ORIGINAL RESEARCH

Yoga for Substance Use: A Systematic Review

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Introduction: **Substance use disorders (SUDs) are complex interactions between various genetic, environmental, developmental, and social factors. Yoga is recommended as a nonmainstream treatment for many health conditions, including SUDs.**

Methods: **Five databases were searched for randomized controlled trials (RCTs) that evaluated yoga as an intervention in adults with any type of substance use disorder. The interventions being studied included Hatha yoga, Sudarshan Kriya yoga, breathing yoga exercises, and meditation. Studies, where yoga was combined with other interventions were excluded. The effect of yoga as an intervention was analyzed using primary outcomes such as anxiety, pain, and craving. Eight RCTs met the eligibility criteria, and quality analysis was conducted using the Cochrane criteria.**

Results: **Among the 8 final studies eligible for quality analysis, 2 had undefined substance use, while the others were focused on tobacco, alcohol, or opioids. Seven out of 8 studies showed significant results and improved primary outcomes such as anxiety, pain, or substance use. Seven out of the 8 studies showed significant positive outcomes using yoga in conjunction with other pharmacological treatment modalities like opioid substitution therapy.**

Conclusions: **Six out of 8 studies showed low concerns, while 2 studies showed some concerns about the risk of bias judgment. Although the results look encouraging, RCTs with larger sample size are needed to better evaluate the effectiveness of yoga as a treatment modality for substance use. (J Am Board Fam Med 2021;34:964–973.)**

Keywords: **Integrative Medicine, Meditation, Substance-Related Disorders, Yoga**

Background

Substance use disorder (SUD) is described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) as a "cluster of cognitive, behavioral, and physiologic symptoms indicating that the individual continues using the substance despite significant substance-related problems."[1] The etiology of SUD is characterized by complex interactions between genetic, environmental, developmental, and social factors still being studied today.[2,3] On the individual level, SUD alters neurochemical pathways and behavioral patterns resulting in negative impacts on physical and mental health, such as poor sleep and nutrition, increased violence and trauma, and a higher risk of contracting a communicable disease.[3,5,6] SUD is classified as mild, moderate, or severe, with the most severe form characterized by chronic and compulsive substance use.[1] Traditional management of substance use disorder takes place in a specialized treatment program and typically includes a combination of pharmacological intervention, behavioral therapy, and supportive services.[3] However, alternative treatments have become

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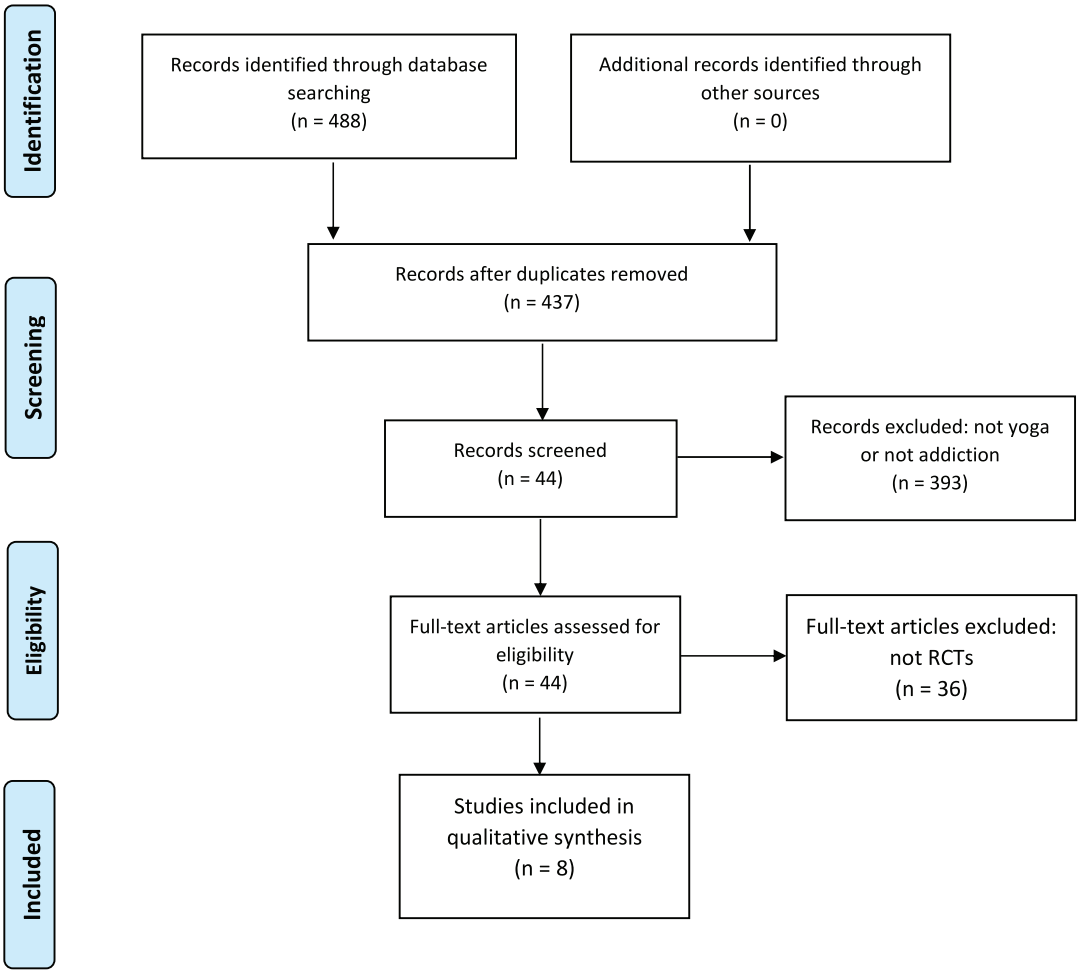
Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram. Abbreviation: RCT, randomized control trial.



