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A Yogic Study on the Impact of Hatha Yoga and Pranayama on Type 2 Diabetes Management in Elderly Individuals

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Abstract:

The present study aims to examine the effect of Hatha Yoga Pranayama on Type 2 diabetes among elderly individuals. With the rising prevalence of diabetes in aging populations, alternative therapies such as yoga and pranayama are gaining attention for their potential role in diabetes management. This research seeks to assess the impact of pranayama on blood glucose levels and overall well-being while also developing a specific yogic intervention for Type 2 diabetes. A total of 60 participants were selected from local diabetic clinics and hospitals and were randomly assigned to either an experimental group (practicing pranayama) or a control group (receiving standard medical care). The study employed a pre-test, post-test control group design, utilizing biochemical lab tests to measure key diabetes indicators such as fasting blood sugar (FBS) and HbA1c levels. The independent variable in this study was the pranayama practice, while Type 2 diabetes was considered the dependent variable.The findings revealed a significant reduction in blood glucose levels in the experimental group, indicating the positive effects of pranayama in managing diabetes. The study highlights the therapeutic potential of integrating yoga-based breathing techniques into diabetes care for older adults. Further research is recommended to explore long-term benefits and the integration of yoga into clinical settings for holistic diabetes management.

Keywords: *Hatha Yoga, Pranayama, Type 2 Diabetes, Elderly Health, Alternative Therapy*

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1. Introduction:

Old age is described by the emergence of various complex health states commonly called geriatric syndromes also old age is the time accompanied by automatic, advancing, and gradual corrosive changes in most organs and physiological systems of the body. One important change is in the systems involved in balance control, which could expose older people to serious damages, such as bone fractures that are associated with high medical costs due to poor balance. Among the many underlying factors that frequently lead to them are urine incontinence, weakness, and delirium. In Old age, people had occupied the position of prestige and power in their family. Nowadays they are becoming physically and mentally inactive, dependent, sick, and weak in terms of economic, physical, and psychological. These phenomena together cause a number of social and economic issues. Poor health, a lack of emotional support, a lack of financial resources, and the post-retirement phase are the primary problems that older people face. These types of problems include inadequate income after retirement, poor health, loss of a spouse or ample free time, social isolation, physical, family relationships, and financial dependence, and so forth - these situations are interrelated or interdependent. In the biological state, deterioration arises from the accumulation of various cellular and molecular losses over time. This leads to a gradual decrease in the physical and mental capacity, an increasing risk of disease and ultimately results in death. These changes may be neither linear nor consistent and they may be only loosely associated with a person's age in the years. The diversity seen in older age is not random. Aside from aging, transitions in life such as retirement, biological changes, moving to a more suitable home, and losing friends and companions are frequently linked to it. Hearing loss, cataracts and refractive errors, back and neck pain and osteoarthritis, chronic obstructive pulmonary disease, diabetes, depression, and dementia are common illnesses that affect older people. Old age should be regarded as a normal, inevitable biological phenomenon. Over the years, the aging process has brought many changes in the life of an individual. One such change is the body becoming vulnerable to many problems due to lack of regenerative processes and an increase in degeneration. The psychological and psycho-social issues generated during the aging process add complexity to its management. At the macro level, the aging of citizens has an impact on a country's overall health condition, policies, and financial management. The science of Yoga, a practical spiritual science, empowers an individual to attain a state of holistic and integrated development in all aspects and at all levels. Various scientific studies have documented its potential to normalize the psycho-physiological functions of an individual. Yoga is basically a science that leads to ultimate liberation (Moksha). The Yogic way of living provides a popular by-product in the form of attaining a dynamic state of health and well-being. However, this depends on the Karma of an individual manifested as the genetic predisposition and the conditioning of the environment in which one is born. The main focus or the central theme of Yoga

happens to be the golden mean, locating the middle path, a constant drive for improvisation and moderation, and a harmonious homeostatic balance. Yoga, the uniting impulse of life, always strives to create a union of diverse streams into a single powerful flow. The judicious practice of science generates an inner balance of the mind that remains serene and stable even amidst chaos. This potent ancient science guides its followers to a clear path ensuring enduring stability even when there are lots of external turmoil.

