

## **"Yoga for Diabetes: Breathe, Move, Thrive: Exploring the Role of Yoga in Managing and Alleviating Diabetes"**

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### **I. Introduction**

Diabetes is a major global health issue. Currently, there are 422 million people worldwide living with diabetes, and this number is expected to rise to 643 million by 2030. This disease contributes to about 11.3% of global deaths. In 2010, India had 50.8 million people with type 2 diabetes, with a higher prevalence in urban areas. By 2030, India is projected to have 79.4 million people with diabetes, with a significant portion over 60 years of age. The state of Kerala has a diabetes prevalence of 17%. Managing diabetes in older adults is challenging due to their varied health conditions and multiple other diseases they often have, like high blood pressure and heart disease.

Older people often struggle to follow medication prescriptions correctly. This is where Complementary and Alternative Medicine (CAM), such as yoga, becomes relevant. CAM includes practices like yoga and meditation, which are used alongside conventional medicine. Yoga, in particular, is gaining popularity in the West for its health benefits. It's a practice that combines body movements, breathing exercises, and meditation to improve overall health. The American Diabetes Association recommends at least 150 minutes of moderate aerobic activity per week for those with diabetes, and yoga is considered a moderate exercise.

Yoga not only helps physically but also mentally and emotionally, improving the overall quality of life. It has shown positive results in clinical trials for diabetes patients, improving stress management and life satisfaction. The practice of yoga can lead to significant changes in physical, psychological, and hormonal states over time. It includes various exercises and techniques that enhance muscle tone, regulate bodily functions, improve breathing, digestion, and sleep patterns, and reduce tension. Regular yoga practice can also aid in behavioural changes and dietary management through mental discipline. Therefore, yoga is increasingly recognized as a beneficial therapy for managing diabetes, especially in older adults, offering a holistic approach to dealing with the disease and its complications.

**Global diabetes prevalence, measured in millions and adjusted for age, reflects the widespread occurrence of diabetes across the world.**

| Region  | 2019        | 2030        | 2045         |
|---|-------------|-------------|--------------|
| Worldwide   | 463 (8.3%)  | 578 (9.2%)  | 700 (9.6%)   |
| South-East Asia (incl. India)   | 88 (11.3%)  | 115 (12.2%) | 153 (12.6%)  |
| Europe  | 59 (6.3%)   | 66 (7.3%)   | 68 (7.8%)    |
| North America and Caribbean   | 48 (11.1%)  | 56 (12.3%)  | 63 (13%)     |
| South and Central America   | 32 (8.5%)   | 40 (9.5%)   | 49 (9.9%)    |
| Africa (excl. North Africa)   | 19 (4.7%)   | 29 (5.1%)   | 47 (5.2%)    |
| Middle East and North Africa  | 55 (12.2%)  | 76 (13.3%)  | 108 (13.9%)  |
| Western Pacific (includes China, SE Asia, Japan, Korea, Australia and NZ) | 163 (11.4%) | 197 (12.4%) | 212 (12.8 %) |

### **Background of The Study**

Diabetes has been a recognized ailment since ancient times, with its roots traced back to the medical treatise Charaka Samhitha by Charaka, a pioneer of Ayur-Veda, dating between 2500 - 2000 BC. In Sanskrit, diabetes was termed madhu-meha, translating to "sweet urine," a concept still echoed in Hindi. Pra-meha, meaning "excess urine," is the popular term in Malayalam. The word "diabetes" itself, coined by Aretaeus of Cappadocia, originates from the Greek diabeínein, signifying "to stride or stand with legs apart," and evolved to represent a disease characterised by excessive urine discharge. In English, "diabete" first appeared around 1425, and Thomas Willis, in 1675, introduced "mellitus" (Latin for "honey") to describe the sweet taste of urine

observed by ancient cultures, including the Greeks, Chinese, Egyptians, Indians, and Persians. Matthew Dobson, in 1776, confirmed this sweetness was due to an excess of sugar in the urine and blood.

Even Sushruta, an ancient Ayur-veda physician and surgeon, noted the impact of diabetes on sedentary, obese individuals, highlighting the importance of physical activity in managing the disease. These historical references underscore the awareness of diabetes pathology among ancient Indians, reflecting a rich understanding of this condition.

## **II. Review of The Literature**

Diabetes, a prevalent metabolic disorder attributed to deficiencies in insulin secretion or action, leads to hyperglycemia. The delicate balance between oxidants and antioxidants in our body, when disrupted, can contribute to various ailments, including diabetes mellitus. Although physical activity serves as a beneficial intervention for diabetes, its regular adoption remains low among patients. Yoga, an ancient Indian practice, stands out as a popular and potentially more acceptable alternative to conventional exercise, especially for older individuals.

