

PREVENTIVE AND THERAPEUTIC EFFECT OF *YOGĀSANA* AND *PRĀNĀYAM* IN THE PATIENTS OF DIABETES MELLITUS: AN OVERVIEW

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ABSTRACT

Objective: The present review was carried out with the objectives of identifying the role of *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices) as a modality to prevent and treat diabetes. **Data Source:** The feasible beneficial effects of *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices) on diabetes were assessed, which is based on relevant classical texts along with textbooks of contemporary medical sciences. Besides, recent research articles related to clinical studies conducted in various institutions as available on the internet and published in authentic databases (Pub-Med, Google Scholar, Web of Science etc.) were also referred through the ancestry approach. **Review Methods:** The possible correlation has been made between collected information and has been presented systematically. The quality of the studies was assessed by the author and logically presented in this context. **Result and Discussion:** Yoga offers a non-invasive way to manage various clinical conditions up to some extent. It can be prescribed with other systems of medicines as an adjuvant for health promotion. Recent evidence suggests that Yoga and controlled lifestyle measures reduce blood sugar load in people with diabetes.

Keywords: Yoga, *Yogāsana*, *Prānāyām*, Diabetes mellitus, Insulin resistance, lifestyle disease.

INTRODUCTION

Diabetes mellitus is responsible for more than 60% of morbidity and death, putting a huge strain on the healthcare system and the economy. India had more people with diabetes than any other country (International Diabetes Foundation) According to the Indian diabetes federation & Southeast Asia region (IDF SEA); 425 million people have diabetes in the world of which 82 million people are affected with diabetes in the Southeast Asia Region. 72 million cases of diabetes have been reported in India in the year 2017, and this will rise to 151 million by the year 2045 [1]. The high prevalence is linked to a combination of genetic susceptibility, a high-calorie diet, and a lack of physical activity among India's increasing middle class. (Kleinfield, 2006).

Now a day faulty dietary habits and lifestyle errors are the important causative factors for the genesis of various lifestyle disorders, including obesity and diabetes. Deranged lipid metabolism has been implicated in the core matrix of insulin resistance diathesis in recent years. Diseases such as obesity, metabolic syndrome and Type-2 DM are the outcome of insulin resistance [2]. DM is a vicious and deadly disease that often coexists with other chronic illnesses. Diabetic neuropathy, retinopathy, nephropathy, and diabetic foot gangrene and ulcer make life difficult for both patients and caregivers.

Yogic lifestyle is holistic, and an ideal way of living, which imparts significant inputs for prevention as well as management of ailments. It is a rich heritage of human culture and civilization in India. International Yoga Day is celebrated on 21st June worldwide, declared unanimously by the United Nations General Assembly (UNGA) in 2015.

Yoga is not just as physical exercise, but a way of physical, mental and spiritual practices that originated in India. The effectiveness of *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) are mentioned in classical literature for the preservation of health, and the management of various diseases. Now it has become the theme of modern scientific

assessment. In recent years, Yogic techniques emerge as the centre of attraction for solving the problems of ailing one. Seeing this fact, the researchers are inclined to assess its safety and efficacy in a healthy and diseased person. In this context, we through some light on the role of *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) practices in people with diabetes based on classical & neo contemporary evidence.

Objective

The purpose of this review was to determine the role of *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) as a modality for the prevention and management of diabetes mellitus.

Material and Methods

The possible beneficial effect of *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) were assessed about DM based on classical texts of Yoga & Ayurveda along with textbooks of contemporary medical sciences to put essential inputs on diabetes. Besides human clinical trials, the available data on the internet and published in authentic databases (PubMed, MEDLINE, Web of Science etc.) related to *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) on people with diabetes were also referred to put an overview.

Review Methods:

The present review work is based on research material available in the text of Yoga, published in authentic data sources, contemporary Yoga literature, and related clinical research work conducted at various institutes. This information was initially analyzed, and possible correlation has been made and presented systematically. Step by step, the genuineness of available research was separately observed by the author and laid down an emphasis on *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) on the patients of diabetes mellitus.

