



Role of yoga on type two diabetic: A Descriptive Study

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Abstract

Type II diabetes mellitus (T2DM) has emerged as a global public health concern. Although physical activity has been empirically recognized as a promising therapeutic approach for the prevention and management of T2DM, consensus regarding the effectiveness of yoga in T2DM management has not yet been reached across studies and requires an updated systematic examination.

Yoga originated in India over 5,000 years ago and serves as a means of balancing and harmonizing the body, mind, and emotions. Yoga practice has been found useful in the management of various lifestyle disorders, including type 2 diabetes. Psycho-neuro-endocrine and immune mechanisms are involved in the beneficial effects of yoga on diabetes. The incorporation of yoga practices into daily life helps in attaining glycemic control and reducing the risk of complications among individuals with diabetes. In this review, the role of various yoga practices in the management of diabetes is briefly described on the basis of evidence drawn from different clinical studies.

Keywords: Diabetes, hormonal imbalance, Yoga asana, Pranayama, Meditation

Introduction

India is currently facing a diabetes epidemic. Recent data from the **ICMR-INDIAB 2024** study estimates that over 101 million Indians live with diabetes, with an additional 136 million in the prediabetes stage. There is significant variation in diabetes prevalence across states, with rural areas catching up to urban rates. This white paper explores the current landscape of diabetes care in India, highlights key challenges, and presents strategies to improve prevention, management,

and outcomes. RSSDI is dedicated to working with national and international organization to combat this growing health crisis.

Current Status: India's diabetes prevalence is among the highest globally, largely due to urbanization, lifestyle changes, and genetic predisposition. According to the ICMR-INDIAB study, Overall Diabetes Prevalence is 11.4% nationally, with urban prevalence at 14.2% and rural prevalence at 8.3%. Prediabetes Prevalence: 15.3%, highlighting a large at-risk population. Regional Disparities: States like Punjab report high prevalence rates (19.0%), while rural states show rising rates, reflecting increasing diabetes spread into underserved areas.

In 2014, around 387 million people had diabetes with a prevalence of 8.3%; by 2035 this will rise to 592 million (Thangasami S et.al, 2015).

Type 2 diabetes is a common lifestyle disorder caused by insulin resistance with relative or absolute insulin deficiency, resulting in chronic hyperglycemia and various cardiovascular complications. Globally, according to the International Diabetes Federation diabetes atlas (eighth edition, 2017), in 2017 there were roughly 425 million people with diabetes, a figure that is projected to increase to 629 million by 2045 [1]. Sedentary habits and unhealthy dietary patterns are the major risk factors for the development of various lifestyle disorders, including diabetes. Psychological stress also increases the risk and severity of diabetes. Lack of physical activity was found to increase the risk of diabetes by 3 times and the risk of coronary artery disease by 2.4 times. Dietary control and exercise are established treatment modalities in patients with type 2 diabetes and other lifestyle disorders, including obesity, hypertension, and dyslipidemia. Urbanization, the intake of calorie-rich food, use of various machines, less open space for exercise, a busy modern lifestyle, and lack of motivation reduces the likelihood of adherence to dietary control and exercise as a management option in people with diabetes. Moreover, individuals with diabetes have a reduced capacity to engage in exercise because of overweight, physical unfitness, sedentary lifestyle, limited joint mobility, and other diabetes-related complications, including cardiovascular disease, peripheral neuropathy, and diabetic foot problems. Several studies have shown that poor adherence to diet and exercise programs were major limitations in the implementation of non-pharmacological treatments of diabetes.

Lifestyle modification is the best treatment modality in this case. Yoga is a series of mental, physical and spiritual disciplines that originated in ancient India. Yoga told by Lord Shiva is one among them having great potential to provide health in many disease conditions. The world is looking towards Yoga as a better management for Diabetes mellitus along with Ayurveda. Yoga, which originated in India more than 5,000 years ago, aims at balancing and harmonizing the body, mind, and emotions. increasing evidence suggests that yoga practice tackles the pathophysiologic mechanisms of diabetes and helps in controlling diabetes and its complications (Liu XC, 2014). Yogic involves different lifestyle changes like kriyas, various asana, changes in

diet, managing stress, meditation and leading a holistic life. The comprehensive yoga, an approach incorporating body postures (asanas), breathing techniques (pranayamas), meditation (affecting the manomayakosa), cleansing (kriyas), nutrition (satvik diet), attitudinal and behavioral modification, and mental discipline, (affecting the vijnanmaya and anandamayakosha) is more beneficial and loyal to its ancient inhabitants (Babita R et.al,2016).