increasingly popular among patients due to increasing evidence of their effectiveness and the desire for treatment options outside traditional medicine.[7]

Yoga originated in India over 2 centuries ago and has since become increasingly incorporated into medical practice.[8] Today, these practices are known as complementary and alternative medicine (CAM), defined by the National Center for Complementary and Integrative Health as a nonmainstream practice that is used together with conventional medicine or as a substitute for conventional medicine.[9] In substance use disorder, CAM modalities studied include acupuncture, hypnotherapy, herbal medicine, mindfulness, music therapy, and yoga.[7] Yoga, in particular, has been studied in SUDs as an effective alternative therapy and has been found to reduce stress and addictive behaviors while improving self-esteem and increasing self-control.[10,11] The 2012 National Health Interview Survey (NHIS) showed that yoga was the third most common complementary health approach among adults.[12] The overall structure of yoga includes specific breathing patterns (*pranayamas*), physical postures (*asanas*), relaxation, and meditation (focused thoughts and breathing) that act together to improve the mind and body.[8] While the exact mechanisms of action are unclear, the use of yoga as a treatment for substance use disorder has been found to decrease addictive behaviors, enhance well-being, and improve cognitive flexibility.[8,10,13] Assessing studies on yoga as an effective alternative therapy can provide information to clinicians seeking additional methods to reduce substance use and improve the quality of life in patients with substance use disorder.

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Table 1. Data Extraction from the Eligible Studies

Author	Country	Sample Size; Sex	Type of Substance Use	Co-Morbidity	Intervention	Control Group	Follow-up Period	Primary Outcome	Outcome Measures	Overall Risk of Bias
Lyons, Thomas et al (2019)[15]	US	n = 189; M	Not specified	PTSD	Yoga plus mindfulness meditation	Communication skills session	45 days	Anxiety, PTSD symptoms, craving, and mindfulness	Five Facets Mindfulness Questionnaire; Freiburg Mindfulness Inventory; Beck Anxiety Inventory; Penn Alcohol/Drug Craving Scale; PTSD Symptom Checklist	Low
Uebelacker, L. A. et al (2019)[16]	US	n = 35; M and F	Opioid	None	Yoga (breathing and asana) + TAU (opioid agonist therapy)	Health education class + TAU (opioid agonist therapy)	3 months	Pain, anxiety, mood	SAFTEE, Credibility Expectancy Questionnaire, International Physical Activity Questionnaire, Mood pre- and post-test, Pain Interference Scale	Low
Bock, Beth C. (2019)[17]	US	n = 227; M and F	Tobacco	None	Iyengar Yoga + smoking cessation class	Group Wellness class + smoking cessation class	3 and 6 months	Motivation, readiness, and confidence to quit	Fagerström Test,	Low
Wimberly, Alexandra S. et al (2018)[18]	US	n = 73; M and F	Alcohol and drugs	HIV	Yoga plus TAU	TAU (see Table 2)	1, 2, and 3 months	Percentage of days of drug use and the effect of time on treatment.	Perceived stress survey	Low
Sharma, Neelam et al (2017)[19]	India	n = 30; M	Not specified	Not specified	Group 1: Yoga; Group 2: Recreational Activity	No training	10 weeks	Criminal propensity	Standardized scale of criminal propensity	Some concern
Sarkar et al (2017)[20]	India	n = 1213; M and F	Tobacco	Not specified	15 minutes quit smoking talk + yogic breathing training (Kapalbhati, Anulom)	1-minute quick quit smoking advice	1 and 7 months	Abstinence	7-day biochemically validated point prevalence abstinence	Low

