



The effectiveness of yoga therapy on caregivers of people living with dementia: A systematic review and meta-analysis of randomized controlled trials

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ABSTRACT

Introduction: Yoga is a type of practice with numerous benefits for health. This systematic review aimed to synthesize evidence on yoga therapy and determine its effects on caregiver stress and mental health among those who provide care for people with dementia.

Methods: The Cochrane methodological guidelines were adopted and reported using the PRISMA statement. MEDLINE, Cochrane Central, CINAHL, EMBASE, PROQUEST, Scopus, and Web of Science were among the seven online databases searched between January 2010 and October 2021 for randomized controlled trials. The risk of bias in the trials was evaluated using the Cochrane risk of bias tool. Meta-analysis was done using Revman software 5.4 version.

Results: Thirteen randomized controlled trials consisting of 522 research participants assessed the impact of yoga on caregiver stress, burden, mental health, and depression. A random effects model on the effect of yoga revealed that yoga is beneficial in caregiver stress reduction and enhancing the psychological well-being of caregivers of people with dementia with statistical significance (95%CI: 0.64–0.89, $p < 0.05$). It was statistically significant that caregiver stress was reduced among the caregivers of people living with dementia.

Discussion: The practice of yoga decreases caregiver stress with a positive impact on caregiver mental health. Additionally, yoga plays a vital role in bringing down caregiver burden and depression. However, considering the heterogeneity among the included studies, additional research with larger sample size and rigorous randomized controlled trials must be conducted to generate a higher quality of evidence.

1. Introduction

Yoga is a holistic approach to health and an ancient practice that is classified as a form of complementary and alternative medicine in western culture.¹ The Sanskrit root of the term “yoga” is “yuj,” which means “to yoke” or “combine” as well as to focus and direct one’s

attention.² Continuous yoga practice improves self-awareness, enables traits of affability, compassion, and self-control, enriches a sense of serenity and well-being, and enhances the sensation of strength to live fully with genuine happiness.^{3,4} It is an effective method for managing stress reactions.⁵

Yoga is a type of practice that combines physical exertion with

Abbreviations: RCT, Randomized Controlled Trials; MBSR, Mindfulness-Based Stress Reduction.

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inwardly regulated mindfulness of one's breath, body, and energy.³ Its practice is linked with many health enhancements, including reduced risk of cardiovascular diseases, blood pressure control and body mass index, improved respiration, psychological well-being, pain management, and in the management of stress.⁶ By boosting flexibility and muscular strength, yoga supports and improves respiratory and cardiovascular function, supports the treatment of addiction and recovery, reduces stress, anxiety, and depressive symptoms, enhances sleep quality, and generally improves well-being.^{7,8} It consists of the eight limbs such as yamas, niyamas, asanas, pranayamas, pratyaharas, dharanas, dhyanas, and samadhis of yoga.⁹

Asana is the posture that gives stability and relief.¹⁰ One important yogic practice is pranayama which is a Sanskrit name made up of the words "prana," which refers to the breath of life or vital force, and "Ayama," which denotes expansion, regulation, and control.¹¹ Practicing Pranayama regularly increases the expansion of the chest wall and other lung functions and utilizes abdominal and diaphragmatic muscles efficiently by improving the respiratory system.¹² While meditation lowers stress by balancing the hypothalamic-pituitary-adrenal axis, asana and pranayama enhance the passage of oxygenation to the cells and increase the amount of oxygen in the blood. The practice of asana, pranayama, and meditation are of crucial significance to an individual's health and lifestyle problems.¹³ Practice of pranayama has been recognized to regulate autonomic cardiac function with an enhancement in cardio-respiratory functions.¹⁴ Pranayama can be beneficial along with antihypertensive medicines for improved management of hypertension among mild hypertensive people.¹⁵

To combat stress, Dr. Jon Kabat-Zinn developed the Mindfulness-Based Stress Reduction (MBSR) program in 1979 which is a highly developed psycho-educational and skill-based treatment program that combines hatha yoga and mindfulness meditation.^{16,17} It is employed for individuals with various chronic illnesses such as depression, anxiety, skin and immune disorders, chronic pain, cancer, diabetes mellitus, hypertension, and those looking to improve coping and reduce stress.¹⁸ It was discovered that mindfulness therapies were effective at improving the health of dementia caregivers.¹⁹⁻²¹ A yoga-based intervention could increase a caregiver's mental health by reducing caregiver stress, burden, and depression. Mixed effects on the interventions were noted. There were no reports of significant adverse effects.¹⁹ As yogic practice improves well-being by lowering stress and boosting mental health, it can be used as a diversion for those who care for persons with severe mental illnesses.²² Yoga is effective at reducing stress in those who care for people with schizophrenia, as evidenced by considerable improvements in overall quality of life and total psychological distress' mental health component score.^{23,24}

Dementia is a condition normally chronic and progressive, where there is a decline in cognitive function beyond the anticipation of the usual effect of normal aging. It is a significant contributor to older dependency and incapacity, and it has negative physical, psychological, social, and economic repercussions for those who care for them, their families, and society as a whole.²⁵

Memory, learning ability, reasoning, direction, learning capacity, judgment, behaviour, and daily living tasks are just a few of the areas of the brain that are affected due to dementia.²⁵ Hence, people suffering from dementia require comprehensive care based on the stage of dementia. The majority of them are taken care of at home by their family or relatives.²⁶ Some of the factors influencing the effect of the caregiving experience include gender, relationship with the patient, culture, and individual traits.²⁷

