60	54	Anulom vilom Pranayama	From 3rd POD to 6 months	Pulmonary functions – FEV, FVC, & PEFR	PFT	NR	There was a significant improvement in pulmonary functions ($p<0.05$).
Raghuram et al., 2014, RCT [34]	250 EG:121 CG:129	Only male: 250	35-65	53	Yogic breathing practices, Asanas	30 minutes, Preop day – 12 months	LVEF, Stress, Anxiety, Depression, and lipid profile	PSS HADS	0.85 0.85	A significant difference in LVEF, stress, anxiety, depression and lipid profile ($p<0.05$)
Shah et al., 2019, Before after intervention trial [35]	30 EG:30 CG:00	Male: 14 Female: 66	55-75	NR	Yogic breathing practices, & Nadishodhan Pranayama, Sukhasana.	15 minutes, Five sessions	Anxiety, Depression, PEFR	DASS	NR	There was a significant decrease in anxiety, depression and improvement in PEFR ($p<0.05$)
Sushna et al., 2021, RCT [36]	42 EG:21 CG:21	Male: 35 Female: 07	30-70	59	Anuloma-vilom and Nadi suddhi pranayama	10 minutes, Two sessions a day for four days	Pain, Anxiety	VAS, BAI	0.93	There was a significant decrease in anxiety, and pain ($p<0.05$)

Note: RCT =Randomized Controlled Trial; EG = Experimental group; CG = Control Group; PG= Placebo Group; CABG=Coronary artery bypass graft; FAS = Face Anxiety Scale; 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; STAI=State Trait Anxiety Inventory; VAS-A = Visual Analogue Scale-Anxiety; VAS-P = Visual Analogue Scale-Pain; SAI= State Anxiety Inventory; PSS= Perceived Stress Scale; QOL = Quality of Life; BAI = Beck Anxiety Inventory; DASS= Depression, Anxiety and Stress Scale; PEFR= Peak Expiratory Flow Rate; HADS= Hospital Anxiety Depression Scale; PFT= Pulmonary Functions Test; SVR = systemic vascular resistance; PVR= Peripheral vascular resistance; ELISA = enzyme-linked immunoassay; FEV=Forced expiratory volume; FVC= Forced vital capacity; WHO = World Health Organization

Table 3: Summary of findings

Yoga therapy compared to the usual care among patients undergoing CABG surgery

Patient or population: CABG

Setting: Cardiovascular and thoracic surgery units

Intervention: Yoga therapy

Comparison: Usual care

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Control Group	**Risk with Experimental Group**				
Anxiety assessed with: Beck Anxiety Inventory, State Anxiety Inventory, Hospital Anxiety Depression Scale Scores from: 0 to 80 follow-up: mean 7	The mean anxiety scores ranged across control groups from 6.12 to 57.1	The mean anxiety scores in the experimental group was 1.86 lower (3.49 lower to 0.24 lower)	SMD **1.86 lower,** 95% CI -3.49 to 0.24, Z=2.25, P=0.02	497 (4 RCTs)	⨁⨁⨁◯ Moderate[a,b]	Yoga therapy likely reduces anxiety.

***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).

CI: confidence interval; **SMD:** standardised mean difference

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.

Explanations

a. There was a 40 % unclear risk of bias in randomization and allocation concealment. 40% of the studies demonstrated a high risk of bias in blinding of personnel and participants and 60% in the blinding of outcome assessment

b. Inconsistency because the I^2 statistic value is more than 50%.

Table 4 Effect of yoga interventions on secondary outcomes

Secondary Outcomes	HR	RR	SBP	DBP	SVR	Pulmonary functions	Depression	Stress	SpO2	Quality of life
Aditi et al., 2016 [20]	↓	↓	↓	↓						
Amaravathi et al., 2018 [22]										=
Centrella-Nigro et al., 2017 [24]								↓		↑
Eraballi et al., 2018 [26]										↑
Manikumar et al., 2018 [31]						↑				
Mohan et al., 2018 [32]	↓	↓	↓	↓	↓				↑	
Padhy et al., 2020 [33]						↑				
Raghuram et al., 2014 [34]							↓	↓		
Shah et al., 2019 [35]						↑	↓	↓		

Note:

RCT= Randomized Controlled Trial; HR = Heart Rate; RR= Respiration Rate; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; SVR = Systemic Vascular Resistance; SpO2= oxygen saturation