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Table 1. Continued

Author	Country	Sample Size; Sex	Type of Substance Use	Co-Morbidity	Intervention	Control Group	Follow-up Period	Primary Outcome	Outcome Measures	Overall Risk of Bias
Dhawan, Anju et al (2015)[21]	India	n = 84; M	Opioid	Not specified	SKY	Opioid substitution therapy	3 and 6 months	QOL	WHO QOL-BREF instrument;Urine test to assess recent drug use	Some concern
Reddy, Shivani et al (2014)[22]	India	n = 38; F	Alcohol and drugs	PTSD	Yoga (12 Kripalu-based Hatha yoga sessions)	No yoga	1 month	Alcohol and substance use risky behavior	AUDIT, DUDIT	Low

AUDIT, Alcohol Use Disorders Identification Test; DUDIT, Drug Use Disorders Identification Test; F, female; M, male; QOL, quality of life; PTSD, post-traumatic stress disorder; SAFTEE, systematic inquiry about emergent clinical events; SKY, Sudarshan Kriya Yoga; TAU, treatment as usual; WHO, World Health Organization; US, United States.

There is a limited number of randomized control trials (RCTs) assessing the benefits of yoga, and many are underpowered and burdened by risk of bias due to small sample sizes.[10] To our knowledge, only 1 systematic review of randomized control trials studying yoga in substance use disorder has been published in 2014.[10] Therefore, in this systematic review, we explore and evaluate the most recently studied effects of yoga on adult patients with substance use disorder.

Methods

The systematic review included RCTs that studied the effect of yoga (including breathing and meditation) in adult patients 18 years and older with a substance use disorder. The trials published on or after January 2013 until the team conducted the literature search in January 2021 were included in this review. This study will provide evidence in continuation to the systematic review published in *Focus on Alternative and Complementary Therapies*, published in 2014.[10] Studies where yoga was combined with other interventions were excluded. Nonrandomized, quasi-experimental or observational studies were excluded as well. The databases used for systematic search were MEDLINE, EMBASE, Cochrane Library, SCOPUS, and PsycINFO. The search methodology included keywords such as yoga, alternative treatment, substance use, addiction, drug dependence, alcohol use, and MeSH terms like Substance-Related Disorders. There were no additional articles found through manual search.

The data screening was independently conducted by 2 reviewers and verified by 2 other coauthors. In case of any disagreement in the screening between the 2 reviewers, it was resolved by the third and the fourth reviewers or via a consensus-based discussion. The data extraction was done by 3 reviewers using a preset data extraction form. The information was extracted on author name, publication journal and year, sample size, type of substance use disorder, comorbidities, if any, treatment details in intervention and control group, follow-up plan, outcome measures, conclusions, and biases reported. The quality of the trials, using The Cochrane tool ROB2,[14] was assessed based on 5 domains, namely bias due to randomization process, deviations from intended interventions, missing outcome data, measurement of outcome, and

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selection of reported result. The overall score was reported as H = high risk of bias, S = some concerns, and L = low risk of bias.

Results

The search across the databases yielded a total of 488 manuscripts. After eliminating the duplicates and screening the abstracts, 8 studies met our eligibility criteria and were included in the review. Figure 1 describes the PRISMA flow diagram of the multiple steps involved in selection process. The data extraction form is summarized in Table 1.

Lyons et al[15] studied the effect of mindfulness (yoga and meditation) versus a communication skills session in 189 male prisoners (intervention arm = 88, control arm = 101) on preventing relapse in prisoners; 58% of the enrolled participants were African American with a mean age of 35.8 ± 11.3 years. Post-traumatic stress disorder (PTSD) and craving scores declined in both arms, and mindfulness increased. When controlled for Freiburg mindfulness pretest, decline in anxiety and PTSD was greater in the intervention group than the control group ($P < .05$). The authors concluded that the Mindfulness-Based Relapse Prevention (MBRP) program is a promising intervention adjunct to the substance use disorder treatment received in prison.

