Indian Journal of Clinical Anatomy and Physiology 2023;10(3):149–152

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical Anatomy and Physiology

Journal homepage: https://www.ijcap.org/

Review Article

A systematic review on physiological role of yoga and pranayama in management of orthostatic hypotension and vasovagal syncope

Balaji P A [1,2,*], **Smitha R Varne** [1,3]

[1] *Preksha Wellness and Yoga Center, Bangalore, Karnataka, India*
[2] *Sakaria Hospital, Bangalore, Karnataka, India*
[3] *Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka, India*

ARTICLE INFO

Article history:
Received 02-09-2023
Accepted 21-09-2023
Available online 21-10-2023

Keywords:
Orthostatic hypotension
Vasovagal syncope
Yoga
Pranayama

ABSTRACT

Background: OH and VVS are increasingly recognized as important causes of impairment of quality of life and potentially of poor prognosis. Existing management therapies have modest effect. Recently few studies have emerged and have demonstrated the efficacy of yoga and pranayama in disorders having autonomic imbalance, suggesting its possible efficacy in OH and VVS.
Objective: This review aims to determine the effectiveness of yogic practices in patients with orthostatic hypotension (OH) and recurrent vasovagal syncope (VVS).
Materials and Methods: A Medline search was done in Google chrome to review relevant articles in English literature considering the eligibility criteria that the article should focus on yoga and pranayama and its physiological effects on OH and VVS. The main outcome expected was attenuation of OH and frequency of attacks of syncope and presyncope.
Results and Conclusions: Out of the total 86 articles searched, 7 articles (3 RCTs, 3 observational/interventional, 1 review) full filled the eligibility criteria and depicted that yogic practices can have positive impact in attenuation of orthostatic hypotension and reduce the frequency of attacks of syncope and presyncope, among patients with recurrent VVS. However, we recommend higher-quality RCTs in future to confirm our results.

1. Introduction

Orthostatic hypotension (OH) can be defined as a sustained decrease in systolic blood pressure (SBP) of at least 20 mm Hg or in diastolic blood pressure (DBP) of at least 10 mm Hg within 3 minutes of standing or head-up tilt to at least 60° on a standard tilt table. [1,2]

Orthostatic hypotension (OH) is a common cardiovascular (CV) disorder and may be asymptomatic or symptomatic. The most common symptoms are giddiness, lightheadedness, pain in the back of neck and shoulders, sweating, auditory and visual disturbances, weakness, and nausea, and in more severe cases, OH can result in loss of consciousness due to extreme drop in blood pressure and decreased cerebral perfusion. [3–5]

1.1. Pathophysiology of orthostatic hypotension (OH)

Normally, change of posture from supine to upright position, causes a transient reduction in venous return, a decrease in stroke volume and cardiac output (30 to 40%) and finally drop in blood pressure (BP) levels. This results in activation of short acting regulating reflexes that rise from baroreceptors (pressure receptors) located in the carotid sinus and the aortic arch, results in stimulation of the sympathetic system and diminished activity of the

* *Corresponding author*.
E-mail address: drpaba@rediffmail.com (Balaji P A).

https://doi.org/10.18231/j.ijcap.2023.033

parasympathetic system that increase heart rate, venous return, cardiac contractility, and vascular tone and BP levels are restored within seconds.[2,3] OH occurs in patients with imbalance in autonomic nervous system (ANS) and can be due to a) drug-induced, b) related to depletion of (total or effective) intravascular volume and c) neurogenic.[6,7]

OH is considered as one of the major causes of vasovagal syncope (VVS).[3] Vasovagal syncope is the most common form of neurocardiogenic reflex syncope, caused by a failure in the autoregulation of blood pressure, resulting in cerebral hypoperfusion leading to transient loss of consciousness.[8,9] About 1/3 rd. of people globally experience at least one VVS episode and around 5% of all populations experience at least 3 to 5 VVS episodes in lifetime. VVS occurs in all age groups but is found more commonly among younger individuals.[9–11]

