



## Effect of Integrated Module of Siddha and Yoga on Blood Sugar Level in the management of Type 2 Diabetes

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**ABSTRACT:** Indian systems of medicine prove effective in management of Diabetes. Siddha medicine and Yoga are holistic traditional Indian systems of medicine which treat the individual as a whole and not the disease.

To study the combined effect of integrated Siddha medicine and Yoga therapy on blood sugar level in the treatment of non-insulin dependent diabetes.

This study is a randomized controlled trial with 109 diabetic subjects attending Siddha OPD, Puducherry, were split up into two groups. Yoga group (Group A) received yoga training for 4 months with standard siddha medication (n = 54) and Control group (Group B) received only standard siddha medication (n = 55). Pre and post assessment of glycated hemoglobin (HbA1c), postprandial blood sugar (PPBS) and fasting blood sugar (FBS) were done before and after yoga training respectively.

Baseline values were comparable. FBS was statistically significant in Group A ( $p < 0.001$ ) whereas there was no statistical significance in Group B. PPBS and HbA1c were statistically significant in both the groups ( $p < 0.001$ )

Integrated Siddha and Yoga showed effective reduction in FBS, PPBS and HbA1c whereas siddha treatment showed significant reduction in PPBS and HbA1c. We may conclude that integrating yoga therapy along with siddha medicine proves potential and effective in treatment of diabetes.

**Keywords:** Integrated siddha-yoga protocol, fasting blood sugar, post prandial, HbA1c, holistic

## INTRODUCTION

Diabetes is a Chronic metabolic condition characterized by high blood sugar levels, which over time produce major harm to the heart, blood vessels, eyes, kidneys and nerves causing global threat and disease burden to the society day by day which initiates new research studies for its prevention, delaying the onset and proper management. Nearly 537 million adults worldwide have diabetes, and that figure is expected to rise up to 643 million by 2030 and 783 million by 2045, according to the International Diabetes Federation (International Diabetes Federation, 2021).

Type 2 diabetic besides hyperglycemia and deranged lipid profile is an impaired insulin secretion, peripheral insulin resistance and obesity which has become a major health concern worldwide. Yoga is a physical and mental discipline that originated in Indian culture over 2,000 years ago (Khosravi *et al.*, 2015).

The average yearly direct and indirect expenditures for treating diabetes were calculated to be 25,391 and 4,970 rupees, respectively, in India (Tharkar *et al.*, 2010) and

on an average, the medical costs were 2.3 times greater than they would have been without diabetes (American Diabetes Association, 2018). In developing nations, better public healthcare and cost-effective solutions can stop the rising expenses of treating diabetes mellitus. According to studies, yoga is an inexpensive technique that can help to prevent and reduce the health risks related to diabetes (Nagarathna *et al.*, 2020). WHO advises nutritious diet, frequent exercise, and adhering to appropriate weight to avoid or postpone the onset of diabetes which initiates to study the impact of indigenous medical systems on diabetes which emphasis on proper diet, life style modifications and social wellbeing.

The study revealed that the selected blood sugar and blood pressure were significantly reduced due to the influence of yogic practices and naturopathy treatments in diabetic patients (Soni *et al.*, 2013).

Yoga therapy is one which is very effective in both the cases i.e. changes in body circulations and heat regulatory disturbance in outer parts (Lodhi *et al.*, 2021).

Siddha system of medicine and Yoga are both ancient traditional Indian medical systems interrelated with each other, comes under AYUSH. Siddhars practiced yoga as a form of kayakarpam and introduced to humans for spiritual, mental and physical wellness. Siddhars practiced intense yoga techniques including years of meditation and achieved super natural powers (siddhi), gained supreme wisdom and immortality. Through this supreme knowledge they wrote manuscripts on all aspects of life from which Siddha system developed. Their contributions were mainly in Gnanam, Yogam, Vaatham and Vaidhyam. Both systems have similarities of concepts such as tridoshas, trigunas, chakras and nadis. Yoga is an important and integral part of Siddha system which is evident from the Siddha text “Thirumanthiram” (Kanakavalli *et al.*, 2019) proving that Siddha and Yoga were practiced traditionally as an integrated system of medicine which is lacking in modern times. This paved the way for us to choose such a topic for research

This study aims to integrate both the systems in bringing together the traditional combined effect of Yoga and Siddha to show positive effects in diabetes. Reviews show that many number of studies have been done integrating yoga and modern medicine but only one observational study has been done integrating yoga and Siddha (Mirunaleni *et al.*, 2018). We assume that this study will initiate further scientific studies paving the way for realizing the full potential of AYUSH Systems as an applied component in public health.