Uebelacker et al[16] assessed the acceptability and feasibility of hatha yoga for chronic pain relief in 35 eligible participants (mean age in yoga and control group was 43 ± 10.7 and 44 ± 10.8 years, respectively) receiving treatment as usual (TAU) in the form of opioid agonist therapy for opioid use disorder. Participant mood improved pre-class to post-class (measured using a Likert scale survey to measure sadness, anxiety, irritability), with greater decreases in anxiety and pain for high attenders (those who attended 6 or more classes) in the yoga group ($P < .05$) as compared with those taking a health education class (see Table 2). The authors concluded that yoga could be delivered on-site at opioid agonist treatment programs with home practice taken up by participants.

Bock et al[17] studied yoga as a complementary therapy for smoking cessation in 227 randomly selected people (yoga = 113, control = 114). The overall mean age of the participants was 46.2 ± 12. Participants in the Yoga intervention arm had 37% greater odds of achieving abstinence than the participants in the Wellness arm. A significant dose-response relationship was observed for Yoga (OR, 1.12, 95% CI, 1.09% to 1.26%), but not Wellness, such that each Yoga class attended increased odds of quitting at end of treatment by 12%. The authors concluded that Yoga seems to increase the odds of successful smoking abstinence, particularly among light smokers (≤ 10 cigarettes/day).

Wimberly et al[18] studied the effect of hatha yoga for stress and substance use among 73 people (yoga = 37, TAU = 36) living with HIV in reentry from prison. At 3 months, yoga participants reported less stress ($P < .05$) and fewer days of substance use ($P < .001$) than participants in the control group receiving treatment as usual (case management, recreational or General Educational Development (GED) classes, and free health care) as seen in Table 2. The authors concluded that yoga interventions could provide a complementary treatment option for citizens returning from prison and experiencing HIV and substance use.

Sharma et al[19] determined yoga and recreational activity as an avenue to prevent criminal propensity among 30 men (15 to 35 years) with substance use disorder. After 10 weeks, the findings revealed that there was a significant difference ($P < .05$) in all the treatment groups (group 1 = yoga; group 2 = recreational activity) when compared with the control group (no intervention), as seen in Table 2. The adjusted mean values of recreational activity (group 2) were found to be the least, indicating that this group was considered the most effective treatment group in reducing criminal propensity among individuals with substance use disorder. It was concluded that yoga and recreational activities have significant effect on lowering criminal propensity.

Sarkar et al[20] evaluated the effectiveness of a brief community outreach tobacco cessation intervention (including yogic breathing) in 1213 randomly selected people (mean age of 46.3 ± 13.6 years) in India (refer to Table 1). The smoking cessation rate at 6 months post-intervention was found higher in the intervention group than in the control group (risk ratio [RR], 5.32; $P < .05$). Intention-to-treat analysis showed that the participants in the yoga group were 5 times more likely to be in abstinence at 6 months than those in the control group. The authors concluded that a single session of community outreach intervention could increase

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Table 2. Description of the Interventions and Their Results