The advantages of incorporating yoga into the physical activity regimen for diabetes encompass several aspects. Firstly, yoga follows a holistic philosophy that integrates physical exercises into a broader lifestyle approach, encompassing diet, relaxation, and stress management. Secondly, it imposes lower cardiovascular demands compared to other exercise forms. Thirdly, as a low to moderate-intensity activity, yoga caters to individuals facing challenges like obesity, mobility issues, or contraindications to strenuous exercises (e.g., proliferative retinopathy). Lastly, it provides an alternative identity option, as yoga practitioners often do not identify themselves as traditionally "sporty."

Numerous controlled studies have explored the effectiveness of yogic practices as complementary and alternative therapies for various health conditions, including cardiovascular disease and diabetes. In the context of diabetes, research has shown positive outcomes, such as reductions in anthropometric parameters, fasting and postprandial blood glucose levels, cholesterol levels, and improvements in overall well-being. Additionally, studies have reported a decrease in HbA1c levels and serum malondialdehyde (MDA) levels, suggesting the potential of yoga as an adjunct to managing diabetes.

Diabetes mellitus is marked by high blood sugar levels and changes in the body's handling of glucose and fats, as noted by Wierusz-Wysocka and others in 1995. This condition leads to alterations in various oxidative stress markers like superoxide dismutase (SOD), catalase, glutathione reductase, and others. These changes, including variations in glutathione levels, vitamins, lipid peroxidation, nitrite concentration, and the formation of nonenzymatic glycosylated proteins, contribute to the high blood sugar and related complications seen in diabetes.

Research, including studies by Heistad in 2005 and Liu and colleagues in 2006, has delved into how free radicals cause lipid peroxidation in diabetics and the status of antioxidants in these patients. Complications of diabetes mellitus are often linked to the heightened activity of free radicals that induce lipid peroxidation and the build-up of its byproducts. The factors leading to increased formation of lipid peroxides in people with diabetes are numerous. They include the autooxidation of glucose due to high blood sugar, the non-enzymatic glycation of proteins and lipids, increased activity in the sorbitol pathway, oxidation of advanced glycation end-products (AGEs), and the cyclooxygenase-dependent creation of prostaglandin H<sub>2</sub> (PGH<sub>2</sub>), as explained by Lorenzo and others in 2008.

As early as the 17th century, an English physician associated the onset of diabetes with "prolonged sorrow," as highlighted by Cathy Lloyd and colleagues in 2005. The impact of stress on health, particularly in individuals with type 2 diabetes, is widely acknowledged. Stress, a term encompassing psychological, biological, and medical aspects, was conceptualised by endocrinologist Hans Selye in the 1930s as "the non-specific response of the body to any demand." Stress triggers the release of counter-regulatory hormones, including cortisol, leading to energy mobilisation and other physiological responses.

Cortisol, in interaction with insulin, influences glucose production, hepatic gluconeogenesis, and inhibits peripheral glucose utilisation, contributing to the development of metabolic syndrome components such as visceral obesity, insulin resistance, and dyslipidemia, as discussed by Surwit and Roland in 2002 and 2005, respectively.

Training in stress management skills has demonstrated positive effects on glycemic control in type 2 diabetes patients, resulting in approximately a 0.5% reduction in HbA1c compared to control patients, according to Surwit et al. in 2002. Patients with elevated cortisol profiles in type 2 diabetes exhibit higher levels of glucose, HbA1c, and blood pressure, suggesting a potential role of the hypothalamic-pituitary-adrenal axis (HPA) in the development of metabolic disturbances, as indicated by Kerstin et al. in 2006.

Specific forms of yoga, such as Iyengar yoga, have been shown to reduce stress-related diseases, indicating an impact on the HPA axis. Andreas et al. in 2005 highlighted the potential of yogic practice to alleviate stress effects and promote positive downstream effects on the neuroendocrine system.

### **Significance of The study**

This study highlights the critical role of yoga as a complementary and alternative medicine in managing diabetes, particularly in the ageing population and amidst rising global and Indian diabetes rates. It emphasises the holistic benefits of yoga in addressing the unique challenges faced by older adults with diabetes, including improved blood glucose control, stress management, and overall well-being. By integrating scientific validation and historical-cultural perspectives, the study advocates for an interdisciplinary approach that combines yoga with traditional healthcare. This offers a patient-centric strategy with potential behavioural and lifestyle benefits, suggesting significant implications for diabetes management and research globally.

### **Objectives**

- This study focuses on evaluating the role of yogic practices as complementary therapy in diabetes patients.
- Objectives include improving the overall health of individuals with diabetes.
- The study aims to prevent or mitigate secondary complications like nephropathy, neuropathy, and retinopathy, especially in geriatric patients with specific socioeconomic conditions, dietary habits, and lifestyles.
- Additionally, the research intends to assess the effectiveness of yogic practices on stress levels, oxidative stress, antioxidant status, and the function of liver and pancreatic enzymes.