Diabetes is a chronic disease that occurs when the pancreas is no longer able to make insulin or when the body cannot make good use of the insulin it produces. A genetic metabolic condition called type 2 diabetes, also known as non-insulin-dependent diabetes mellitus, is marked by hyperglycemia and resistance to ketosis. Insulin is a hormone made by the pancreas that acts like a key to let glucose from the food we eat pass from the bloodstream into the cells in the body to produce energy. All carbohydrate foods are broken down into glucose in the blood. Insulin helps glucose get into the cells. Not being able to produce insulin or use it effectively leads to raised glucose levels in the blood. Diabetes is a complex group of metabolic disorder diseases that has a variety of causes. Type 2 diabetes mellitus is most prevalent in older adults but due to widespread lifestyle disorder, it's more common in younger people than ever before. According to the CDC's (Centers for Disease Control and Prevention) 2017 National Diabetes Statistics report there were around 1.5 million new total diabetes cases among adults in 2015. In 2015 adults aged 45 to 64 were the most diagnosed age group for diabetes As per the World Health Organization (WHO) globally; an estimated 422 million in 2014 adults were living with diabetes, compared to 108 million in 1980(WHO,2023). It reflects an increase in associated risk caused by being overweight or obese. Over the past 10 years, diabetes prevalence has increased faster in low and middle-economy countries than in high-economy countries. Diabetes caused 1.5 million mortality rates in 2012. Higher than optimal blood glucose caused an additional 2.2 million mortality (Global Report on Diabetes WHO 2016) by increasing the risks of cardiovascular-related disease and other diseases and forty-three percent of the 3.7 million mortality rate occur before the age of 70 years. This percentage of deaths is attributable to high blood sugar or diabetes that occurs before age 70 is higher in low and middle-economy countries than in high-economy countries. This phenomenon is more prominent amongst Indians both in India and abroad, which is attributable to the rapidly changing trends of globalization and demands on coping skills leading to enormous stress.

Yoga is a way of life and a cure for lifestyle diseases. As yoga is the finest lifestyle ever developed, it has made it feasible in the management, prevention, and rehabilitation of widespread lifestyle-related ailments. Today's contemporary world faces a pandemic of lifestyle problems that demand intentional adjustments to be done by individuals

themselves. The Yogic lifestyle, yogic diet, yogic attitudes, and several yogic practices can help humans to strengthen themselves and develop positive health thus implementing them to withstand stress-free. The yogic "health insurance" is achieved by normalizing the probability of stress; enhancing the reaction to it and releasing the suppressed stress effectively through several yogic practices. The major benefits of yoga may occur due to its lifestyle components are a healthy diet, activity, relaxation, and positive attitude as well as the psychosomatic harmonizing effects of pranayama and yogic relaxation.Yoga places very importance on a proper healthy lifestyle whose main components are achar-healthy activities, vichar-healthy relationships, vichar-healthy thoughts, vihar-healthy recreation, and ahar-healthy food, mainly the basic yogic principles are useful in the management of lifestyle-related disorders are discussed along with psychological condition and development of suitable attitudes, stress management normalization of metabolism, visualization, relaxation, and contemplative practices. Yoga is essentially a spiritual discipline based on an extremely subtle science that focuses on bringing harmony between mind and body. It is an art and science for healthy living. Pranayama is part of Yoga, the practicing of Pranayama helps control breath and it helps to increase Prana shakti or vital energy. Also, it brings together physical and mental disciplines to achieve a peaceful body and mind; it helps to manage stress and anxiety and keeps relaxing. We know that Yoga is a vast discipline aimed at integrating mind, body, and spirit to achieve a level of enlightenment and self-realization and it is the art of healthy living that focuses on bringing perfect harmony between body and mind. Today Yoga is very popular worldwide because it has more spiritual value and its role in the prevention of all kinds of disease; it has therapeutic credentials, promotion of health, and management of more lifestyle disorders. Many methods of yoga cater to the needs of different persons in society to bring about the transformation of the individual. According to Maharishi Patanjali, '**Yoga Chitta Vritti Nirodha**' yoga is defined as the process of sublimation of all mental modifications in the mind through a systematic process of yoga to attain a state of Samadhi. Yoga is the science of right living and also it works when integrated into our daily routine it works on all aspects of the person to the physical, intellectual, emotional, and spiritual. So yoga is beneficial for holistic health and is also called a way of life.

2. Objectives:

a. To evaluate the impact of Hatha Yoga Pranayama on blood glucose levels
b. To compare the effectiveness of pranayama practice with standard medical care
c. To assess the overall well-being and potential health benefits of pranayama
d. To develop a specific yogic intervention tailored to managing
e. To explore the feasibility of integrating yoga-based breathing techniques into clinical diabetes management for older adults.