Study	Intervention	Conclusion
Lyons, Thomas et al (2019)[15]	6 weeks; 1 session/wk; 70 minutes each. Each session began with mindful movement/ stretching/chair yoga exercises (5 minutes), a mindfulness meditation exercise and discussion (~ 40 minutes), and an exercise applying mindfulness to everyday life and high drug relapse risk situations (~30 minutes). Control: Texas Christian University's Mapping-Enhanced Counseling Manuals for Adaptive Treatment compiled into a 6-week Communication Skills curriculum.	Anxiety, PTSD symptoms, and cravings declined, and mindfulness increased significantly in both treatment arms. After controlling for the Freiburg test, there was significant improvement ($P < .05$) in the scores for participants in the intervention arm.
Uebelacker, L. A. et al (2019)[16]	Yoga: breathing and asana (no meditation) 1 hour; 12 weeks, 1 class/week Control: Health education-12 classes on different topics	Participant mood improved pre-class to post-class, with greater decreases in anxiety and pain for those in the yoga group ($P < .05$). ITT analysis of high-attenders only (a little over half the sample) showed moderate improvement in pain interference over 3 months in intervention arm if they attended at least half of the 12 intervention sessions.
Bock, Beth C. (2019)[17]	Classes included 5 minutes of pranayama,45 minutes of dynamically linked asanas, and 5 to 10 minutes of resting meditation. Group Wellness: videos, lectures, and demonstrations on a variety of health topics followed by a discussion guided by the study Wellness counselor or other health care professional; 8 weeks (1 hour, twice/wk)	Yoga appears to aid some smokers during quit attempts. A significant dose effect was observed for Yoga (OR, 1.12, 95% CI, 1.09% to 1.26%), but not Wellness, such that each Yoga class attended increased quitting odds at EOT by 12%.
Wimberly, Alexandra S. et al (2018)[18]	12 weeks; 90 minutes session/wk; hatha yoga: breathing, postures, and meditation; TAU* - case management, recreational or GED classes, and free healthcare.	At three months, yoga participants reported less stress than participants in treatment as usual ($P < .05$). Yoga participants reported fewer days of substance use than participants in treatment as usual at one month, two months, and three months ($P < .001$).
Sharma, Neelam et al (2017)[19]	Physical poses, breathing techniques, chanting, and concentration were selected activities in the yoga training program. (10 weeks, 5 1-hour sessions/wk) Recreational activity training program: cat and mice, changing seats, singing, drop the handkerchief etc.	There exists a significant difference in the selected training program of yoga, recreational activity, and control group for managing criminal propensity of the drug addicts ($P < .05$). The adjusted mean value of recreational activity group was found to be least 76.67; thus recreational activity group was considered as the most effective treatment group
Sarkar et al (2017)[20]	15 minutes yogic breathing (2): Kapalbhati, Anulom	Intention-to-treat analysis showed that participants in the intervention group were aboutfive times more likely to be abstinent at 6 months than those in the control group; absolute abstinence rates were increased by 2%, yielding a number needed to treat of 48 toproduce an additional quitter.
Dhawan, Anju et al (2015)[21]	SKY (sudarshan, pranayama, meditation) 60 minutes weekly in clinic for 6 months and at home for 30 minutes daily. Opioid substitution therapy: buprenorphine OR buprenorphine + naloxone	Over time within the study group, all four QOL domain scores were significantly higher at 6 months. Urine screening results were negative for study group indicating no drug use at 6 months. Between-group comparison showed significant increase in physical ($P < .05$), psychological ($P < .001$), and environment domains ($P < .001$) for study group while control group showed significant changes in social relationship domain only. Urine screening results were negative for study group indicating no drug use at 6 months.

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Table 2. Continued

Study	Intervention	Conclusion
Reddy, Shivani et al (2014)[22]	12 Kripalu-based Hatha yoga sessions of 75 minutes each, including poses using guidelines for trauma-sensitive yoga	Linear mixed models showed significance for null model likelihood ratio tests for AUDIT and DUDIT scores. Change in AUDIT and DUDIT scores over time did not differ significantly by group. The difference in high-risk users between intervention and control groups was not statistically significant (all $P > .05$). Significant improvement was noted in PTSD symptoms and coping ($P < .001$).

AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; DUDIT, Drug Use Disorders Identification Test; EOT, end of treatment; GED, general education development; ITT, intent-to-treat; OR, odds ratio; QOL, quality of life; PTSD, post-traumatic stress disorder; TAU, treatment as usual.

tobacco cessation in low to middle-income countries.

Dhawan et al[21] measured the effectiveness of a yogic breathing intervention on quality of life (QOL) of 84 male participants (study group = 55, control group = 29) dependent on opioids. The mean age of the study and control group was 39.2 ± 10.4 and 37.0 ± 9.6 years, respectively. All 4 QOL domain scores, assessed using WHO Quality of Life (QOL) brief scale, were significantly higher at 6-month follow-up period. There was a significant increase in the intervention group's physical, psychosocial, and environment domains, while the control group showed significant changes in the social relationship domain only. They concluded that Sudarshan kriya yoga was a beneficial low-cost and low-risk adjunct therapy for improving QOL in substance treatment settings.

Reddy et al[22] investigated the effect of yoga intervention on alcohol and drug misuse risk in 38 (yoga = 20, control = 18) veteran and civilian women (mean age, 44.4 ± 12.4) with post-traumatic stress disorder. The mean scores for alcohol use disorder identification test (AUDIT) and Drug Use Disorders Identification Test (DUDIT) decreased in the yoga group; in the control group, mean AUDIT score increased, and mean DUDIT score remained constant. 69% in the yoga group reported fewer PTSD symptoms, and 92% reported coping better with symptoms ($P < .001$).