Diabetes

Diabetes Mellitus (DM) is a chronic disease, occurs when the pancreas unable to produce adequate insulin or body cannot respond appropriately to insulin.

Skeletal Muscle: In T2DM, insulin signaling defects reduce GLUT4 translocation to the cell membrane.

Liver: Hepatic insulin resistance leads to failure of insulin to suppress gluconeogenesis. Despite hyperinsulinemia, the liver continues inappropriate glucose production via upregulated PEPCK and G6Pase. This causes fasting hyperglycemia, a hallmark of T2DM.

Adipose Tissue: Impaired anti-lipolytic effect of insulin → increased FFA release. FFAs cause lip toxicity in muscle/liver and further impair insulin signaling via DAG-PKC pathway and mitochondrial dysfunction.

Hormonal imbalance

Hormonal imbalance affects the development and growth of diabetes. In diabetes, hormone insulin not produced or not effectively utilized by the body. This results in elevated blood glucose levels, thereby disturbing normal metabolic processes. Other hormones, such as glucagon, cortisol, and adrenaline, may also become dysregulated.

Stress hormones like cortisol may reduce insulin sensitivity, thereby aggravating hyperglycemia. Imbalances in leptin and ghrelin can additionally influence appetite and energy regulation. Overall, these hormonal disturbances contribute to impaired glucose control and long-term complications.

An approach to addressing hormonal imbalances in adolescents may incorporate lifestyle, nutrition, and stress-management techniques to create a strategy that supports a healthy transition through puberty and promotes well-being through all stages of life.

The reproductive and endocrine systems are the two primary systems involved in puberty and the production of hormones that cause the changes seen in puberty. These hormones act as messengers and affect nearly every organ system within the body. A hormonal imbalance can involve an excess or deficiency of one or more hormones or secretion of hormones at varying times. Issues with sex hormone production can lead to early or delayed puberty. Hormones in the

hypothalamus and pituitary gland of the brain trigger the start of puberty: Gonadotropin-releasing hormone (GnRH) is secreted in the hypothalamus and causes the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the pituitary cells. FSH and LH then act on the testes and ovaries to make testosterone, estrogen, and progesterone. This connection between the brain and the sex organs is called the hypothalamic-pituitary-gonadal axis (HPG axis). In the adrenal glands, the production of hormones such as DHEA and DHEA-S is increased during puberty, which may contribute to changes in physical appearance, such as increased body hair and odor. Women with polycystic ovary syndrome (PCOS) may have higher levels of DHEA.

Asanas (yoga postures)

Asanas emphasize the relationship of body, mind, and awareness, focusing on the synchronization of breathing and movement. They involve stretching/twisting movements and relaxation. The key to performing a yoga posture is that it should be performed with stability and comfort. Seated postures such as ardhmatsyendrasan, yoga mudra, and mandukasan improve pancreatic function. Asanas with forward bends massage and pressurize the pancreas and stimulate the secretion of insulin. Twisting poses, such as vakrasan and ardhmatsyendrasan (seated spinal twist) squeeze the intestines and massage them to prevent the stagnation of colonic contents. For therapeutic benefits, the poses need to be maintained for approximately 30 seconds to 1 minute, depending on individual capacity, and the duration may be gradually increased. A study showed that yoga postures had a positive effect on glucose utilization and fat redistribution in individuals with type 2 diabetes. Malhotra V et al. (2005) In patients with diabetes, pancreatic cells may be rejuvenated and pancreatic β -cell sensitivity may be increased by the alternating abdominal contractions and relaxations involved in yoga practice. Improved blood supply to muscles may enhance insulin receptor expression in the muscles, causing increased glucose uptake. Thangasami SR et al. (2015)

Pranayama (yogic breathing)

Pranayama is controlled or regulated yogic breathing practice. The slow breathing technique in pranayama causes comprehensive changes in body physiology by controlling the autonomic nervous system; it regularizes the rate and pattern of breathing and regulates the heart rate and its variability. Pal GK et al. (2016)

Bal BS (2015) The vibrations created in bhramari prayanama (humming bee breath) have a soothing and calming effect on the mind and could play a vital role in improving mental and physical health. Srivastava S et al. (2017). Right nostril breathing is believed to have a sympathetic stimulating effect and may be recommended in people with diabetes. Nivethitha. L

et al. (2016). Bhastrika pranayama (bellow-breathing) is a powerful and energetic pranayama referred to as “the breath of fire.” It helps in the regulation of the pineal, pituitary, and adrenal glands, which play an important role in the regulation of metabolism. Singh RB (2009).