3. Research Methodology:

Sixty samples of Diabetes mellitus in the age group of 40-70 years were diagnosed. After collection 60 samples are randomly divided into two groups 30 samples in the experimental and another 30 samples in the control group. The subjects of the experimental group used Yogic therapy sessions for 60 days daily under the supervision of a Yoga expert. The Biochemistry lab was used to measure diabetes in the study. The subjects in the experimental group were given Yogic Pranayama packages daily for 30 minutes for 60 days. Yogic Pranayama package includes Nadi Shodhan Pranayama, Bhramari Pranayama, Ujjayi Pranayama, and Bhastrika Pranayama were used. It is advisable to have an empty stomach during this practice. Lastly, researchers had compared with the help of a t-test.

4. Literature Reviews:

Balaji et al. (2011), in their study "Effects of yoga - pranayama practices on metabolic parameters and anthropometry in type 2 diabetes" showed a significant decrease in FBS, PPBS values in both the subgroups T 1 and T2 underwent the 3 months yoga and pranayama practice. The study has significant benefits of yoga-panayama practices on metabolic parameters and anthropometric measurements in uncomplicated type 2 diabetic patients. Effects on HDL levels remained unexplainable.[1]

Srivastava and Tiwari, (2015), in their study "Effect of Yoga-Asanas and Pranayama on Diabetic Adults," showed that there would be a significant effect of Yoga- Asanas and pranayama on blood pressure, blood glucose, and hemoglobin. As a result of one month of Pranayama and Asanas practice when compared to post-test conditions. The results of the study reveal that there is a significant reduction in post-test conditions. Yogic exercises showed a positive and significant impact on diabetic adults.[2]

Jain and Talukdar (1995), in their research "Role of yoga in control of hyperglycemia in middle-aged patients of non-insulin-dependent diabetes mellitus," the study showed, demonstrated the benefits of a 40-day yoga training regimen given to 30 patients with non-insulin-dependent diabetes who were hospitalized. The blood glucose response to oral glucose load measured as area index total (AIT), glycated hemoglobin (GHb) plasma lipids, and lipoproteins measurements before and after yoga training have been compared; they found a significant improvement in AIT, GHb, and plasma triglycerides and cholesterol levels. The data suggested that yoga training along with diet and medical management provides an important metabolic control in NIDDM (Non-insulin-dependent diabetes) and may have a role in the primary prevention of diabetes mellitus.[3]

[1]Balaji, P. A., Smitha, R. V., & Syed, S. (2011). Effects of yoga-pranayama practices on metabolic parameters and anthropometry in type 2 diabetes. *Journal of Diabetes and Metabolic Disorders, XX*(X), 01-04.

[2] Srivastava, P., & Tiwari, S. (2015). Effect of Yoga-Asanas and Pranayama on diabetic adults. *International Journal of Yoga and Allied Sciences,* 95-101

[3] Jain SC, Talukdar B (1995), Role of yoga incontrol of hyperglycemia in middle aged patients of non insulin dependent diabetes mellitus. Indian J Clin.Biochem, pp.62-65

Malhotra, Singh, Tandon, and Sharma (2005) in their study, "The beneficial effect of yoga in diabetes" showed findings indicated that one hour postprandial blood glucose levels reduced from 295.3 +/- 22.0 to 269.7 +/- 19.9 mg/dl and that fasting glucose levels decreased significantly from baseline 208.3 +/- 20.0 to 171.7 +/- 19.5 mg/dl.It was determined precisely how the endocrine system regulating insulin kinetics interacts with various postures and regulated breathing. Yoga asanas may be used as a supplement to diet and medications in the management of Type 2 diabetes mellitus. In their study, significant changes in insulin levels and changes in waist and hip ratio were also seen, suggesting a positive sign of yoga asanas on blood glucose utilization and observed fats redistribution in non-insulin dependent diabetes mellitus.[4]

Badr, Maggie, and Bandar (2008) in their study, "Yoga Practice for the Management of Type II Diabetes Mellitus in Adults: A systematic review" showed investigation revealed that all randomized control clinical trials (RCTs) comparing the yogic practice with other types of intervention or with conventional practices were inconclusive. Each study was assessed for quality by two independent reviewers; the mean difference was used for summar:izing the effect of each study's outcome with 95% confidence intervals. Combining in the studies did not take place due to the wide clinical difference between the studies. Publication bias was assessed by statistical methods. The Five trials with 363 members of the study met the inclusion criteria with medium to high risk of bias and various kinds of intervention characteristics. The study's results show improvement in outcomes among patients with diabetes type II. These improvements were mainly among short-term or immediate diabetes outcomes and not all were statistically significant. The study's findings were not definitive and did not have an impact on long-term outcomes. None of the included studies indicated any negative effects. Participants with diabetes mellitus may get short-term advantages from practicing yoga. The definitive recommendation for physicians to encourage their participants to yogic practice cannot be reached at present.