1.2. The pathophysiology of vasovagal syncope (VVS)

VVS can occur due to a cascade set off by a trigger and/or intrinsic and extrinsic stressors, causing an initial veno dilatation phase leading to decreased cardiac output and consequently there is sympathetic overdrive phase leading to increased heart rate and force of contraction, which stimulates the c-mechanoreceptors in the myocardium ultimately leading to a bradycardia and/or hypotensive phase and subsequently, syncope.[12–14]

Management of OH and VVS, has hitherto proven to be difficult, with various types of therapies showing a modest benefit. Pharmacological drugs including vasoconstrictors like midodrine, beta blockers like (Propranolol, nadolol), autonomic modulators, and mineralocorticoids like fludrocortisone have yielded mixed results.[15–17] OH and VVS are increasingly recognized as important causes of impairment of quality of life and potentially of poor prognosis.[1,2,18]

Yoga is a systematic, psycho-somatic-spiritual, practice of physical and mental exercise that originated in ancient India. It consists of postural exercises (called asanas), breathing patterns (called pranayama), relaxation, and meditation. Recently, few studies have reported that yoga practice might decrease the recurrence of syncope and attenuation of orthostatic hypotension. However, there is insufficient scientific evidence regarding the potential benefits of yoga in OH and VVS. Therefore, we conducted a systematic review to evaluate the Physiological benefits of yoga and pranayama in OH and VVS patients.

2. Materials and Methods

To depict a broad understanding regarding effects of yoga and pranayama on OH and VVS, we searched MEDLINE English literature language published from unrestricted past till September 2023, through PubMed, Embase, PsycINFO, CINAHL and Complementary Medicine Database (AMED), the Cochrane Database of Systematic Reviews, and PROSPERO for records of ongoing or recent to older systematic reviews. The eligibility criteria for screening were that the article should focus on yoga and pranayama and its physiological effects on OH and VVS. The main outcome expected was attenuation of OH and frequency of attacks of syncope and presyncope. Article screening was carried out through the title and then abstract screening done to identify which articles have the potential to meet the expected criteria. Quality of selected articles was carried out using the Critical Appraisals Skill Program (CASP) scoring. Data was extracted by making a summary of each article which included, names of authors, affiliations, year, country of origin of the study, type of study, sample size, intervention procedure, results, discussion, conclusion, and limitations of the study. A total of 86 records were obtained through MEDLINE search. After full text screening, we excluded 47 records, then finally a total of only 7 articles that meet the search criteria, from where the issues were collated and discussed. Extra selected articles were used for standard references. (Search strategy shown in Table 1 and Chart 1).

Table 1: Search strategy of review

#1 Yoga[mesh] # pranayama # meditation # practice
#2 Yoga* OR Yogic OR Pranayama OR Asana OR meditation
orthostatic hypotension # 0H# vasovagal syncope # VVS
#systematic* review OR systematic OR meta-analysis
#review article # original article #

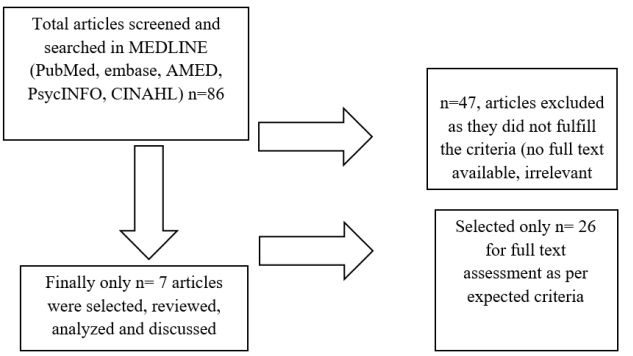

Chart 1: Flow chart of search strategy

3. Discussion

Seven articles (3 RCTs, 3 observational/interventional, 1 review) full filled the eligibility criteria and are discussed as follows.