Dhyan (meditation)

Meditation has been shown to cause physiological changes in the brain. Meditators experience beneficial psychological effects, such as faster reactions to stimuli, and are less prone to various forms of stress Ricard M et al. (2014). The mental stability attained through the practice of meditation helps diabetes patients.

Yoga practice and mindful eating

Yoga participation has been correlated with fruit and vegetable intake, as well as improved eating habits and mindful eating practices [5]. Meditation and ability to heighten mindfulness may be beneficial in controlling binge-eating patterns. Mindful eating in diabetes has shown to facilitate improvements in dietary intake, modest weight loss, and glycemic control [6].

Yoga practice in healthy volunteers was found to result in increases in wellness; reductions in stress, depression, and anxiety; improvements in the physical, psychological, and social domains and total quality of life; a feeling of balance; and a new outlook on life Chung SC et al. (2012), (Kosuri M et al. (2009), Brown RP et al. (2005), Gangadhar BN et al. (2013). Yoga reduces Oxidative stress, as demonstrated by reductions in serum malondialdehyde, interleukin 6, and leptin levels, and improvements in adiponectin levels [44,48]. Yoga therapy increases the number of insulin receptors and increases the proportion of receptor binding in patients with diabetes. Gordon L et al. (2008).

Aum/Om chanting

Scientific analyses have shown that chanting “Aum” is based on the physics of sound, vibrations, and resonance, and has a positive influence on health. Chanting the “Aum” mantra results in stabilization of the brain, removal of negative thoughts, and increase of energy, and mental improvements and relaxation of the body take place within minutes of practice. Gurjar AA et al. (2009) Pranava pranayama (chanting “Aum”) in the supine posture produces an integrated relaxation response, which may have clinical significance in the management of hypertension and diabetes. Bhavanani AB et al. (2012)

Evaluation of the immediate effects of the mind-sound resonance technique in people with type 2 diabetes showed its potential role in enhancing cognitive function. Mohanty S et al. (2015).

Reviews of Literature:

1. **Malhotra V, (2005)** conducted study among type 2 diabetes mellitus patients by using different yoga postures. The postures are Surya namaskar, Trikonasana, Tadasana, Padmasana, Bhastrika Pranayama, Pashimottanasana, Ardhamatsyendrasana, and Shavasana. This asana showed the improvement in health status and decreases the blood sugar level among the type II diabetes patients.
2. **Maurya SK et. Al. (2017)** Importance of Asanas is stability and relaxes the body for long time. Due to various inflection, stretches and strains in the body, the internal organs are stretched and subjected to strain. This increases the blood supply and oxygen supply to the organs, also increasing the efficiency and functioning of the organ. Stretching various glands in the body, results in increased efficiency of the endocrine system.
3. **Mullur RS and Ames D (2016)** Practice of 10 minutes yoga intervention combined with standard medical care could improve metabolic health of the individual with diabetes.
4. Chu et al., (2016) These findings were in line with a recently published meta-analysis yielding favorable effects of yoga on specific metabolic syndrome.
4. Effect of yoga practice on BMI was observed, which is consistent with prior work (**Boulé et al., 2001**). A possible reason behind this was that yoga training decreases muscle insulin resistance and increases glucose disposal through a number of mechanisms that would not necessarily be relevant to losing weight. However, results must be interpreted with caution because of the limited number of selected studies in the analysis. Therefore, additional investigation is necessary to discover the impact of yoga practice on body mass.
5. **Hegde, S. V et al (2020)** Studies have shown a beneficial role of yoga in treating type 2 diabetes mellitus. The present study proceeds in the field by providing an active control. We aimed to evaluate the effect of 3 months of yoga on oxidative stress, glycemic status, and anthropometry in type 2 diabetes mellitus. Forty participants were randomized to receive either yoga (n = 20) or sham yoga (n = 20) as a control. Yoga included postures and breathing exercises, and nonaerobic stretching exercise comprised the control. Yoga participants had significantly greater improvement in reduced glutathione compared to controls. No significant differences between groups were observed in any other outcome variables and type 2 diabetes mellitus. Levels of reduced glutathione improved only in the yoga group.
6. Many yoga practices have been found to be beneficial in the management of type 2 diabetes; however, their judicious use is recommended after a careful assessment of a patient's overall health, individual requirements, associated risk factors, and contraindications
7. American Diabetes Association, moderate intensity aerobic exercise plays a pivotal role in

managing diabetes-induced metabolic disorders (American Diabetes Association, 2019)