Caring for a relative with dementia is recognized to be followed by the burden of giving care.²⁸ Caregiver stress is an unrecognized and untreated health risk resulting in bad consequences for both caregivers and individuals with dementia, including increased morbidity and mortality rates.²⁹ Caregivers of people with dementia tend to sacrifice their leisure time and hobbies. They frequently lack social interaction and support, which leaves them feeling lonely.³⁰ Hence, the caregivers

are often at high risk for various health problems especially poor immunity, cardiovascular problems, chronic conditions such as diabetes, hypertension, anaemia, arthritis, etc.^{26,}

Being a family caregiver for a dementia patient is difficult. In some situations, conventional therapies may not be effective or readily available.³¹ Caregiving for someone with dementia puts a strain on the caregivers, which can lead to a higher level of stress, depression, and health problems for both carers as well as care recipients.^{32,33} Stress levels are higher for informal caregivers of people with dementia compared to those caregivers of individuals with other ailments.³⁴ Numerous studies are being conducted using different approaches to reduce caregiver strain and burden and enhance the quality of life for people taking care of dementia patients.^{18-21,35-38}

Holistic health practices encourage people to consider all aspects of their health, including their physical, emotional, spiritual, intellectual, and mental well-being. Implementation of holistic nursing practices such as yoga helps to improve an individual's quality of life. Health professionals such as doctors, nurses, and counsellors can teach yoga techniques to the caregivers of people living with dementia to enhance their well-being.

1.1. Rationale

Numerous systematic reviews and meta-analyses have examined the effectiveness of interventions like MBSR, educational interventions, support groups, psychoeducational interventions, etc. in reducing caregiver burden among dementia carers to date.^{18-21,35-38} It is still challenging to draw firm results on yoga's efficiency in lowering caregiver stress and enhancing the quality of life. Most of the earlier published reviews comprised heterogeneous interventions and examined the effectiveness of physical exercise, occupation therapy, kirtan kriya yoga, mindfulness meditation, etc.^{39,40,41} Trials are being done to determine whether yoga is useful for helping dementia caregivers. However, there is no evidence of systematic reviews being published in this field, and this is the first systematic review to examine the impact of yoga therapy on those who care for dementia patients. The evidence compiled here could provide insight for future clinical trials and research projects. It is crucial to collect evidence on the effect of yoga treatments on caregiver stress and quality of life.

1.2. Objective

To synthesize evidence on yoga therapy and determine its effects on caregiver stress and mental health among those who provide care for people with dementia.

2. Methods

Utilizing the Cochrane Handbook for Systematic Reviews of Interventions, this systematic review and meta-analysis were conducted. It was then described following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement.⁴²

2.1. Eligibility criteria

The study's eligibility criteria were: (a) Types of participants: participants were caregivers of individuals living with dementia; (b) Types of interventions: interventions that include yoga in any form to reduce caregiver stress and enhance caregiver wellbeing; (c) Types of comparators: comparators with no intervention or intervention other than yoga; (d) Types of outcomes: primary outcomes were: caregiver stress, caregiver mental health, caregiver burden, and caregiver depression; secondary outcomes were (1) heart rate; (2) blood pressure; (3) sleep quality; (4) self-efficacy; (5) quality of life.

The studies were excluded if the RCTs included a dyadic group (i.e., caregivers and people living with dementia), study subjects utilizing

numerous programs simultaneously, research studies with an unclear explanation of intervention contents, or feasibility studies were also excluded.

2.1.1. Information sources

To identify all the potential research studies, a rigorous search method was formulated using the keywords associated with PICO (Population or patient, Intervention, control/comparator, and Outcomes). The following are the search terms combined to recognize the related studies: yoga, asana, pranayama, yogic practices, meditation, mindfulness meditation, effects, dementia, caregivers, Alzheimer's, caregiver burden, and quality of life. The databases were explored independently by the two authors for the qualified studies published between January 2010 - October 2021 which included the MEDLINE, Cochrane library, CINAHL, EMBASE, PROQUEST, Scopus, and Web of Science. Based on the inclusion criteria, references from pertinent studies were manually searched by limiting the language to English exclusively.

2.1.2. Search strategy

((((dementia OR Alzheimer's OR Alzheimer's disease OR cognitive impairment OR cognitive decline OR memory loss OR mild cognitive impairment OR people with dementia OR dementia patients) AND (Caregiver OR Caregivers OR Care giver OR Family OR Family caregiver OR Family caregivers OR Carer OR Carers OR Spouse caregiver OR Spouse care giver OR Relatives OR Informal caregivers OR dementia carers OR dementia caregivers)) AND (Yoga OR Yoga therapy OR Yoga exercise OR Yoga asana OR Yoga asanas OR Pranayama OR Asana OR Meditation OR Mindfulness meditation OR Yogic practices)) AND (Caregiver burden OR Caregiver stress OR Caregiver fatigue OR Caregiver burnout OR Caregiver strain OR Caregiver role strain OR Family burden OR Family stress OR Quality of life OR Well being OR Well-being OR Health-related quality of life OR Life satisfaction OR QOL OR Lived experience OR Satisfaction OR Caregiver satisfaction OR Caregiver wellbeing OR Caregiver well being OR Caregiver well-being)) AND (Randomized controlled trial OR Randomized controlled trial OR Clinical trial OR Clinical trials OR Controlled clinical trials).

2.1.3. Selection process

One reviewer executed a search from each electronic database, scrutinized titles, and abstracts for their eligibility, and retrieved the studies that achieved the pre-established eligibility criteria and involved only those research studies that were published in the electronic databases. In addition, the reviewer also cross-referenced other studies that evaluated the effectiveness of yogic practices.

2.1.4. Data collection process

By using a standard data extraction form, two independent reviewers were able to obtain the study's data. This data extraction form included details of the study (year, authors, and country), features of intervention (type of yoga, methods, duration, frequency, mode), control, outcome measurements (key outcome variables and instruments used to measure them), duration of follow up and engagement evaluation. For any vital information regarding the study that was left out, the original author(s) of the study were contacted. The data was then checked for accuracy and inconsistencies. Any discrepancy between the two researchers was settled by a third reviewer through discussion or agreement.