A combination of key search terms was used to identify papers that have shown the impact of *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices)

for the prevention, and management of diabetes Mellitus. The following keywords were used for research strategy building: *Yogāsana*, the role of Yoga, *Prānāyam*, and diabetes mellitus. These terms were combined in the following way: *Yogāsana* AND diabetes AND *Prānāyam* (OR *Yogāsana* OR Asanas).

YOGA AND DIABETES

Patanjali offers an eight-fold path to consciousness and enlightenment known as "*Ashtanga Yoga*" which means "eight limbs," in the yoga sutra [3][4]. The eight limbs express the ethical ideal for living a serene life and attaining solvency in death. It is beneficial to one's physical, mental, social, and spiritual well-being. Although any of the eight limbs can be practiced independently, the physical postures and breathing exercises (as defined by Yoga philosophy) prepare the mind and body for meditation and spiritual development [5] [6]. Yoga is a Sanskrit word that means 'union', as in the union of mind, body, and spirit. *Āsanās* (relaxation exercises), *Prānāyām* (breathing practices), Nourishing diet, Positive attitude, and Meditation are the five basic elements of yoga. *Prānāyām* (breathing practices) is a yogic breathing method that focuses on increasing lung capacity. (Yadav & Das, 2001; Frostell, 1953) It improves cognitive control and deepens your ability to relax by strengthening the internal organs (Sharma et al. 2005) (Granath, 2006)

Prānāyām (breathing practices) is one of the Yoga techniques which is the least challenging for physically disabled people and, it can be easily practiced in a sitting position (Ramdev, 2005). Yoga has proven its role as an antioxidant by reduction of oxidative stress. It has also shown short term (fasting and post prandial) and long term (HbA1C) glycemic control of people with diabetes through the activation of neuron and endocrine cells (Yadav et al. 2005). Besides, *Yogāsana* (yogic practices) and *Prānāyām* (breathing practices) also activate peripheral utilization of blood glucose by the muscles.

Result:

Observation of the Effectiveness of clinical studies on *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices):

A. Effect on Glycemic control-

Yoga practice aids in the management of Type 2 diabetes mellitus (DM 2). A study shows Yoga Asana have beneficial effects in biochemical parameters for chronic Type 2 diabetic elderly subject. The Yoga group was given personalized *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices) for six days a week for 12 weeks in the study. Pre- and post-intervention biochemical markers were compared between the groups after 12 weeks of intervention. The levels of glycosylated hemoglobin, fasting glucose, and serum lipids all improved significantly [7] [8]. Another prospective case-control study was conducted on 30 patients with diabetes and 30 non-diabetics male volunteers, which revealed that Yoga has shown a significant reduction in fasting and post prandial blood sugar levels at the end of the six months in the patients of T2DM. While on non-diabetic male patients the observed changes in fasting and post prandial blood sugar levels were statistically not significant at the end of six months [9].

Similar findings were found by Vaishali [10], S. Singh et al. [11], Upadhyay et al. [12], and Malhotra et al. [13].

B. Effect on controlling deranged lipid profile

Dyslipidemia is the primary risk factor for cardiovascular disease in people with diabetes mellitus [14]. A high plasma triglyceride (TG), low high-density lipoprotein (HDL) concentration, and an elevated concentration of small dense low-density lipoprotein (LDL) in the serum are all hallmarks of diabetic dyslipidemia. Insulin resistance causes an increase in the flux of free fatty acids in the blood, resulting in lipid changes [15].

Increased hepatic lipase and lipoprotein lipase, which would increase TG uptake by adipose tissue and influence lipoprotein metabolism, could explain the improvement in lipid profile with Yoga [16].

Yoga intervention was conducted for three months to assess its efficacy in the patients of dyslipidemia hav-

ing type 2 diabetes mellitus. It showed decreased total cholesterol, TG and low-density lipoprotein, with an improvement in high-density lipoprotein [17]. Based on the findings of another study it can be concluded that long-term Yoga practice will help to maintain blood sugar and lipid profile levels [18]. A study done by Nisha ShantaKumari et al. has shown that Yoga, exercise and stress management training, significantly corrects deranged lipid profiles, lowers body mass index (BMI), and minimizes the macrovascular complications in person with diabetes [19].