Risk of Bias

Cochrane risk-of-bias tool for randomized trials (RoB 2)[14] was used for quality review and assess the risk of bias in the eligible studies. Overall, 6 out of 8 studies showed low concerns, while 2 studies showed some concerns about the risk of bias judgment (Table 3). One study had some concerns about the risk of bias owing to the lack of information on the randomization process and missing outcome data. Another study had a concerning risk of bias due to assignment to intervention, and the analysis used to estimate the effect of the assignment.

Discussion

Yoga has been used as a treatment for many health-related issues.[23] This systematic review aimed to review up-to-date evidence and significant results from randomized trials conducted across the globe. The results showed that the studies included in this systematic review were undertaken mainly in the United States and India. Two eligible studies had undefined substance use, while the others were focused on tobacco, alcohol, or opioids. Some studies reported HIV or PTSD as a comorbidity in the sample population, while the others did not describe any concomitant health condition. Seven of the 8 studies showed significant results and improved outcomes in anxiety, pain, or substance use.

The studies included in this review were limited to randomized controlled trials to increase the internal validity of the results[24] and provide comprehensive and reliable evidence for yoga as therapy in patients with substance use disorder. As shown in Table 2, studies showed yoga used as an intervention independently or as an adjunct to the other treatment plan improves outcomes. The interventions included Hatha yoga, Sudarshan Kriya yoga,

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Table 3. Risk of Bias Judgement* (Green=Low, Yellow=Some Concerns, Red=High)

	Studies							
	Lyons et al (2019)[15]	Uebelacker et al (2019)[16]	Beth et al (2019)[17]	Wimberly et al (2018)[18]	Sharma et al (2017)[19]	Sarkar et al (2017)[20]	Dhawan et al (2015)[21]	Reddy et al (2014)[22]
Risk of bias arising from randomization process								
Risk of bias due to intended intervention (effect of assignment to intervention)								
Risk of bias due to intended intervention (effect of adhering to intervention)								
Risk of bias due to missing outcome data								
Risk of bias in measurement of the outcome								
Risk of bias in selection of the reported result								
Overall risk of bias								

*Cochrane risk of bias version 2

breathing yoga exercises, and meditation. Hatha yoga is the practice of yoga postures along with breathing and meditation.[25] Sudarshan kriya yoga, on the other hand, involves rhythmic cyclic breathing.[26]

The primary outcomes were measured using standardized and validated surveys for data collection such as AUDIT,[27] and DUDIT,[28] SAFTEE,[29] QOL,[30] and others. Although most of the studies were able to show significant results, lack of blinding in most of the studies was a limitation leading to low or some risk of bias.[31] Seven out of the 8 studies showed significant positive outcomes using yoga in conjunction with other pharmacological treatment modalities like opioid substitution therapy. Most studies failed to report any adverse event. Although adverse events from RCTs have minimum implications in the real world, not reporting such events may question the safety of the intervention.

Globally, SUD is a major public health concern and has placed a significant economic burden on society.[2] In the United States, costs associated with alcohol and other drugs total over $400 billion due to lost workplace productivity, health care costs, law enforcement, and other criminal justice costs.[3,4] CAM has been shown to be a cost-effective treatment modality compared with conventional therapy alone in many medical conditions.[32] Yoga, in particular, is a low to no-cost treatment option for patients. It has been shown to be a cost-effective treatment option for chronic back pain[33] and other musculoskeletal conditions.[34] The use of inexpensive alternative treatments, like yoga, as an adjunct treatment for substance use disorder may help lower the rising health care costs.

Limitations

This review had some limitations. Some relevant studies might have been excluded due to the chosen study design. Including randomized controlled trials in a review provides higher internal validity, but they are less generalizable than other study designs.[35] In addition, data from the studies published in languages other than English were not included. Lastly, this review lacks measurement of the strength of association between the interventions and the outcomes. A meta-analysis in the future can provide a quantitative estimate of the effect of yoga as a treatment intervention.

Conclusion

Most of the studies included in this review had larger sample sizes than a similar review published

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in 2013. This updated review of randomized controlled trials provides strong evidence[35] to include yoga as an effective complementary treatment modality in the management of patients with substance use disorder. Further studies comparing the effect of yoga on specific substances used should be conducted to study concrete evidence in using yoga as a main-line treatment for different types of substance misuse.

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