=, No statistical significant difference the music and control group

↓, Significant decrease with the music group

↑, Significant increase with the music group

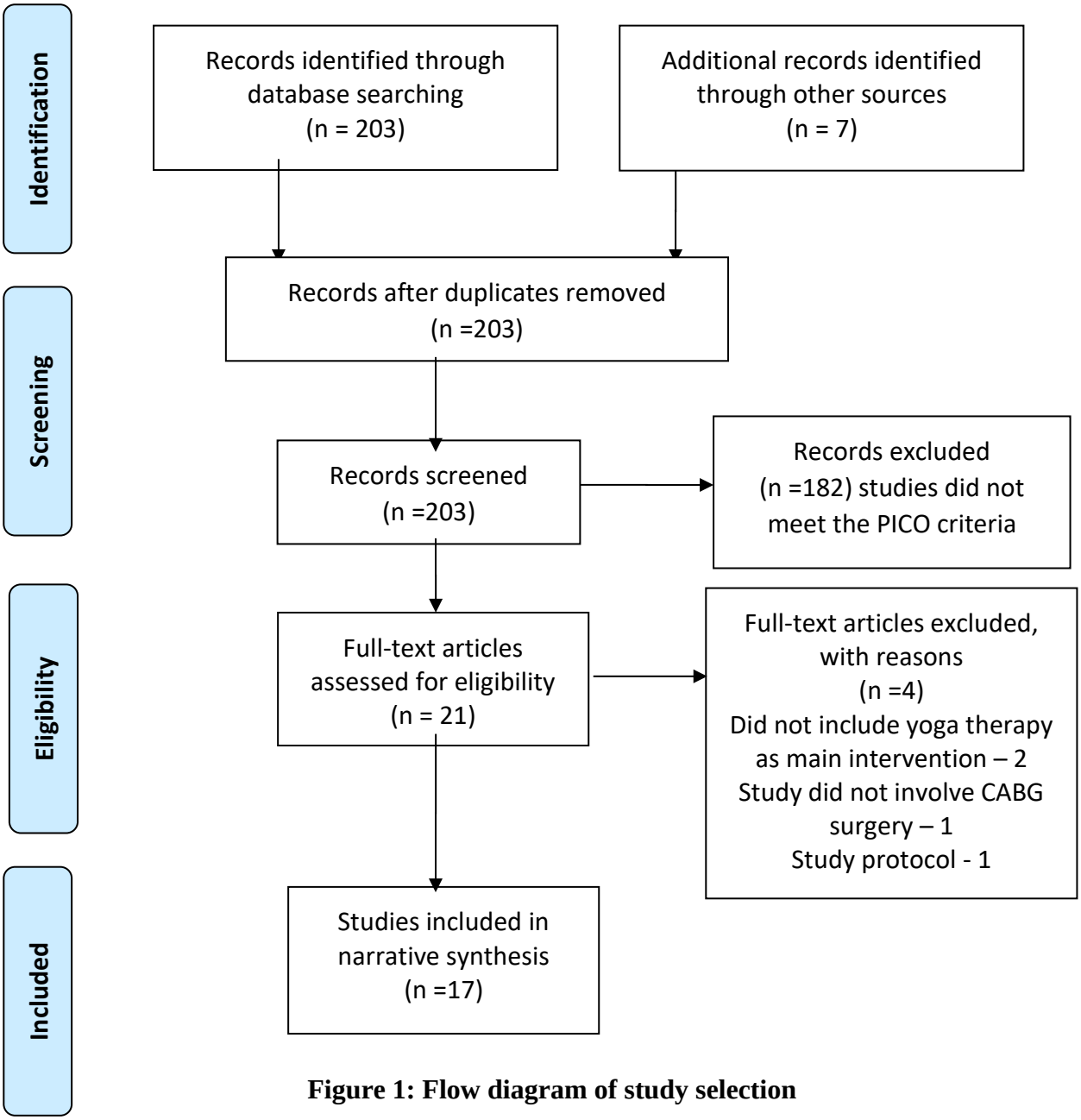

Figure 1: Flow diagram of study selection

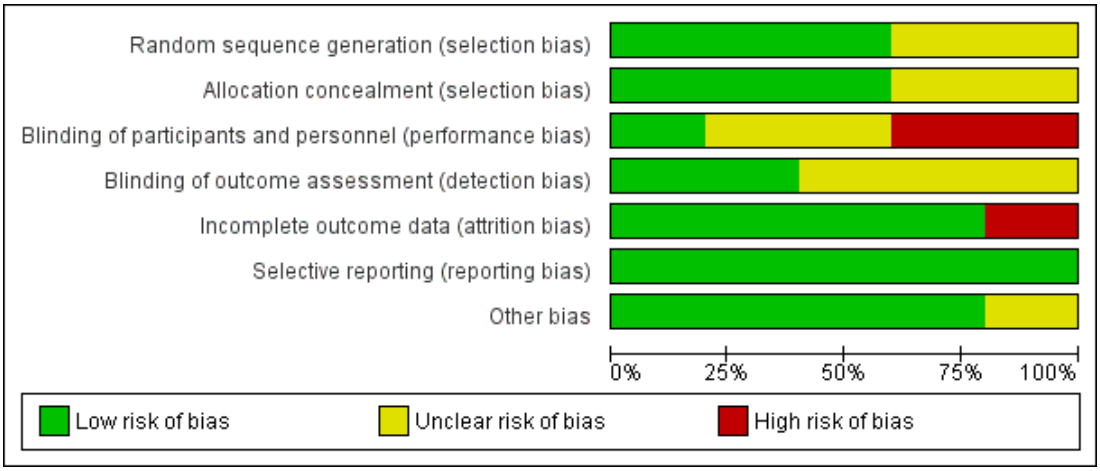