8. yoga has played a significant role in the treatment and prevention of diabetes. Several experimental studies examining the effectiveness of yoga on T2DM have shown favorable results in blood glucose, lipid profile, oxidative stress, blood pressure, anthropometric indicators, and quality of life (Ranga et al., 2021; Sivapuram et al., 2021).

Conclusion:

Yoga practices are applicable for wellness, as well as for illness. The modern scientific evidence suggests the potential role of yoga-based lifestyle amendments in the management of type 2 diabetes and its associated risk factors. It is suggested that psychoneuro-endocrine and immune mechanisms have complete effects in diabetes control. Parasympathetic activation and the associated anti-stress mechanisms improve patients' overall metabolic, breathing pattern and psychological profiles, increase insulin sensitivity, and improve glucose acceptance and lipid metabolism. Yoga practices such as cleansing processes, Sukshma vyayama, asanas, pranayama, mudras, bandha, ram beej mantra chanting, Om meditation, mindfulness, and relaxation are known to reduce blood glucose levels and to help in the management of comorbid disease conditions associated with type 2 diabetes mellitus, resulting in significant positive outcomes.

Reference:

1. Raghuwanshi, B., Bhatia, V., & Manik, R. H. (2016, January). A review on yoga therapy for diabetes management. *National Journal of Laboratory Medicine*, 5(1), 33–36.
2. Bal, B. S. (2015). Effects of short-term practice of Anuloma Viloma Pranayama on components of health-related fitness. *Education Practice and Innovation*, 2, 10–18.
3. Boulé, N. G., Haddad, E., Kenny, G. P., Wells, G. A., & Sigal, R. J. (2001). Effects of exercise on glycemic control and body mass in type 2 diabetes mellitus: A meta-analysis of controlled clinical trials. *JAMA*, 286(10), 1218–1227.
4. Bijlani, R. L., Vempati, R. P., Yadav, R. K., Ray, R. B., Gupta, V., et al. (2005). A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. *Journal of Alternative and Complementary Medicine*, 11
5. Bhavanani, A. B., Madanmohan, Sanjay, Z., & Vithiyalakshmi, S. L. (2012). Immediate cardiovascular effects of pranava relaxation in patients with hypertension and diabetes. *Biomedical Human Kinetics*, 4, 66–69.

6. Brown, R. P., & Gerbarg, P. L. (2005). Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: Part II—Clinical applications and guidelines. *Journal of Alternative and Complementary Medicine*, 11(4), 711–717.
7. Chen, S., Deng, S., Liu, Y., & Yin, T. (2022). Effects of yoga on blood glucose and lipid profile of type 2 diabetes patients without complications: A systematic review and meta-analysis. *Frontiers in Sports and Active Living*, 4, Article 900815.
8. Chu, P., Gotink, R. A., Yeh, G. Y., Goldie, S. J., & Hunink, M. M. (2016). The effectiveness of yoga in modifying risk factors for cardiovascular disease and metabolic syndrome: A systematic review and meta-analysis of randomized controlled trials. *European journal of preventive cardiology*, 23(3), 291-307.
9. Chung, S. C., Brooks, M. M., Rai, M., Balk, J. L., & Rai, S. (2012). Effect of Sahaja yoga meditation on quality of life, anxiety, and blood pressure control. *Journal of Alternative and Complementary Medicine*, 18(6), 589–596.
10. Gangadhar, B. N., Naveen, G. H., Rao, M. G., Thirthalli, J., & Varambally, S. (2013). Positive antidepressant effects of generic yoga in depressive out-patients: A comparative study. *Indian Journal of Psychiatry*, 55(Suppl. 3), S369–S373.
11. Gordon, L., Morrison, E. Y., McGrowder, D., Penas, Y. F., Zamora, E. M., Garwood, D., et al. (2008). Effect of yoga and traditional physical exercise on hormones and percentage insulin binding receptor in patients with type 2 diabetes. *American Journal of Biochemistry and Biotechnology*, 4(1), 35–42.
12. Gurjar, A. A., Ladhake, S. A., & Thakare, A. P. (2009). Analysis of acoustics of “OM” chant to study its effect on the nervous system. *International Journal of Computer Science and Network Security*, 9, 363–367.
13. Hegde, S. V., Adhikari, P., Kotian, S. M., & Shastry, R. (2020). Effects of yoga versus sham yoga on oxidative stress, glycemic status, and anthropometry in type 2 diabetes mellitus: A single-blinded randomized pilot study. *International journal of yoga therapy*, 30(1), 33-39.
14. Innes, K. E., Bourguignon, C., & Taylor, A. G. (2005). Risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga: A systematic review. *Journal of the American Board of Family Practice*, 18(6), 491–519.