5. Data Analysis and Result:

In the study, 60 patients have finished the program and completed the protocol. Table 1 summarizes pre and post-intervention changes in the variables. Compared to the non-yoga group, the yoga group revealed a pattern of improvement in type 2 diabetes postprandial blood glucose level ($p<0.0001$).

Table 1: Experimental (Yoga group)

[4] Malhotra, V., Singh, S., Tandon, O. P., & Sharma, S. B. (2005). The beneficial effect of yoga in diabetes. *Indian Journal of Physiology and Pharmacology, 49*(2), pp.149-155.

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Test	N	Mean	SD	SED	T-value	df	r	Significance level
Pre Test	30	169.23	27.18	7.10	2.01	29	0.92	P<0.01
Post Test	30	154.90	27.86					

Fig.1 - Graphical representation of the mean value of experimental yoga group

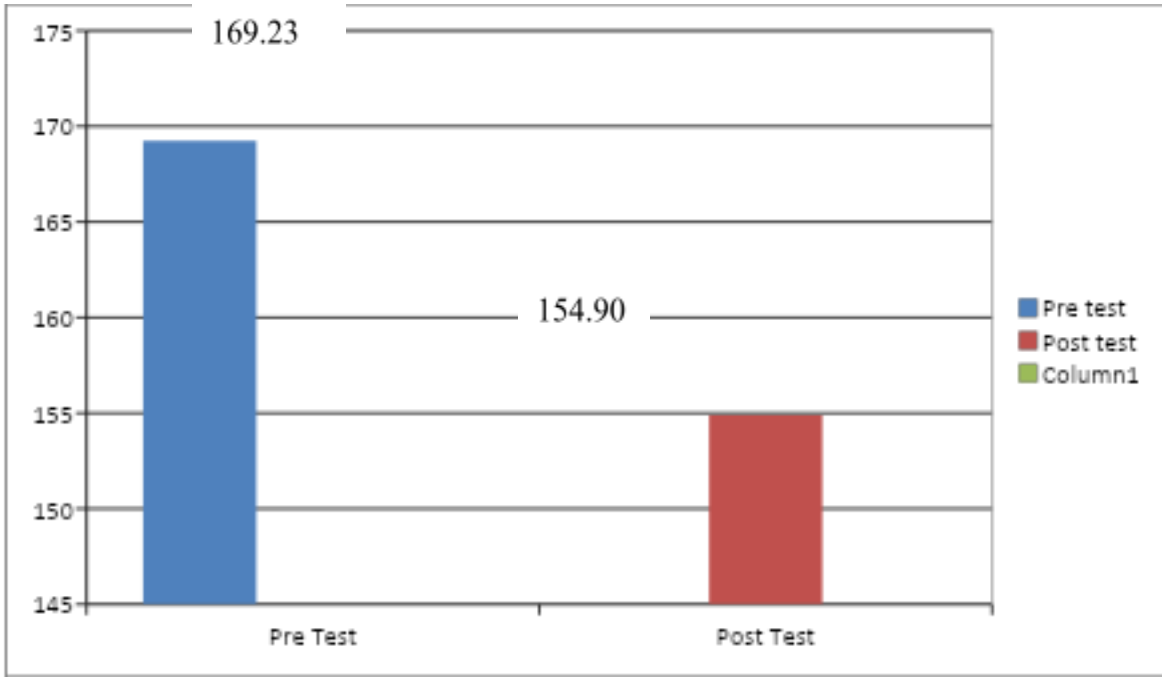

Table 2: Controlled (Non-Yoga group).

