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Yoga Based Non-Pharmacological Approach in the Management of Glycemic Control and Associated Metabolic Disorders: A Review Article

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ABSTRACT

Yoga attempts to harmonize and balance the body, mind, and emotions. *Yoga* incorporates particular physical postures, breathing methods, relaxation, and meditation to help the body's mental and physical wellness. Based on data from several clinical trials, we briefly summarize the function of various *yoga* practices in the management of glycemic control and associated metabolic disorders in this review. We searched numerous databases and checked the bibliographies of pertinent review papers and all recognized publications to find qualified studies. Medication alone is not enough for most people to achieve glycemic control; various healthy habits, including nutrition, frequent physical exercise, and stress management, must also be addressed. *Yoga* practice has been shown to improve glycemic control by reducing stress and other self-care activities. *Yoga* as a mindfulness practice may be particularly beneficial to those with type 2 diabetes (T2DM).

Keywords: *Yoga*, mind, glycemic control, metabolic disorders.

INTRODUCTION

The term "*yoga*" is derived from the *Sanskrit* root *"yuj,"* which means "union" or "yoke," and also to direct and concentrate one's attention. [1,2] *Yoga* is a mind-body intervention that incorporates particular physical postures (*asanas*), breathing methods (*pranayama*), relaxation, and meditation to promote mind-body union. [3,4] There are eight limbs of *yoga*: *Yama* (ethical behaviour), *niyama* (personal behaviour), *asana* (physical posture), *pranayama* (breath regulation), *pratyahara* (sensory inhibition), *Dharana* (concentration), *dhyana* (meditation), and *samadhi*, (integration). The *yogic* practice of these limbs leads to a greater ethical, spiritual, and healing condition.[5]

Yoga has been studied as a therapeutic tool to prevent or cure medical disorders such as stress, insomnia, anxiety, obesity, diabetes, glucose tolerance, oxidative stress, dyslipidemia, coronary heart disease, and neurodegenerative disease in recent years. [6–8] The development of numerous lifestyle problems, including diabetes, is associated with sedentary behaviours and improper food patterns. Diabetes risk and severity are also increased by psychological stress. Lack of physical exercise has been associated with a three-time increase in the risk of diabetes and a 2.4-time increase in the risk of coronary artery disease.[9] Medication, nutrition, and physical activity are all important aspects of diabetes control.[10] People have used many complementary and alternative activities, in

the prevention and treatment of diabetes.[11,12] *Yoga* has been researched for its effectiveness in a variety of chronic conditions, including hypertension, chronic obstructive pulmonary disease, asthma, and diabetes.[13–15] Previous research has suggested that *Yoga* can help to manage Insulin Resistance Syndrome, which is a group of risk factors for the development of T2DM, and has shown promising outcomes in terms of relieving symptoms, improving prognosis, and reducing complications.[13,15–19] Other studies have shown that persistent physical exercise,[20-23] a balanced diet,[21] and active stress management,[24,25] can either postpone or alleviate the progression of diabetes from a pre-diabetic condition.

SOME OF THE BENEFICIAL EFFECTS OF *YOGA* PRACTICES ON GLYCEMIC CONTROL

***Surya namaskar* (sun salutation)**

It comprises a specific sequence of dynamic *yoga* poses. *Surya namaskar* stimulates insulin synthesis via brain signaling,[26] it has a significant reduction in hip circumference and has a positive influence on glycemic outcomes.[27]

***Yoga asana* (*yoga* postures)**

When practicing *yoga*, the pancreas cells are revitalized by alternate abdominal contractions and relaxations. *Yoga* also improves blood supply to muscles and increases insulin receptor expression in muscles. It also increases glucose absorption by muscles[28] and improves glucose utilization and fat redistribution in people with type 2 diabetes.[29]

Forward bend -It massages and pressurizes the pancreas, and stimulates insulin production.

Backward bend -It has stimulating and energetic effects.

Twisted poses - It squeezes the intestines to prevent colonic contents from becoming stagnant.

Inversions - It boosts blood circulation.

***Shuddhi kriya* (Cleansing processes)**

***Kapalbhati* (frontal brain purification):** The breathing techniques that involve exhaling forcefully and inhaling automatically. Exhalation creates abdominal pressure, which improves the effectiveness of β-cells of the pancreas. It promotes the synthesis of insulin and the regulation of blood glucose levels.