15. ICMR-INDIAB 2024 <https://rssdi.in/newwebsite/pdfdata/White-Paper-on-Diabetes-Current-Status-Challenges-and-Future-Vision.pdf>
16. International Diabetes Federation. (2017). IDF diabetes atlas (8th ed., pp. 40–59). Brussels, Belgium: Author. psychological outcomes. Metabolic Syndrome and Related Disorders, 7(6), 515–517.
17. Liu, X. C., Pan, L., Hu, Q., Dong, W. P., Yan, J. H., & Dong, L. (2014). Effects of yoga training in patients with chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Journal of Thoracic Disease*, 6, 795–802.
18. Malhotra V, Singh S, Tandon OP, Sharma SB (2005) The beneficial effect of yoga in diabetes. *Nepal Med Coll J* 7: 145-147.
19. Malhotra V, Singh S, Tandon OP, Madhu SV, Prasad A, Sharma SB. Effect of Yoga asanas on nerve conduction in type 2 diabetes. *Indian J Physiol Pharmacol* 2002;46:298–306
20. Manjunatha S, Vempati RP, Ghosh D, Bijlani RL. An investigation into the acute and long-term effects of selected yogic postures on fasting and postprandial glycemia and insulinemia in healthy young subjects. *Indian J Physiol Pharmacol*. 2005; 49:319–324. [PubMed] [Google Scholar]
21. Maurya Somendra Kumar et al. / *Journal of Pharmacy Research* 2017,11(7),836-846
22. Mohanty S, Metri K, Nagaratna R, Nagendra HR. Immediate effect of mind sound resonance technique (MSRT-A yogic relaxation technique) on cognitive functions in type 2 diabetes. *Voice Res* 2015;4:44-5.
23. Mullur RS, Ames D. Impact of a 10-minute seated yoga practice in the management of diabetes. *J Yoga Phys Ther*. 2016; 6:1000224. [PMC free article] [PubMed] [Google Scholar]
24. Nivethitha L, Mooventhan A, Manjunath NK. Effects of various Prāṇayama on cardiovascular and autonomic variables. *Anc Sci Life* 2016;36:72-7.
25. Ranga, S. A., Agrawal, S., Rukadikar, C. A., and Rukadikar, A. R. (2021). Study of effect of yoga on blood pressure, blood glucose, and glycosylated hemoglobin levels of patients with Type 2 diabetes mellitus. *Natl. J. Physiol. Pharm. Pharmacol*. 11, 449–453. doi: 10.5455/njppp.2021.11.02056202110032021



26. Sahay BK. Role of yoga in diabetes. *J Assoc Physicians India* 2007;55:121–6. Stevens DL. The use of complementary and alternative therapies in diabetes. *Clin Fam Prac* 2002;4:911–28.
27. Singh RB, Wilczynska-Kwiatk A, Fedacko J, Pella D, De Meester F. Pranayama: the power of breath. *Int J Disabil Hum Dev* 2009;8:141-53.
28. Sivapuram, M. S., Srivastava, V., Kaur, N., Anand, A., Nagarathna, R., Patil, S., et al. (2021). Ayurveda body–mind constitutional types and role of yoga intervention among type 2 diabetes mellitus population of Chandigarh and Panchkula Regions. *Ann. Neurosci.* 27, 214–223. doi: 10.1177/09727531211000040
29. 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.s