Figure 2 – Risk of bias of RCTs

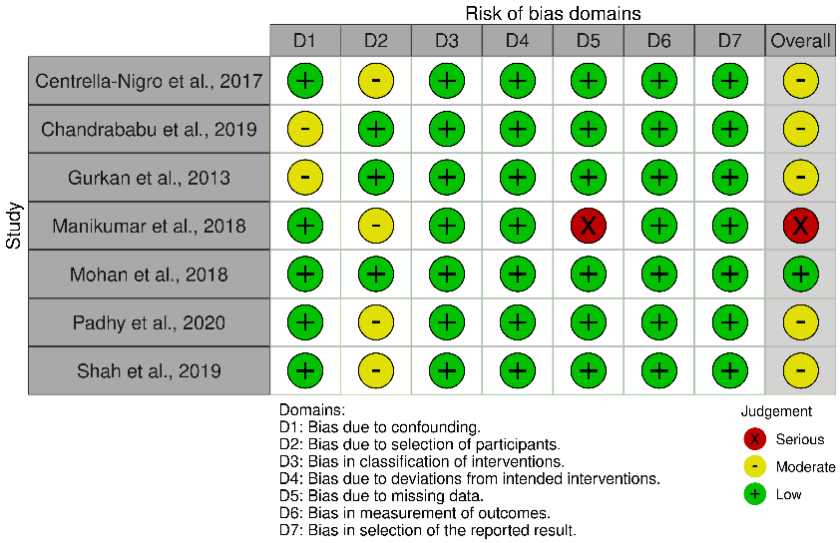

Figure 3 – Risk of bias of Non RCTs

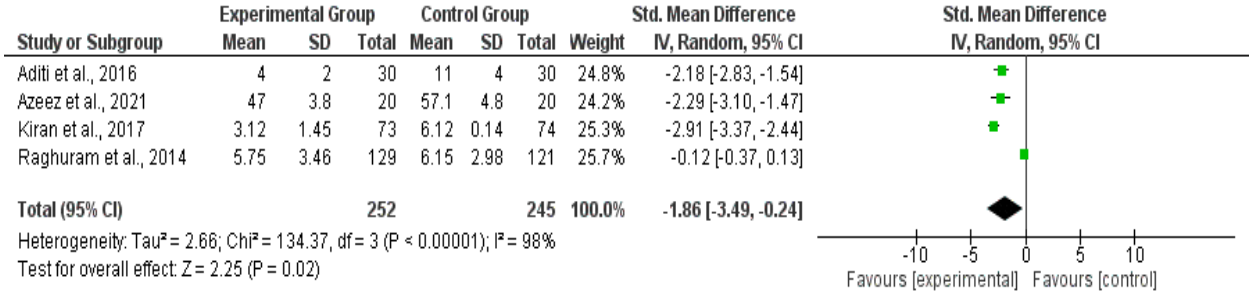

Figure 4 – Effects of yoga intervention on anxiety

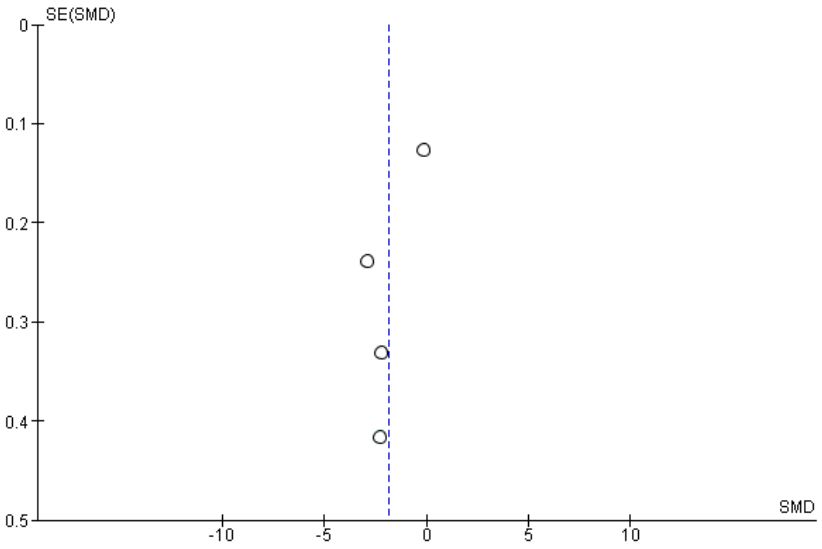

Figure 5: Publication bias