C. Effect on body weight and BMI

Presently deleterious effects of obesity have been observed in developed as well as in developing countries like India. It has an increased risk of developing various diseases, including type-2 diabetes, high blood pressure, asthma, heart and kidney-related disease etc. There are many complementary and alternative medicines available to manage such types of physical and mental conditions. Among these, Yoga has played a prominent role in the management of obesity and related complications. Yoga poses (*Āsanās*) work on endocrine glands, improve blood circulation and improve tissue metabolism [20]. The waist-hip ratio was reduced as a result, which is similar to what Sahay et al. reported. They also found a rise in lean body mass and a decrease in skin-fold thickness. Yoga helps in the reduction of central obesity through the redistribution of body fat. It reduces insulin resistance; potentiate insulin receptors & sensitivity along with the shift to the peak insulin level to the left with normalization of blood glucose level. Thus, in this way, it reduces body weight and BMI [21] [22].

D. Effect on High blood pressure (HBP)

By damaging arteries & making them target for hardening (called atherosclerosis), diabetes can lead to high blood pressure. People with Type I and Type-2DM have chances of high blood pressure 25%, 80%, respectively [23]. LF person with DM having high blood pressure may lead to developing micro & macrovascular hemorrhage, cardiovascular accident (CVA) retinal tissue damage (Retinopathy) and kidney disease (Nephropathy) or make them worse. If

diabetes with high blood pressure is not treated in due time, it may lead to blood vessel damage, heart attack and kidney failure [24]. Behavioral approaches like stress reduction, increased exercise and healthy dietary habits are recommended for blood pressure reduction. The benefits of Yoga in reducing blood pressure have been proved. However, it has received little attention in existing health care practices in developing countries. A study in Nepal by Dhungana et al. has been established that the package of Yoga intervention significantly minimizes the blood pressure in hypertensive patients [25].

E. Effect on Oxidative stress

Recent data reveals that oxidative stress plays a key role in the aetiology of lifestyle diseases such as diabetes. In addition, oxidative stress appears to be a pathogenic role in diabetic complications. External factors (ionizing radiation and chemical carcinogens) as well as endogenous mechanisms, such as energy consumption in mitochondria, produce reactive oxygen species (ROS). In living cells, such ROS can simultaneously target lipids, proteins, and nucleic acids. There are a variety of mechanisms and processes through which these ROS could contribute to the development of insulin resistance, b-cell malfunction, diabetes, and other clinical problems [26]. Yoga practices improved the antioxidant levels, thereby reducing the oxidative stress in type 2 diabetic patients. It is found that the Yoga practitioners achieved a 20% reduction in oxidative stress [27].

F. Effect on stress and anxiety

Diabetes and mental stress have a close relationship, both affected by each other. High blood sugar levels can cause mood fluctuations, which can put emotional strain on relationships and personal lives. It also causes nervousness, anxiety, and confusion, resulting in diabetic distress. Although these symptoms may not be serious enough for a doctor to diagnose diabetes distress as a mental disease, they can have an impact on a diabetic's quality of life [28]. Yoga practices aid in the proper management of stress, anxiety, and depression and a number of studies have demonstrated the effectiveness of Yoga in the treatment of mental illnesses.

G. Effects on sleep

Patients with diabetes mellitus have closely associated with several sleep disorders, of which some are related to the disease itself or complications or related co-morbidities with diabetes. On the other hand, reduced sleep time and irregular sleep patterns have been linked with a higher incidence of obesity, metabolic syndrome, and T2DM [28].

The addition of regular Yoga exercise in the daily routine of older adults can help to achieve good sleep quality and improve their quality of life [29]. People with diabetes are two to three times more prone to develop depression than others (National Institute for Clinical Excellence-NICE-Guidance CG91 2009) [30]. Results of a study by Banker et al.; have shown that older adults routinely practicing Yoga had fewer chances of disturbed sleep, easily falling asleep, had normal daytime functioning, minimal requirement of sleep medications and also felt more energetic. This is because, since Yoga exercises impart muscle stretching and relaxation, may lead to physical and mental exertion resulting in better overall sleep quality and efficiency [31] [32] [33]