Test	N	Mean	SD	SED	T-value	df	r	Significance level
Pre	30	170.07	30.98	8.16	0.23	29	0.98	*p*>0.05
Post	30	171.97	32.22					

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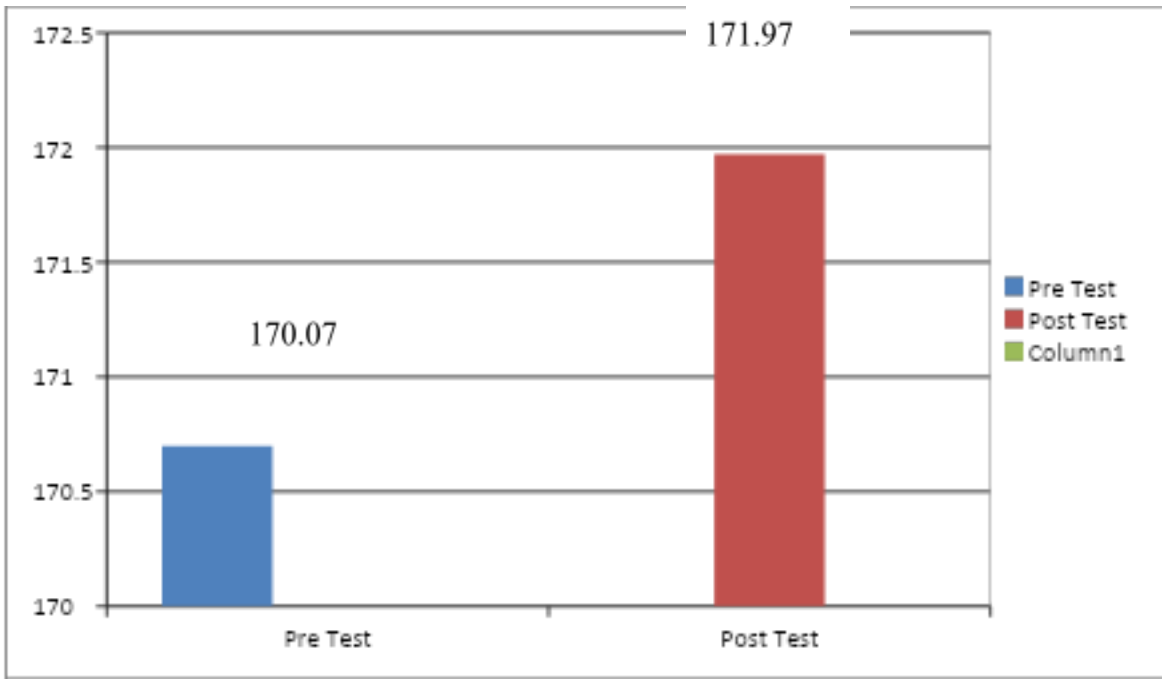
Fig.2 - Graphical representation of the mean value of control non-yoga group.



Tables 1 and 2 summarize the pre and post-intervention changes in the experimental and controlled groups. Compared to the non-yoga group, the yoga group revealed a pattern of improvement in type 2 diabetes postprandial serum glucose level ($p<0.01$).

6. Discussion and Conclusion:

In this study, the effect of pranayama practices was seen on type 2 diabetes on old age People. Significant improvement in level type 2 diabetes postprandial blood glucose was observed. In research conducted in India, an 8-week program of yogic practices was undertaken to observe post-prandial blood glucose levels in type 2 diabetes patients, significant increase in post-prandial blood glucose levels was observed in the patients with yoga. It was found that pranayama practices are useful in the prevention and managing metabolic disorders related to the body system. In the present study post prandial blood glucose level significantly decreased after applying yogic practices in yoga groups. So it can be said that yoga has many positive effects in life if adhered to regular practice. The present study showed significant improvement in the Post Prandial Blood Sugar and Quality of Life in the Yoga Group after two months of pranayama practice. By proper adherence to the regular practice of yoga, further complications of

type 2 diabetes mellitus can be prevented. Hatha Yoga pranayama are techniques to bring about very deep rest to different parts of the body. In diabetes mellitus, it uses pranayama which brings deep rest to the pancreas and releases the parana blocks. Hence the pranayama used under special techniques for Diabetes Mellitus either stretches, compresses, or twists the abdominal area, so that it may bring awareness to the pancreatic area, focus, and then defocus to give very deep rest to the pancreas. Pranayama is a technique to remove the imbalance of prana blocks and it can reduce blood glucose levels. This shows that balancing the prana through a basic set of pranayama is very useful in type 2 diabetes. The study found that the Nadi Shodhana Pranayama practice was the best type of practice as seen by a reduction in blood glucose levels. The pranayama practices are useful in a real yogic sense to slow down the mind, which in turn reduces stress levels. Regular practice of hatha yoga pranayama can also help to reduce the risk of developing diabetes due to family history which has a high possibility. Thus, the regular practice of yoga has overall health benefits.

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