An interventional study involving sample of fifty healthy volunteers subjected to 75 min yoga practice a day for forty-one days, demonstrated blood pressure response to standing showing significant response (–36.36%) reduction

in fall in systolic blood pressure while standing, indicating an attenuation of orthostatic hypotension.[19]

Another interventional study involving seventy healthy adults (30 males and 40 females) in the age group of 16-20 years, subjected to 4 months of specific yogasanas depicted that among autonomic functions the sympathetic activity in females had marginally significant orthostatic variation of blood pressure and concluded that the practice of yoga and pranayama would benefit individuals, as it would prepare them in overcoming stress by modulating and optimizing sympathetic activities in stressful situations thereby immediately restoring equilibrium, which in turn avoids intervention of inhibitory parasympathetic system.[20]

A pilot study involving 61 patients in Tadasana group, and 52 in conventional group, depicted reduction in the mean events greater in the tadasana group than in the convention group (6.1 ± 9 vs 2.7 ± 2.0; p = 0.01), tadasana group having 378 syncope/near-syncope events before treatment; at follow-up, only 6 events occurred in 5 patients (8%) and per patient, total events declined from a mean of 6 to 0.1 and concluded that the Tadasana yoga exercise, practiced for just 15 minutes twice a day, gradually corrects orthostatic imbalance, which possibly occurs due to the influence of Yogasanas and breathing over neuromuscular reflex malfunction that occurs in vasovagal syncope. The movements focus on strengthening neuromuscular reflexes in the quadriceps and the calf muscles, which can increase the blood circulation and venous return, thus preventing pooling of blood in the lower extremities.[21]

Fifty-five patients with recurrent VVS were randomized to receive either a specialized yoga training program in addition to current guideline-based therapy (intervention arm, group 1) or current guideline-based therapy alone (control arm, group 2). The primary outcome expected was the number of episodes of syncope and presyncope after 12 months. The mean number of syncopal or presyncopal events after 12 months was 0.7 ± 0.7 in the yoga intervention arm, compared to 2.52 ± 1.93 in the control arm ($P < 0.01$). In the intervention arm, 13 (43.3%) patients remained free of events versus 4 (16.0%) patients in the control arm. They concluded that Yoga as add-on therapy in VVS could be superior to medical therapy alone in decreasing the syncopal and presyncopal events and in improving the QoL. They also postulated that positive effects of yoga could be through combined central and peripheral mechanisms, which comprise various isotonic postures involving different muscle groups leading to enhanced muscle and vascular tone in addition to building muscle strength, which can not only blunt the venodilatation phase of a syncope episode but also accelerate the venous return.[22] Additionally, pranayama breathing and relaxation techniques have been shown to increase parasympathetic tone and improve autonomic balance which could potentially reduce the sympathetic overdrive phase and interrupt the activation of the c-mechanoreceptors, which is a vital stage in the syncope cascade.[14,23]

Jayaprakash S et al., randomized 97 symptomatic subjects with recurrent reflex VVS (>3 episodes in the past 1 year) and positive head-up tilt test to guideline-directed therapy (Group 1 n= 47) or yoga therapy (Group 2 n= 50). Patients in Group 1 were advised guideline directed treatment and Group 2 was taught yoga by a certified yoga expert. The primary outcome was VVS recurrences and Quality of life score. The mean age was 33.1 ± 16.6 years, male: female ratio of 40:57, symptom duration of 17.1 ± 20.7 months, with a mean of 6.4 ± 6.1 syncope episodes. Over a follow-up of 14.3 ± 2.1 months Group 2 had significantly lower syncope burden compared with Group 1 at 3 (0.8 ± 0.9 vs. 1.8 ± 1.4, $P < 0.001$), 6 (1.0 ± 1.2 vs.3.4 ± 3.0, $P < 0.001$), and at 12 months (1.1 ± 0.8 vs. 3.8 ± 3.2, $P < 0.001$). The Syncope functional score questionnaire was significantly lower in Group 2 compared with Group 1 at 3 (31.4 ± 7.2 vs. 64.1 ± 11.5, $P < 0.001$), 6(26.4 ± 6.3 vs. 61.4 ± 10.7, $P < 0.001$), and 12 months (22.2 ± 4.7 vs. 68.3 ± 11.4, $P < 0.001$). They suggested that guided yoga therapy was superior to conventional guideline-directed dietary modification and physical counterpressure measures in reducing the number of syncopal episodes, and improved QoL in patients and may be a useful therapeutic option for VVS patients.[24] Basel A et al, conducted a review involving four studies involving VVS patients, two RCTs and two observational studies. The total number of patients was 309, with a mean age of 36.4 ± 13.5 years. It was observed that, yoga therapy significantly decreased the number of episodes of syncope and presyncope among yoga group, compared to the control group (MD -1.86; 95% CI -3.30, −0.43; $P = 0.01$). Surprisingly, analysis did not show significant improvement in the Quality of life. They concluded that the yoga therapy can reduce the frequency of syncope and presyncope among patients with recurrent VVS.[25]