After removing duplicates, two reviewers separately looked at the titles and abstracts to assess whether the research was eligible. Both researchers further obtained and read through the entire text of research studies that any of them believed would be relevant. Additional discussion was held to clarify any disagreements or ambiguity regarding the inclusion of trials. If an agreement could not be reached, disputes were settled by a senior reviewer in the team.

Using the Cochrane Collaboration risk of bias tool, two independent authors assessed the quality of the included trials.⁴³ Following that, each

study trial was rated according to the Cochrane Handbook for Systematic Reviews of Interventions as having a high, unclear, or low risk of bias. The study's quality was assessed separately by two reviewers, and any disagreements were settled with the help of a senior reviewer (Fig. 2).

2.2. Data items

The primary outcomes were (i) caregiver stress; (ii) caregiver mental health; (iii) caregiver burden; (iv) caregiver depression.

The secondary outcomes were heart rate, systolic blood pressure, diastolic blood pressure, sleep quality, quality of life, serum cortisol, fatigue, life satisfaction, and self-efficacy.

2.3. Study risk of bias assessment

The risk of bias in the trials was evaluated using the Cochrane risk of bias tool. Fig. 2 & Fig. 3 explains the risk of bias evaluation.

2.3.1. Effect measures

The effect of each outcome measure(s) (e.g., risk ratio, mean difference) used in the synthesis or presentation of results is explained in the results section.

2.4. Synthesis methods

To summarise the effect of yoga on caregiver outcomes, meta-analyses were conducted by using Review Manager 5.4 by the statistical principles specified in the Cochrane Handbook for Systematic Reviews of Interventions. When doing the meta-analysis, a random effects model was adopted because the studies used various scales. To determine the difference between continuous outcomes evaluated using the same scale and other scales, the standardized mean difference (SMD) was determined.

The statistical significance of heterogeneity was determined by the Q test with a p-value of >0.10 , which was used to calculate heterogeneity. Following that, the level of heterogeneity was determined using the I^2 statistics. If heterogeneity was significant, statistical pooling was done using a random effects model (p-value of Q test >0.10 and $I^2 < 50\%$).⁴⁴ When quantitative synthesis was inappropriate, narrative synthesis was executed. To deliver the strength and quality of the evidence and outcome measurements, the GRADE approach guidelines and recommendations were implemented.⁴⁵ Table 3 describes the summary of evidence synthesis. Overall, the estimated primary outcomes had low-quality evidence because the risks of bias were unclear, there was significant heterogeneity, and inconsistent data. No higher quality evidence on the primary outcome caregiver burden was noted (Table 3).

2.4.1. Reporting bias assessment

Bias in reporting is mentioned in the results section.

3. Results

3.1. Study selection

The PRISMA flow graphic illustrates the wide search approach (Fig. 1). A preliminary pool of 150 trials was found, and 132 further records were examined for eligibility. After reviewing a total of 13 trials, nine research, totalling 323 participants, were comprised in the meta-analysis. Table 1 provides a summary of all the pertinent information about the included research. Each included study had a sample size ranging from 9 to 145. The participants' ages ranged from 34 to 66.12 years old with an average of 57.01 years. The length of the intervention ranged from three weeks to twelve weeks. Among the 13 studies, one study used multi-center RCT.⁴⁶

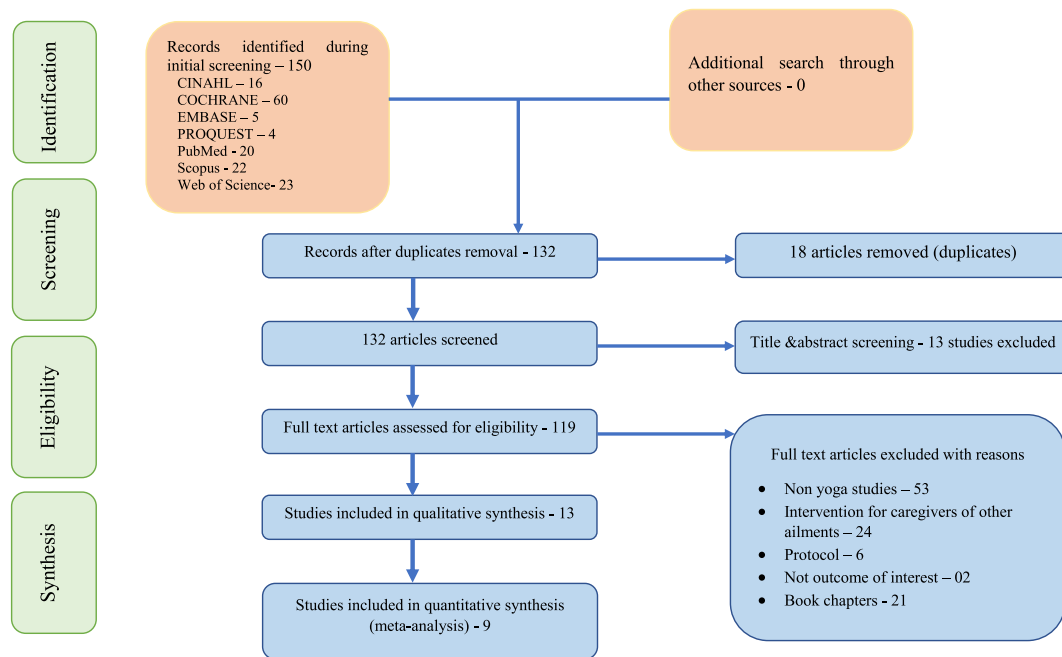


Fig. 1. Prisma flow diagram.