### **III. Results and Discussion**

Diabetes poses a significant global health challenge, leading to increased mortality and serious morbidity. Maintaining the balance between oxidants and antioxidants in the body is crucial, and its disruption can contribute to various diseases, including diabetes mellitus, which is further aggravated by stress. Lifestyle interventions, particularly adopting a physically active routine, are recommended, but barriers like low motivation and poor social support hinder regular exercise among patients. Despite positive feedback on the benefits of yoga for diabetic control, there's a notable gap between participants' assessments and commitment to yoga classes. In a focused study on 73 elderly diabetic patients practising yoga, high attendance (80-100%) was recorded, demonstrating positive effects on stress, oxidative stress, antioxidant status, liver and kidney function, trace element levels, and nerve conduction function. This study emphasises the potential of yogic practice as a complementary therapy for diabetes in geriatric patients, offering improved glycemic control and reestablishing oxidant/antioxidant equilibrium.

This study demonstrated a significant reduction in cortisol levels, from  $23.06 \pm 0.8$  to  $18.66 \pm 0.557$   $\mu\text{g/dl}$ , after engaging in yogic practices, aligning with findings by Andreas Michalsen et al., (2005). This indicates yoga's impact on the hypothalamic-pituitary-adrenal (HPA) axis, potentially easing stress-related effects and positively influencing the neuroendocrine system. The results align with those of Lajpat (1996), Parshad (2005), and Gupta et al. (2006), suggesting that yoga can effectively alleviate stress. It achieves this by modulating limbic system activity and regulating endocrine secretions linked to stress response. Yoga's stress reduction effects may also involve the upregulation of hippocampal 5HT1A receptors, leading to decreased cortisol levels and improvement in cognitive functions. The practice appears to enhance cerebral blood flow during various asanas, contributing to these beneficial changes. A notable reduction in cortisol was observed in group III (24.4%), suggesting yoga's effectiveness across various stages of disease progression. Stress is believed to contribute to coronary artery spasms through mechanisms like  $\alpha$ -adrenergic stimulation and the release of thromboxane A<sub>2</sub> and catecholamines. As part of cardiac rehabilitation, institutions like the Texas Heart Institute have integrated yoga to relieve stress and improve musculoskeletal flexibility, which is thought to significantly benefit cardiovascular health by reducing arterial blood pressure.

### **IV. Conclusion**

The research presented here comprehensively illustrates the significant impact of yoga as a complementary therapy in the management of diabetes, particularly among older adults. The study underscores several crucial findings and implications: Regular participation in yoga has shown positive effects on the management of blood sugar levels in diabetic patients. This is evident through improvements in various metabolic markers, including reductions in fasting and postprandial blood glucose levels and HbA<sub>1c</sub>.

**Stress Reduction:** A key finding is the substantial decrease in cortisol levels among participants, indicating that yoga effectively mitigates stress. This is particularly relevant for diabetes management, as stress can exacerbate the condition. The practice of yoga influences the hypothalamic-pituitary-adrenal (HPA) axis, leading to reduced stress effects and improved neuroendocrine function.

Yoga has been shown to positively affect the balance between oxidants and antioxidants in the body, which is a critical aspect in the progression and management of diabetes. The study's results suggest that yoga helps in reestablishing this balance, potentially reducing the risk of complications associated with diabetes.

**Impact on Secondary Complications:** The practice of yoga can help in preventing or mitigating secondary complications associated with diabetes, such as nephropathy, neuropathy, and retinopathy, especially in older patients. This is likely due to its holistic approach, which includes physical, mental, and emotional well-being.

Beyond the physical benefits, yoga encourages lifestyle and dietary modifications through mental discipline. This can lead to healthier choices and behaviours, contributing to better overall management of diabetes.

**Accessibility and Acceptability:** As a low to moderate-intensity activity, yoga is particularly suitable for older individuals who might face challenges in performing high-intensity exercises. Its holistic and less strenuous nature makes it an accessible and attractive option for many. Given the rising prevalence of diabetes globally and in India, incorporating yoga into diabetes management regimens presents a viable and effective strategy. It offers a culturally sensitive, cost-effective, and patient-centric approach to diabetes care.

In conclusion, this study reaffirms the role of yoga as a valuable addition to conventional diabetes treatment, especially in geriatric care. It highlights the need for an integrated approach that combines traditional healthcare with complementary practices like yoga to enhance the quality of life and health outcomes for diabetic patients. This holistic approach can be particularly beneficial in countries like India, where diabetes prevalence is rapidly increasing, and traditional practices like yoga are culturally ingrained and widely accepted.

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