***Agnisar kriya* (stimulating the digestive fire):** The act of pulling the abdomen in (*uddiyan bandha*) and snapping it back and forth while holding one's breath. The 'vacuum' effect of this movement massages internal organs and improves blood flow to the region. It aids in the healthy functioning of the abdominal organs and boosts metabolism.[29]

***Vaman dhauti* (stomach cleansing with induced vomiting):**

It increases glucose absorption, lowers insulin resistance, and improves insulin action by lowering the body's circulating free fatty acid levels. It indicates a lower fasting and post-prandial blood glucose level.

***Shankhaprakshalana* (intestine cleansing):**

It aids in the reduction of blood glucose levels and the rise of insulin production.[26]

***Pranayama* (regulated breathing):**

Pranayama, includes *Anulom vilom, bhramari, Sheetali/Sitkari, chandrabhedan, Suryabhedan*, and *Bhastrika*. It improves cerebral blood flow and oxygenation, as well as neuronal activity in brain centres such as the limbic regions, hypothalamus, and medulla. It also improves sympathovagal outflow.[30]

***Anulom vilom* (alternate nostril breathing):**

It helps with cardiorespiratory endurance, body fat percentage, and flexibility, all of which are important aspects of health-related fitness.[31]

***Bhramari* (humming bee breath)**
It has a relaxing and soothing effect on the mind and is beneficial to both mental and physical health.[32]

***Sheetali/Sitkari* (cooling breath)**
It provides a cooling effect and helps to lower blood pressure.

***Chandra bhedan* (left nostril breathing)**
It activates the parasympathetic nervous system.

***Surya bhedan* (right nostril breathing)**
It stimulates the sympathetic nervous system and may be beneficial to diabetes.[33]

***Bhastrika* (bellows breath)**
It regulates the pineal, adrenaline, and pituitary glands and plays a crucial role in metabolism regulation.[34]

***Bandha* (lock)**
It includes constricting a specific area of the body and assisting in the re-direction of blood and the lymph to other parts of the body.
Uddiyan bandha (abdominal lock):
It causes the abdomen to constrict and produces negative pressure. The function of the pancreas enhances by the production of negative abdominal pressure.

***Hasta mudras* (hand gestures)**
Apan and *Gyan mudra* help to relieve stress and induce deep relaxation. *Linga mudra*, *Prana mudra*, and *Surya mudra* increase metabolic rates, help weight reduction, and lower blood glucose levels.

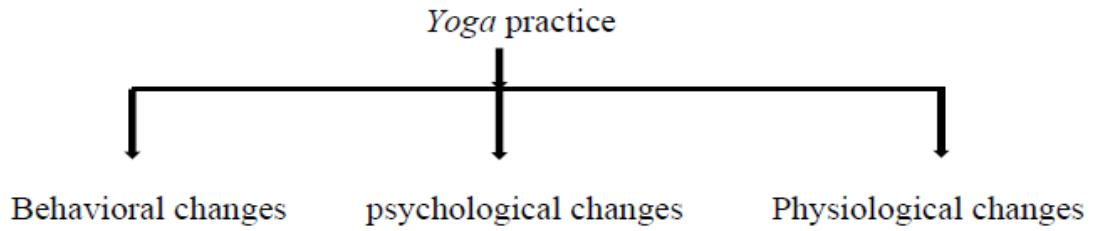
***Dhyan* (meditation)**
It offers psychological benefits including quicker stimulus reactions and being less prone to various types of stress,[35] anxiety lowering, and blood pressure regulation,[36] It also lowers blood glucose levels. During meditation, focus on the *Manipur chakra* (solar plexus) and visualize the pancreas.

Mindfulness
In diabetes and coronary heart disease persons, it promotes sleep quality, relaxation, and more receptive attitudes toward sickness and the illness experience.[37]

***"Aum"* chanting**
Within minutes of practice, it has brain-stabilizing effects, eliminates negative thoughts, boosts energy, and enhances the mind and body relaxation.[38] In the supine position, chanting induces an integrated relaxation response.[39]

***Yoga Nidra* (*yogic* relaxation)**
It aids in the improvement of symptom scores, as well as the lowering of fasting and postprandial blood glucose levels.[40]

BENEFITS OF *YOGA* PRACTICE IN TYPE 2 DIABETES; BP (BLOOD PRESSURE); HPA (HYPOTHALAMIC-PITUITARY-ADRENAL); GH (GROWTH HORMONE)



Behavioral changes: - It increases Physical activity and adherence to diet and medicines.

Psychological changes: - It increases Quality of life, and mood, and decreases stress.

Physiological changes: - It improves endothelial function, pancreas regeneration, and exercise tolerance by lowering body weight, heart rate, blood pressure, and lipid profile.