3.2. Study characteristics

All included studies were carried out in various nations, with the USA accounting for the majority of them ($n = 7$). These are the countries where studies have been carried out.: USA (7),^{47–53} Each of the following countries had one study done there.: Australia (1),⁵⁴ China (1),⁵⁵ India (2),^{56,46} (out of which India & Nepal – one collaborative study),⁴⁶ Nepal (1),⁴⁶ Brazil (2).^{57,58} Five out of the studies ($n = 5$) had both male and female participants.^{54,55,46,57,58} The included studies comprised different yogic interventions with a narrow population. Four studies used Mindfulness Based Stress Reduction (MBSR),^{48,49,51,55} one study used Asana, pranayama, and breathing techniques,⁵⁶ eight studies used meditation as an intervention.^{47,50,52–54,46,57,58} out of which two used yoga and compassion meditation,^{57,58} another used inner resource meditation,⁵² only a single study used transcendental meditation,⁵⁴ three studies used Kirtan Kriya meditation.^{47,50,53} and one RCT used meditation as intervention.⁴⁶ (Table 1).

3.2.1. Characteristics of interventions

The type of yogic practices could be classified as follows: Asanas (Sukhasana, Vajrasana, Yoga-Mudra, Paschimotanasana, Ardha-Matsyendrasana, Shavasana, Naukasana, Bhujangasana, Ardha-Shalabhasana, Chakrasana, Vrikshasana, and Sarvangasana), Pranayamas (Adhama Pranama, Bastrika, Ujjayi, Suryabhedana, Chandrabhedana, Nadisodhana, and Kapallabhati) and meditation (kirtan kriya meditation, modified mindfulness-based stress reduction, transcendental meditation, compassion meditation, inner resource meditation).

Two of the thirteen studies that looked at how yoga affected caregivers of dementia patients used it for the full twelve weeks^{52,54}; the other five trials used it for eight weeks,^{47,48,50,51,53} one single trial used it for seven weeks,⁴⁹ two RCTs for three weeks,^{57,58} one for a month,⁵⁶ one single study used it every week for five years.⁴⁶ and another RCT gave seven face-to-face interventions for more than 16 weeks.⁵⁵ The period of each session varied from 12 min to 2 h each trial.

The studies that were included used various yogic therapies on a limited population. Four studies used Mindfulness Based Stress Reduction (MBSR),^{48,49,51,55} whereas two studies used yoga and compassion meditation,^{57,58} one study used inner resource meditation,⁵² another

study used asana, pranayama, and breathing techniques,⁵⁶ and only a single study used transcendental meditation.⁵⁴

3.3. Risk of bias in studies

Fig. 2 explains the risk of bias evaluation. Nine research studies (69.23%) presented the random sequence generation in detail.^{47,50,51,53–55,46,57,58} Four (30.76%) trials effectively reported allocation concealment.^{47,54,46,58} Four RCTs (30.76%)^{48,50,53,57} did not blind the study participants or research team. Due to the lack of implementation of outcome blinding among outcome assessors, five (38.46%) trials were evaluated to have a low risk of detection bias.^{50–52,55} Three trials (23.07%) were identified to have a high probability of attrition bias,^{48,54,46} and a substantial risk of bias for selection bias was identified in 2 RCTs. 2 RCTs (15.38%).^{47,55} The risk of bias summary is depicted in Fig. 3.

3.4. Results of individual studies

All included studies were carried out in various nations, with the USA accounting for the majority of them ($n = 7$). These are the countries where studies have been carried out.: USA (7),^{47–53} Each of the following countries had one study done there.: Australia (1),⁵⁴ China (1),⁵⁵ India (2),^{56,46} (out of which India & Nepal – one collaborative study),⁴⁶ Nepal (1),⁴⁶ Brazil (2).^{57,58} Five out of the studies ($n = 5$) had both male and female participants.^{54,55,46,57,58} The included studies comprised different yogic interventions with a narrow population. Four studies used Mindfulness Based Stress Reduction (MBSR),^{48,49,51,55} one study used Asana, pranayama, and breathing techniques,⁵⁶ eight studies used meditation as an intervention.^{47,50,52–54,46,57,58} out of which two used yoga and compassion meditation,^{57,58} another used inner resource meditation,⁵² only a single study used transcendental meditation,⁵⁴ three studies used Kirtan Kriya meditation.^{47,50,53} and one RCT used meditation as intervention.⁴⁶ (Table 1).

3.5. Results of syntheses

3.5.1. Effects of yoga on caregiver outcomes

Out of the thirteen-research studies evaluated, only nine studies

Table 1
Summary of findings.