H. Effect on Nervous system

Stress has undoubtedly caused a wide range of health conditions, and Yoga is the foremost comprehensive approach to battling stress [34]. Besides, the relaxation induced by meditation or *Prānāyām* (breathing practices) helps stabilization of the autonomic nervous system with a tendency towards parasympathetic dominance. (O. Prashad, WIMJ, June 2004). By directly enhancing parasympathetic output, possibly via vagal stimulation, yogic practices help to shift the autonomic nervous system balance from sympathetic to parasympathetic, resulting in positive changes in cardiovagal function and related neuroendocrine, inflammatory, and hemodynamic profiles in sleep-related metabolic parameters [35]. Raja Yoga meditation is a superior form of meditation in which the natural use of the mind to relieve stress enhances the flow of thoughts. Yoga can help people who have or are at risk of developing type 2 diabetes (DM2) [36].

I. Effect on to reduce modern medication

Researchers and scholars are attempting to determine how the Yoga discipline improves general wellness. Yoga can help to reduce the usage of modern pharmaceuticals for various common medical illnesses such as diabetes, HIV, immunological function, osteoarthritis, menopause, multiple sclerosis, Post Traumatic Stress Disorder, and smoking cessation, among others [37].

DISCUSSION

Yoga has been an enormously evolved science of its kind since antiquity, which offers various physical and mental health benefits and enlightens to achieve the highest level of consciousness.

In India, Yoga, along with Naturopathy is recognized as an official system of medicine. In recent years, Yoga gained momentum regarding its health benefits. The researchers are trying to explore its mechanism of action by adopting tools and techniques of biomedical sciences. The precise mechanisms of yogic intervention in blood sugar reduction remain unknown [38] [39]. The mechanisms that could be used are listed below.

- a) Various yogic therapies may directly rejuvenate pancreatic cells. Through an enzymatic process, it may improve glucose consumption and metabolism in peripheral tissues, the liver, and adipose tissues [40].
- b) Yoga techniques may lead to muscular relaxation, development and improved blood supply to muscles. It also reduces insulin resistance, which results in higher glucose uptake by muscles, lowering blood sugar levels [41].
- c) The *Yogāsana* (yogic practices) recommended for people with diabetes focuses on the pancreas, the organ responsible for producing insulin. The Yoga poses (such as Manduka-Āsana, paschimottan-Āsana etc.) massage the pancreas, which facilitates the release of toxins from the cells, and improves fresh blood circulation to the respective organs.
 - *Yogāsana* (yogic practices) is linked to weight loss in healthy adults, which helps to avoid the

onset of many chronic illnesses, including diabetes.

- Blood pressure is linked to the development of diabetes and related complications, and Yoga has been shown to help. Yoga reduces adrenaline, nor-adrenalin and cortisol levels in the blood, collectively known as 'stress hormones. In this way, patients with diabetes are benefited from the practice of *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices).
- Āsanas practice helps to rejuvenate the pancreatic beta cells, and thus maintain the desired insulin secretion.
- It also helps to lower blood sugar levels by improving peripheral glucose utilization from the muscles, which comes from the pancreatic beta cells.
- The state of mind and the body are intimately related at the time of stress. As Glucagon secretion is enhanced by a variety of stressors, *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices) effectively reduce the stress, and level of Glucagon and possibly improve insulin action at the peripheral muscles.

Therefore, regular practice of Yoga and a controlled lifestyle reduces blood sugar load in people with diabetes. Although there are various practicing methods and implementation of Yoga therapy, however, the data show that yoga has a significant short-term effect on a variety of health-related outcomes.

CONCLUSION

Diabetes is a severe and lifelong ailment. It cannot completely cure, but effective control on blood sugar level and prevent or postpone the diabetes-related complications. Yoga-based treatment has recently emerged as a potential technique for the prevention of lifestyle diseases, including diabetes. It targets increased cholesterol and blood glucose levels in diabetic patients by incorporating an integrated strategy of Yoga. Yoga practices have given multiple health benefits and management tools for metabolic disorders. As a result, we may infer that *Yogāsana* (yogic practices) and *Prānāyam* (breathing practices) have

shown some promise in managing diverse clinical problems. It can be used in conjunction with other medical systems as an adjuvant for health maintenance, as well as the prevention and treatment of illnesses.

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