It has Immunomodulation by Changes in gene expression, inflammatory response, and cellular immunity. It affects the Sympatho-adrenal and HPA axis by elevating Melatonin and endorphin levels while decreasing GH, cortisol, prolactin, and adrenaline levels. It increases insulin secretion and decreases Insulin resistance. It also boosts cardiac autonomic function, nerve conduction, coagulation profile, and mental stability. *Yoga*'s overall impact is to prevent and control diabetes, as well as to regulate body weight, blood pressure, and lipid profile, as well as to prevent cardiovascular events and diabetic complications.

CONCLUSIONS

Yoga therapy helps with both health and sickness. According to the most recent scientific data, *yoga*-based lifestyle changes may have a role in the treatment of type 2 diabetes and its risk factors. Psycho-neuro-endocrine and immune systems are thought to have a comprehensive impact on diabetes management. Parasympathetic activation and the anti-stress processes that accompany it enhance patients' overall metabolic and psychological profiles, improve glucose tolerance and boost insulin sensitivity and lipid metabolism. *Yoga* techniques such as cleansing, *pranayama, asanas*, meditation, *mudras, bandha*, mindfulness, and relaxation have been shown to lower blood glucose levels and assist in the treatment of comorbid medical conditions associated with T2DM, with considerable good clinical effects. However, well-designed RCTs are required to assess the long-term effectiveness of *yoga* intervention not just for the risk of T2DM but also for other metabolic syndromes and cardio-vascular diseases.

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REFERENCES

1. Lasater J. The heart of *pantajali*. *Yoga J.* 1997; 137:134-44.
2. Raub JA. Psychophysiologic effects of *hatha yoga* on musculoskeletal and cardiopulmonary function: A literature review. *J Altern Complement Med.* 2002; 8:797-812.
3. Chong CS, Tsunaka M, Tsang HW, Chan EP, Cheung WM. Effect of *yoga* on stress management in healthy adults: a systematic review. Altern Ther Health Med. 2011; 17:32-8.
4. Satchidananda SS. Sādhana Pāda. In: Satchidananda SS, editor(s). The *yoga sutras* of *patanjali*, 15th ed ed.Buckingham, United States of America: Integral Yoga Publications, 2010; 131-150.
5. Pal R, Gupta N. *Yogic* practices on oxidative stress and of antioxidant level: a systematic review of randomized controlled trials. J Complement Integr Med. 2017. DOI: 10.1515/jcim-2017-0079.
6. Khalsa SBS. *Yoga* as a therapeutic intervention: a bibliometric analysis of published research studies. Indian J Physiol Pharmacol. 2004; 48:269–85.
7. Penman S, Cohen M, Stevens P, Jackson S. *Yoga* in Australia: results of a national survey. Int J Yoga. 2012; 5:92.
8. Taneja DK. *Yoga* and Health. Indian J Community Med. 2014; 39:68–72.
9. Thangasami SR, Chandani AL, Thangasami S. Emphasis of *yoga* in the management of diabetes. J Diabetes Metab 2015; 6:613.
10. Cui J, Yan JH, Yan LM, Pan L, Le JJ, Guo YZ JJodi. Effects of *yoga* in adults with type 2 diabetes mellitus: A meta-analysis. 2017; 8(2):201–9.
11. Falci L, Shi Z, Greenlee H JPcd. Peer Reviewed: Multiple Chronic Conditions and Use of Complementary and Alternative Medicine Among US Adults: Results From the 2012 National Health Interview Survey. 2016; 13.
12. Medagama AB, Bandara R JNj. The use of complementary and alternative medicines (CAMs) in the treatment of diabetes mellitus: is continued use safe and effective? 2014; 13(1):102.