In an interventional study, 44 subjects were enrolled, 21 in the yoga intervention group and 23 in the control group with mean age was 21 ± 3 years, participants of yoga group were given a DVD containing yoga videos and were instructed to practice yoga therapy for 60 min, three times a week for 3 consecutive months and Syncope functional status questionnaire score (SFSQS) was assessed pre- and post-test. In the yoga intervention group, there was significant reduction in number of episodes of syncope (4 ± 1 vs 1.3 ± 0.7, $p < 0.001$) and presyncope (4.7 ± 1.5 vs 1.5 ± 0.5, $p < 0.001$). The mean SFSQS also reduced from 67 ± 7.8 to 29.8 ± 4.6 ($p < 0.001$). All participants had positive head up tilt table at the time of enrollment and on completion of yoga intervention phase only six patients had (10/100 vs 6/28%, $p < 0.0001$). They concluded that yoga therapy can potentially improve the symptoms

of presyncope and syncope in young female patients with neurocardiogenic syncope.[26]

4. Conclusion

Seven articles (3 RCTS, 3 Observational/interventional, 1 review) that meet all search criteria, demonstrated that yogic practices can have positive impact in attenuation of orthostatic hypotension and prevent frequency of recurrence of VVS. However, we recommend higher-quality RCTs in future to confirm our results.

5. Source of Funding

None.

6. Conflict of Interest

None.

7. Ethical Clearance

As this is review article, and no human/animals are experimented, ethical clearance is not required.