| Citation | Sample size, group | Gender | Type of Participants | Age in years | | Intervention | | Outcome measures | Instrument | | Study findings |
|---|----------------------------------|---------------------------|---|----------------------------------|----------------------|--|--|---|--|---------|--|
| | | | | Limit | Mean | Type of yoga | Duration & Frequency | | Name | r value | |
| Black et al., 2012 ⁴⁷ | 39 IG: 23 CG: 16 | Female only | Caregivers of people living with dementia | NR | IG: 60.5 CG: 60.6 | IG: Kirtan Kriya CG: Relaxing music | Kirtan Kriya: 24 min daily for 8 weeks RM: 12 min for 8 weeks | Clinical depression Transcription of cytokines | Peripheral blood leukocyte count | NR | Reduced expression of genes bearing NF-kB-response elements (p = 0.006) |
| Brown, Coogle and Wegelin, 2016 ⁴⁸ | 38 MBSR: 23 SS: 15 | NR | Caregivers of people living with dementia | NR | NR | IG: MBSR CG: Standard Social Support (SS) | 1.2-2-h classes, daylong session on MBSR - 8 weeks | Perceived stress | Perceived Stress Scale | NR | A significant reduction in perceived stress (p = 0.003) |
| Oken et al., 2010 ⁴⁹ | 28 M: 8 E: 11 RO: 9 | Females only | Caregivers of people living with dementia | 45–85 | 64.46 | MBSR & MBCT, education, & respite only | 90 min weekly, 7-week session | Perceived stress RMBPC scores | Perceived Stress Scale, RMBPC | NR | Decrease in caregiver stress (p = 0.030) |
| Pomykala et al., 2012 ⁵⁰ | 9 IG: 4 CG: 5 | Female: 8 Male: 1 | Caregivers of people living with dementia | NR | 55.8 | IG: Kirtan kriya CG: Relaxation | 12 min and eight-week session | Health-related QOL, Depression, brain metabolism | SF 36, HRSD-24 scale | NR | Significant differences were found in the bilateral cerebellum (p < 0.0005), Significant decrease in stress (p = 0.007) & depression (p = 0.005) |
| Whitebird et al., 2013 ⁵¹ | 78 IG: 38 CG: 40 | Females only | Women caring for a parent with dementia | 32–82 | 56.8 | MBSR CCES | 2.5-h sessions for 8 weeks | Perceived stress Depression Caregiver burden | Perceived stress scale, CES-D scale, MBCB scale | NR | Significant improvements in diurnal cortisol level and overall life satisfaction (p = 0.01) |
| Waelde et al., 2017 ⁵² | 31 IR:16 PTS:15 | Females only | Caregivers of people living with dementia | 37–83 | 59.6 | Inner Resource meditation, Psychoeducation & telephone support control condition | 3 h–10 sessions for 12 weeks | Diurnal cortisol slope, overall life satisfaction | Saliva collection, Satisfaction with Life Scale | NR | Improved mental health score was significant in the meditation group (p = 0.01) |
| Lavretsky et al., 2013 ⁵³ | 39 MG: 23 REL: 16 | Female 37 Male:2 | Caregivers with depressive symptoms of people with dementia | MG: 60.5 REL: 60.6 (60.55) | 60.3 | MG: Ancient chanting meditation, Kirtan Kriya RG: Relaxation | MG: 12 min for 8 weeks RG: 12 min for 8 weeks | Depression, Health-related QOL | HRSD-24 SF-36 | NR | Significant improvement in WebNeuro response (p = 0.03) |
| Leach et al. 2015 ⁵⁴ | 17 IG: 8 CG: 9 | Female: 15 Male: 2 | Caregivers of people living with dementia | NR | 66.12 | Transcendental Meditation | 12-week TM | Health-related Quality of life & stress | Assessment of quality of life & WebNeuro test battery | NR | A significant decrease in perceived stress (p = 0.030) |
| Cheung et al., 2020 ⁵⁵ | 53 (42) MBSR:20 MBCT:22 | Female – 46 Male - 7 | Caregivers of people living with dementia | 18–100 | 56 | Mindfulness-based stress reduction & mindfulness-based cognitive therapy | 2.5 h and seven sessions for 16 weeks | Perceived stress | Perceived Stress Scale | 0.85 | Significant improvement in anxiety, depression, stress, emotional regulation & sleep quality (P < 0.05) |
| Chhugani et al., 2018 ⁵⁶ | 36 IY: 18 (17) CG: 18 (13) | Females only | Caregivers of people living with dementia | 20–50 | 34 | Asana, Pranayama Breathing Practices Relaxation & chanting | 1 h per day X 6 days per week 1 month | HR, BP Anxiety Depression Stress Sleep Quality ERQ | Omron Automatic BP monitor, DASS 21, PSQI | NR | A significant reduction in caregiver burden (p = 0.001) |
| Pandya, 2019 ⁴⁶ | 145 IG: 78 CG: 67 | Female – 126 Male - 19 | Caregivers of people living with dementia | NR | 58.02 | Meditation program | 45 min once a week for five years | Caregiver Burden | Zarit Burden Interview | 0.91 | Reduction in stress (p < 0.05), anxiety (p < 0.000001), depression (p < 0.00001) |
| Danucalov et al., 2013 ⁵⁷ | 46 YCMP: 25 CG: 21 | Female: 41 Male - 5 | Caregivers of people living with dementia | Age above 18 years | 55.5 | IG: Yoga & compassion meditation CG: No intervention | 1 h 15 min per week for 3 weeks | Stress Anxiety Depression salivary cortisol | Lipp's Stress Symptom Inventory for Adults, Beck Depression Inventory, | NR | |

(continued on next page)

Table 1 (continued)

| Citation | Sample size, group | Gender | Type of Participants | Age in years | | Intervention | | Outcome measures | Instrument | | Study findings |
|--------------------------------------|--------------------|----------------------|---|--------------------|------|--|---------------------------------|------------------|--------------------------------|---------|--|
| | | | | Limit | Mean | Type of yoga | Duration & Frequency | | Name | r value | |
| Danucalov et al., 2017 ⁵⁸ | 46 YCMP: 25 CG: 21 | Female - 41 Male - 5 | Caregivers of people living with dementia | Age above 18 years | 55.5 | IG: Yoga & compassion meditation CG: No intervention | 1 h 15 min per week for 3 weeks | Quality of life | Salivary cortisol WHO-QOL-BREF | NR | A significant increase in quality of life (p < 0.05) |

*IG- Intervention group, CG-Control group, MBSR – Mindfulness Based Stress Reduction, MBCT-Mindfulness-based cognitive therapy, NR- Not recorded, QOL-Quality of life.