13. Chandler K. The emerging field of *yoga* therapy. 2001.
14. Liu X-C, Pan L, Hu Q, Dong W-P, Yan J-H, Dong L JJotd. Effects of *yoga* training in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. 2014; 6(6):795.
15. Raub JA JTJoA, Medicine C. Psychophysiologic effects of Hatha *Yoga* on musculoskeletal and cardiopulmonary function: a literature review. 2002; 8(6):797–812.
16. Damodaran A, Malathi A, Patil N, Shah N, Marathe S JTJotAoPoI. Therapeutic potential of *yoga* practices in modifying cardiovascular risk profile in middle aged men and women. 2002; 50(5):633–40.
17. Garfinkel M, Schumacher HR Jr JRDCoNA. *Yoga*. 2000; 26(1):125–32.
18. Pandya DP, Vyas VH, Vyas SH JCt. Mind-body therapy in the management and prevention of coronary disease. 1999; 25(5):283–93.
19. Sahay B, Sahay RK JJotIMA. Lifestyle modification in management of diabetes mellitus. 2002; 100(3):178–80.
20. Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, et al. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. 2016; 39(11):2065–79.
21. Katula JA, Kirk JK, Pedley CF, Savoca MR, Effoe VS, Bell RA, et al. The Lifestyle Intervention for the Treatment of Diabetes study (LIFT Diabetes): design and baseline characteristics for a randomized translational trial to improve control of cardiovascular disease risk factors. 2017; 53:89–99.
22. Sanders AB. Effectiveness of a low dose behavior change intervention on physical activity maintenance following an exercise trial in pre-type II diabetics: Colorado State University. Libraries; 2017.
23. Schellenberg ES, Dryden DM, Vandermeer B, Ha C, Korownyk CJ Aoim. Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. 2013; 159(8):543– 51.
24. Hardie EA, Critchley CR, Moore SM JAP. Prediabetes Subtypes: Patterns of risk, vulnerabilities, and intervention needs. 2015; 50(6):455–63.
25. O'Dea A, Tierney M, McGuire BE, Newell J, Glynn LG, Gibson I, et al. Can the onset of type 2 diabetes be delayed by a group-based lifestyle intervention in women with prediabetes following gestational diabetes mellitus (GDM)? Findings from a randomized control mixed methods trial. 2015; 2015.
26. Shalinee, Mishra D, Kamal K, Gupta AK, Sharma KK. Shankhaprakshalana: a *yogic* karma for purification. Int J Ayurvedic Herb Med 2012; 2:578-81.
27. Sreedevi A, Gopalakrishnan UA, Karimassery Ramaiyer S, Kamalamma L. A randomized controlled trial of the effect of *yoga* and peer support on glycaemic outcomes in women with type 2 diabetes mellitus: a feasibility study. BMC Complement Altern Med 2017; 17:100.
28. Thangasami SR, Chandani AL, Thangasami S. Emphasis of *yoga* in the management of diabetes. J Diabetes Metab 2015; 6:613.
29. Malhotra V, Singh S, Tandon OP, Sharma SB. The beneficial effect of *yoga* in diabetes. Nepal Med Coll J 2005; 7:145-7.
30. Pal GK. Effects of pranayama on cardiovascular health. Int J Clin Exp Physiol 2016; 3:57-8.
31. Bal BS. Effects of short-term practice of *Anuloma Viloma Pranayama* on components of health-related fitness. Educ Prac Innov 2015; 2:10-8.
32. Srivastava S, Goyal P, Tiwari SK, Patel AK. Interventional effect of *Bhramari Pranayama* on mental health among college students. Int J Ind Psychol 2017; 4:29-33.
33. Nivethitha L, Mooventhan A, Manjunath NK. Effects of various *Praṇayama* on cardiovascular and autonomic variables. Anc Sci Life 2016; 36:72-7.
34. Singh RB, Wilczynska-Kwiatek A, Fedacko J, Pella D, De Meester F. *Pranayama*: the power of breath. Int J Disabil Hum Dev 2009; 8:141-53.
35. Ricard M, Lutz A, Davidson RJ. Mind of the meditator. Sci Am 2014; 311:38-45.
36. Chung SC, Brooks MM, Rai M, Balk JL, Rai S. Effect of *Sahaja yoga* meditation on quality of life, anxiety, and blood pressure control. J Altern Complement Med 2012; 18:589- 96.
37. Keyworth C, Knopp J, Roughley K, Dickens C, Bold S, Coventry P. A mixed-methods pilot study of the acceptability and effectiveness of a brief meditation and mindfulness intervention for people with

diabetes and coronary heart disease. Behav Med 2014; 40:53-64.
38. Gurjar AA, Ladhake SA, Thakare AP. Analysis of acoustic of *"OM"* chant to study its effect on nervous system. Int J Comput Sci Netw Secur 2009; 9:363-7.
39. Bhavanani AB, Madanmohan, Sanjay Z, Vithiyalakshmi SL. Immediate cardiovascular effects of *pranava* relaxation in patients with hypertension and diabetes. Biomed Hum Kinet 2012; 4:66-9.
40. Amita S, Prabhakar S, Manoj I, Harminder S, Pavan T. Effect of *yoga-nidra* on blood glucose level in diabetic patients. Indian J Physiol Pharmacol 2009; 53:97-101.

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