References

1. Magkas N, Tsioufis C, Thomopoulos C, Dilaveris P, Georgiopoulos G, Sanidas E, et al. Orthostatic hypotension: From pathophysiology to clinical applications and therapeutic considerations. *J Clin Hypertens (Greenwich)*. 2019;21(5):546–554.
2. Ricci F, DeCaterina R, Fedorowski A. Orthostatic Hypotension: Epidemiology, Prognosis, and Treatment. *J Am Coll Cardiol*. 2015;66(7):848–60.
3. Brignole M, Moya A, Lange FJD, Deharo JC, Elliott PM, Fanciulli A, et al. ESC Guidelines for the diagnosis and management of syncope. *Eur Heart J*. 2018;39(21):1883–1948.
4. Arbogast SD, Alshekhlee A, Hussain Z, Mcneeley K, Chelimsky TC. Hypotension unawareness in profound orthostatic hypotension. *Am J Med*. 2009;122(6):574–80.
5. Kanjwal K, George A, Figueredo VM, Grubb BP. Orthostatic hypotension: definition, diagnosis and management. *J Cardiovasc Med (Hagerstown)*. 2015;16(2):75–81.
6. Gibbons CH, Schmidt P, Biaggioni I, Frazier-Mills C, Freeman R, Isaacson S, et al. The recommendations of a consensus panel for the screening, diagnosis, and treatment of neurogenic orthostatic hypotension and associated supine hypertension. *J Neurol*. 2017;264(8):1567–82.
7. Low PA, Tomalia VA. Orthostatic hypotension: mechanisms, causes, management. *J Clin Neurol*. 2015;11(3):220–6.
8. Jeanmonod R, Sahni D, Silberman M. Vasovagal Episode (Internet). Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470277/.
9. Kinsella SM, Tuckey JP. Perioperative bradycardia and asystole: relationship to vasovagal syncope and the Bezold-Jarisch reflex. *Br J Anaesth*. 2001;86(6):859–68.
10. Lakkireddy D, Atkins D, Pillarisetti J, Ryschon K, Bommana S, Drisko J, et al. Effect of yoga on arrhythmia burden, anxiety, depression, and quality of life in paroxysmal atrial fibrillation: the YOGA My Heart Study. *J Am Coll Cardiol*. 2013;61(11):1177–82.
11. Cramer H, Lauche R, Haller H, Steckhan N, Michalsen A, Dobos G. Effects of yoga on cardiovascular disease risk factors: a systematic review and meta-analysis. *Int J Cardiol*. 2014;173(2):170–83.
12. Mosqueda-Garcia R, Furlan R, Tank J, Fernandez-Violante R. The elusive pathophysiology of neurally mediated syncope. *Circulation*. 2000;102(23):2898–906.
13. Sharpey-Schafer EP. Syncope. *Br Med J*. 1956;1(4965):506–9.
14. Mark AL. The Bezold-Jarisch reflex revisited: Clinical implications of inhibitory reflexes originating in the heart. *J Am Coll Cardiol*. 1983;1(1):90–102.
15. Romme J, Dijk NV, Go-Schön IK, Reitsma JB, Wieling W. Effectiveness of midodrine treatment in patients with recurrent vasovagal syncope not responding to non-pharmacological treatment (STAND-trial). *Europace*. 2011;13(11):1639–47.
16. Sheldon R, Raj SR, Rose MS, Morillo CA, Krahn AD. Fludrocortisone for the Prevention of Vasovagal Syncope: A Randomized, Placebo-Controlled Trial. *J Am Coll Cardiol*. 2016;68(1):1–9.
17. Brignole M, Menozzi C, Gianfranchi L, Lolli G, Bottoni N, Oddone D. A controlled trial of acute and long-term medical therapy in tilt-induced neurally mediated syncope. *Am J Cardiol*. 1992;70(3):339–42.
18. Shibao C, Lipsitz LA, Biaggioni I. ASH position paper: evaluation and treatment of orthostatic hypotension. *J Clin Hypertens (Greenwich)*. 2013;15(3):147–53.
19. Divya TS, Vijayalakshmi MT, Mini K, Asish K, Pushpalatha M, Suresh V. Cardiopulmonary and Metabolic Effects of Yoga in Healthy Volunteers. *Int J Yoga*. 2017;10(3):115–20.
20. Sahoo JK, Vatve M, Sahoo KD, Patil VV. Effect of specific "yogasanas" on cardiovascular autonomic function test. *Pravara Med Rev*. 2010;2(1):10–5.
21. Rao BH, Gowlikar V, Vooturi S, Benditt DG, Rao HN, Surath M. "Tadasana" Yoga Maneuver for Preventing Vasovagal Syncope Recurrences. *J Am Coll Cardiol EP*. 2022;8(2):253–4.
22. Sharma G, Ramakumar V, Sharique M, Bhatia R, Naik N, Mohanty S, et al. Effect of Yoga on Clinical Outcomes and Quality of Life in Patients With Vasovagal Syncope (LIVE-Yoga). *JACC Clin Electrophysiol*. 2022;8(2):141–9.
23. Ross A, Thomas S. The health benefits of yoga and exercise: a review of comparison studies. *J Altern Complement Med*. 2010;16(1):3–12.
24. Shenthar J, Gangwar RS, Banavalikar B, Benditt DG, Lakkireddy D, Padmanabhan D. A randomized study of yoga therapy for the prevention of recurrent reflex vasovagal syncope. *Europace*. 2021;23(9):1479–86.
25. Abdelazeem B, Abbas KS, Manasrah N, Amin MA, Mohammed SM, Mostafa MR. Yoga as a treatment for vasovagal syncope: A systematic review and meta-analysis. *Complement Ther Clin Pract*. 2022;48:101579. doi:10.1016/j.ctcp.2022.101579.
26. Gunda S, Kanmanthareddy A, Atkins D, Bommana S, Pimentel R, Drisko J, et al. Role of yoga as an adjunctive therapy in patients with neurocardiogenic syncope: a pilot study. *J Interv Card Electrophysiol*. 2015;43(2):105–10.

Author biography

Balaji P A, Consultant Physician, ESH Hypertension Specialist https://orcid.org/0009-0003-3230-8990

Smitha R Varne, Consultant Yoga & Integrated Physician https://orcid.org/0009-0006-6593-0032

Cite this article: Balaji P A, Varne SR. A systematic review on physiological role of yoga and pranayama in management of orthostatic hypotension and vasovagal syncope. *Indian J Clin Anat Physiol* 2023;10(3):149-152.