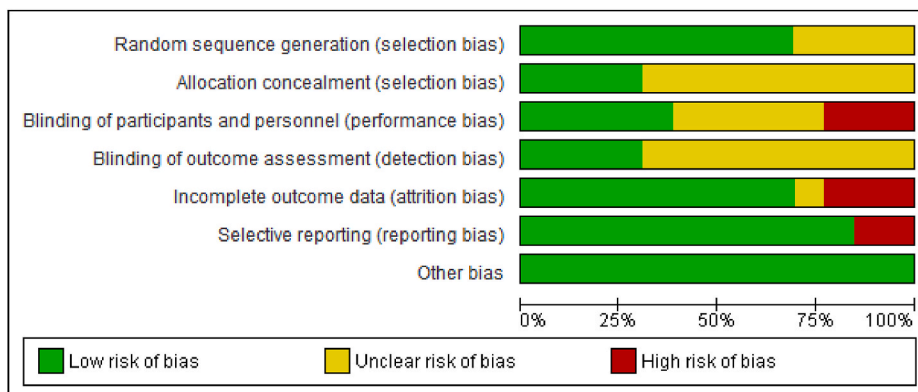


Fig. 2. Risk of bias graph.

produced enough data to be included in the meta-analysis.^{47-53,55,46} The remaining five trials were incorporated into quantitative synthesis.^{49, 54,56,57,58} (see Table 1)

3.5.2. Effects on caregiver stress

A considerable reduction in caregiver stress, statistically (SMD, -0.13%; 95% CI; -0.51 to -0.23; p = 0.38; I² = 3%) was seen in favour of the intervention group in the meta-analysis utilizing the random effects model (Fig. 4).

3.5.3. Effects on mental health scores

Using a random effects model to analyze pooled data, it was found that the intervention group’s mental health scores had improved statistically significantly (SMD, 0.06%; 95% CI; 0.12 to 0.65; p = 0.07; I² = 50%) (Fig. 5).

3.5.4. Effects on caregiver burden

The analysis of the random effects model revealed that the caregiver burden was statistically significantly lower in the intervention group. (SMD, -1.07%; 95% CI; 0.05 to -0.23; p < 0.00001; I² = 98%) (Fig. 6).

3.5.5. Effects on caregiver depression

When the random effects model was examined, it was found that the intervention group saw a statistically significant reduction in depression. (SMD, -0.33%; 95% CI; -0.27 to -0.65; p = 0.54; I² = 0%) (Fig. 7).

3.5.6. Effects on secondary outcomes

The secondary outcomes in this study were comprised of heart rate, anger, confusion, fatigue, cognition, medical burden, anxiety, diurnal cortisol level, life satisfaction, and self-efficacy. To evaluate the impact of yoga treatment on secondary outcomes, a narrative synthesis was conducted. Five of the 13 trials examined the impact of yoga therapy on ancillary results.^{49,52,57,58} The impact of yoga therapy on secondary

outcomes is shown in Table 2.

3.5.6.1. Reporting biases. Publication bias.

Asymmetry in funnel plots suggests that the included research may have publication bias. This could be due to the study effect sizes and the level of heterogeneity. These indications imply that there is evidence of publication bias.

4. Discussion

Dementia is prevalent among older adults and is associated with frequent episodes of memory loss. The person with dementia may not be able to carry out everyday tasks at the advanced stage, may need to be continually watched, and may need full-time care. This will result in increased stress and burden in giving care affecting the caregiver’s mental health and leading to depression. Numerous research has shown that yoga is beneficial for improving quality of life and reducing burden, stress, and depression. The effectiveness of yoga therapy as a caregiver intervention for those with dementia was examined in this current study using meta-analysis.

In this systematic review, we sought to determine whether yoga therapy may enhance caregivers’ mental health by lowering stress, burden, and depression. An extensive systematic review of studies published from January 2021 to October 2021 was carried out to analyze the current evidence regarding the effect of yoga therapy on caregiver outcomes among caregivers of people living with dementia. The RCTs that were used in this meta-analysis were conducted in both middle-income and high-income nations.

A total of 13 randomized controlled trials were included and reviewed, of which nine were used in the meta-analysis and four trials were used in the narrative synthesis. According to this meta-analysis, yoga therapy benefits caregivers of people with dementia by enhancing their mental health and by reducing caregiver stress, burden, and depression. Among the four studies included in narrative synthesis,

| | Random sequence generation (selection bias) | Allocation concealment (selection bias) | Blinding of participants and personnel (performance bias) | Blinding of outcome assessment (detection bias) | Incomplete outcome data (attrition bias) | Selective reporting (reporting bias) | Other bias |
|--------------------------------|---|---|---|---|--|--------------------------------------|------------|
| Black et al, 2012 | + | + | ? | ? | + | - | + |
| Brown, Coogole & Welling, 2015 | ? | ? | - | ? | - | + | + |
| Cheyung et al, 2020 | + | + | + | + | ? | - | + |
| Chugani et al, 2018 | ? | ? | ? | ? | + | + | + |
| Danuclav et al, 2017 | + | ? | ? | ? | + | + | + |
| Danuclav et al; 2013 | + | ? | ? | ? | + | + | + |
| Lavretsky et al, 2012 | + | ? | - | ? | + | + | + |
| Leach, Francis & Ziaian, 2015 | + | + | + | ? | - | + | + |
| Oken et al, 2010 | ? | ? | ? | ? | + | + | + |
| Pandya, 2019 | + | + | + | ? | - | + | + |
| Pomykala et al, 2012 | + | ? | - | + | + | + | + |
| Waelde et al, 2017 | ? | ? | + | + | + | + | + |
| Whitebird et al, 2012 | + | ? | + | + | + | + | + |

Fig. 3. Risk of bias summary.

one single study concluded that yoga therapy improves life satisfaction and self-efficacy,⁵² another RCT reported that yoga is beneficial in controlling heart rate, systolic and diastolic blood pressure, and sleep quality,⁵⁶ and another study reported serum cortisol reduction after

yoga therapy,⁵⁷ one study proved that yoga is effective in improving quality of life.⁵⁸ None of the 13 research found any negative effects of yoga therapy on those who care for dementia patients.

This meta-analysis demonstrates that there is evidence of yoga therapy as an intervention is effective in helping caregivers reduce stress, burden, and depression while also enhancing their mental health. The findings provide preliminary support for healthcare professionals such as nurses, physicians, yoga therapists, counsellors, etc to integrate the practice of yoga therapy in reducing stress, burden, and depression among the caregivers and also to improve their mental health and well-being. Table 1 provides an overview of all the included trials, their results, measurements, and conclusions.

One RCT's results were in agreement with the findings about the impact of yoga therapy on the people who care for those with dementia.⁵⁹ which concludes that yoga is most efficacious in bringing down the symptoms of anxiety, depression, and pain. To generate further evidence for yoga therapy interventions in developing countries, additional studies are required. A meta-analysis reported that yoga is beneficial in improving muscle strength, balance, and flexibility among the elderly and hence yoga should continue as an activity that enhances physical and mental well-being among older adults.⁶⁰ Dementia is a condition that affects people in their old age who are taken care of by either spouses or children who are in their mid-life. As a result, the study suggests that it will be helpful to those who care for people with dementia.

Among the 13 reviewed trials, the majority were conducted in developed countries like USA, and Australia, and hence, results from these studies cannot be directly applied in developing nations like India or other Asian countries as socio-cultural and economic factors may affect the recipient's reaction to the given interventions. Some of the included trials were pilot studies, so, high-quality randomized controlled trials with a larger sample size are necessary to build solid evidence for yoga therapy as an intervention to reduce caregiver stress, caregiver burden, and caregiver depression, as well as to enhance caregiver mental health in developing nations.⁶¹⁻⁶⁴

4.1. Strengths and limitations

There are a few limitations in this systematic review that should be considered while explicating the results. The quality of the evidence was lesser due to the unclear risk of bias, inconsistency, and high heterogeneity among the included studies. The meta-analysis only included a small number of good qualities RCTs. The strength of this systematic review is that this is the first systematic review to examine the impact of yoga therapy on those who care for people with dementia.

4.2. Implications for practice, policy, and future research

The findings of this meta-analysis and systematic review demonstrate that yoga intervention can improve the well-being of people who

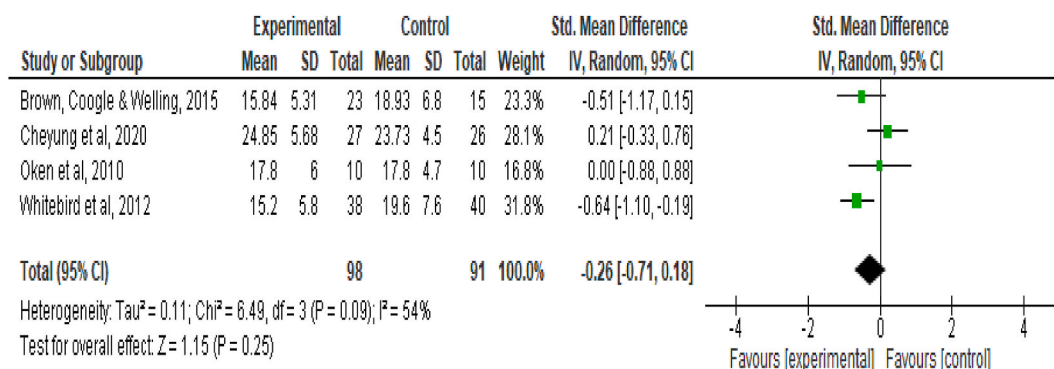


Fig. 4. Caregiver Stress Forest plot.

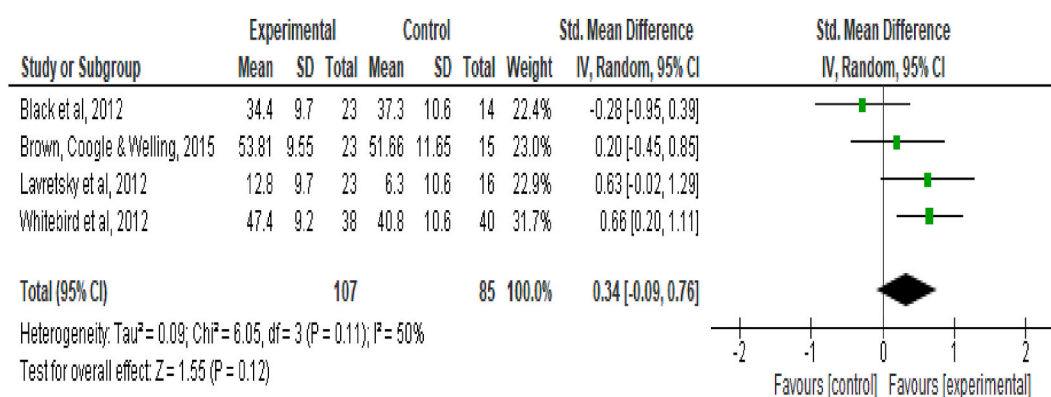


Fig. 5. Caregiver mental health forest plot.

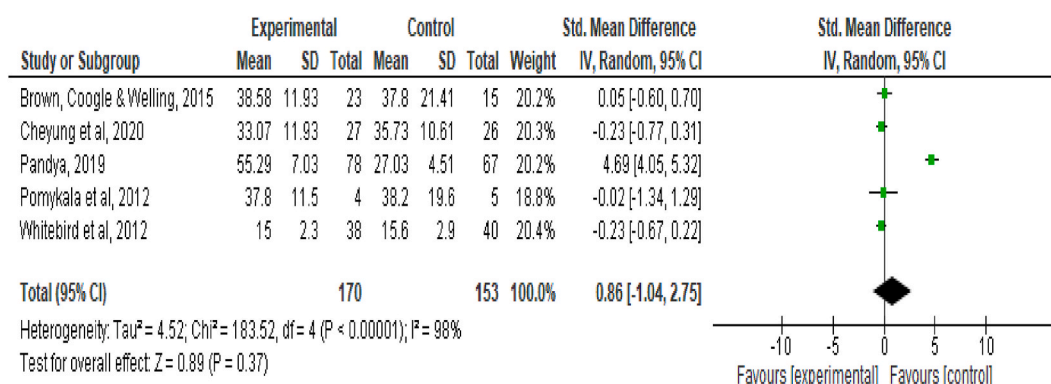


Fig. 6. Caregiver burden forest plot.

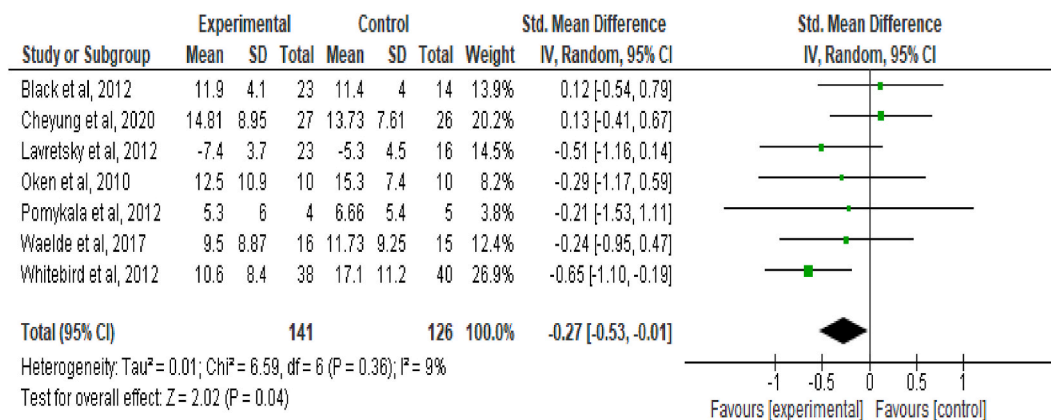


Fig. 7. Caregiver depression forest plot.

Table 2

Effect of yogic intervention on secondary outcomes.

| Secondary outcomes | HR | SBP | DBP | SQ | QOL | Serum Cortisol | Fatigue | Life satisfaction | Self-efficacy |
|--------------------------------------|----|-----|-----|----|-----|----------------|---------|-------------------|---------------|
| Oken et al., 2010 ⁴⁹ | = | = | = | = | = | = | ↓ | = | = |
| Waelde et al., 2017 ⁵² | = | = | = | = | = | = | = | ↑ | ↑ |
| Chhugani et al., 2018 ⁵⁶ | ↓ | ↓ | ↓ | ↓ | = | = | = | = | = |
| Danucalov et al., 2013 ⁵⁷ | = | = | = | = | ↑ | ↑ | = | = | = |
| Danucalov et al., 2017 ⁵⁸ | = | = | = | = | ↑ | = | = | = | = |

HR: Heart rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SQ: Sleep quality, QOL: Quality of life, ↑: Significant increase in the scores, ↓: Significant decrease in the scores, = : Not included as a study outcome in the analyzed trials.

Table 3

Summary of findings table using grade approach.

| [Yogic Practices] compared to [Control group] for [Caregivers of people living with dementia] | | | | | | |
|---|--|---|--------------------------|--|-----------------------------------|----------|
| Patient or population: [Caregivers of people living with dementia] | | | | | | |
| Setting: Community | | | | | | |
| Intervention: [Yogic Practices] | | | | | | |
| Comparison: [Stress] | | | | | | |
| Outcomes | Anticipated absolute effects ^a (95% CI) | | Relative effect (95% CI) | N ^o of participants (studies) | Certainty of the evidence (GRADE) | Comments |
| | Risk with [Stress] | Risk with [Yogic Practices] | | | | |
| Caregiver Stress | – | SMD 0.13 lower (0.42 lower to 0.16 higher) | – | 189 (4 RCTs) | ⊕⊕○○ Low | |
| Mental Health Functioning | – | SMD 0.13 higher (0.12 lower to 0.39 higher) | – | 192 (4 RCTs) | ⊕⊕○○ Low | |
| Caregiver Burden | – | SMD 0.96 lower (1.23 lower to 0.69 lower) | – | 323 (5 RCTs) | ⊕⊕○○ Low | |
| Caregiver Depression | – | SMD 0.33 lower (0.57 lower to 0.08 lower) | – | 267 (7 RCTs) | ⊕⊕⊕⊕ High | |

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.^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). **CI:** confidence interval; **SMD:** standardized mean difference.

care for dementia patients. However, given the heterogeneity and the paucity of research that has scrutinized the impact of yoga therapy on carers' stress, to provide a solid scientific basis for the use of yoga among caregivers of people with dementia, higher-quality studies with larger sample sizes are necessary.

Registration and protocol

This systematic review protocol is registered with PROSPERO and the registration number is CRD42020212566.

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Availability of data, code, and other materials

No data is available in public domain.

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CRedit authorship contribution statement

Clarita Shynal Martis: Data curation, Formal Analysis, Data collection, writing the original draft. Elsa Sanatombi Devi: Methodology Supervision, writing – original draft, supervision. Ramesh Chandrababu: Conceptualization, Supervision, writing – original draft. Rajeshkrishna Bhandary: Data Curation, Supervision. Ravishankar N: formal analysis. Ciraj Ali Mohammad: Writing – Review and editing. Debbie Tolson: Visualization, Methodology, Supervision.

Declaration of competing interest

The authors declare there are no conflicts of interest.

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