## MATERIALS AND METHODS

This randomized control study was done among patients attending Outpatient department at Siddha unit, Primary health centre, Department of Indian System of Medicine & Homoeopathy, Govt of Puducherry. Sri Balaji Vidyapeeth University, Institutional Human Ethics Committee has given its approval for the study, (PhD PROJECT /08/2019/008 dated 23/08/2019), permission obtained from Directorate of Indian system of medicine and Homoeopathy, Govt of Puducherry and also registered with Clinical Trial Registry of India (CTRI/2020/03/024086).

After obtaining informed consent from the subjects, as detailed in [Fig. 1], diabetic patients taking siddha medication, whose age from 35 years to 65 years, HbA1c level between 7% and 10%, subjects who are willing to do and able to practice the yoga technique were selected for the study. Patients taking allopathic medication, whose HbA1c less than 7% and more than 10%, with clinical manifested evidence of diabetic complications were excluded from the study. Total of 132 subjects were assessed, out of which 109 subjects were recruited and then randomized to Group A- yoga group ( $n = 54$ , mean age:  $51.37 \pm 9.26$  years), who received yoga therapy twice a week and were encouraged to practice every day at their residence and to record a diary to measure compliance for 4 months with standard Siddha medical treatment, and Group B - control group ( $n = 55$ , aged  $52.6 \pm 9.45$  years) got only standard Siddha medical treatment which comprises of Mathumeganoichoomam tablet, Triphalachoornam

tablet and Keezhanelli tablet for management of type 2 diabetes. Studies proved the safety and anti-diabetic activity of Madhumegachurnam (Gaddam *et al.*, 2019; Sadagopan *et al.*, 2014; Vadivelan *et al.*, 2011) the hypoglycemic impact of Triphalachurnam (Rajan *et al.*, 2008) and blood sugar reduction of Keezhanelli extract (Modak *et al.*, 2007; Raphael *et al.*, 2002). All the subjects were advised proper diet and life style modifications along with Siddha medical treatment. All blood samples were collected and analyzed by skilled technicians from the Indira Gandhi Government General Hospital and Post Graduate Institute, Puducherry, who were unaware of the subjects or their assignment to the different groups.

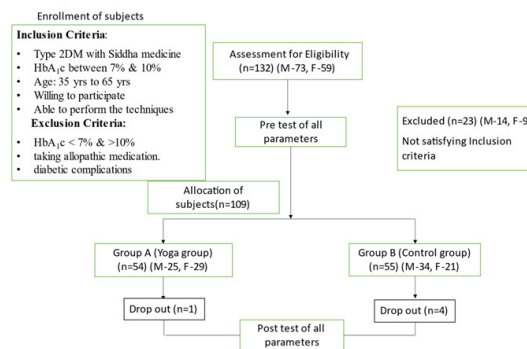


Fig. 1. Consort Flow diagram (Cuschieri, 2019).

**Yoga Intervention.** At the Primary Health Centre, yoga therapy sessions were led by certified and trained yoga therapists in a sequential order detailed in [Table 1] which begins with prayer, followed by warming up, asanas, pranayama and relaxation.

Table 1: Yoga Therapy protocol (45 min).

Sr. No.	Yogic Techniques	Duration (min)
1	Jathis/Warming up	5
2	Talasana	2
3	Trikonasana	3
4	Arthakatchhakrasana	3
5	Vakrasana	3
6	Jataraparivrittanasana	3
7	Pavanamuktthanasana	3
8	Viparitararani	3
9	Nadishuddhi	5
10	Brahmari	5
11	Marmanasthanam kriya	10
	Total duration	45

Practices were given depending on the subject's flexibility and the intensity of the schedule was increased gradually so that diabetic subjects are not overloaded

**Statistical analysis.** SPSS, version 21.0 statistical software was used for statistical analysis. Both paired and unpaired "t" tests were used to analyze the data. Pre- and post-study data were compared within each group using the student's paired test, while group comparisons were made using the student's unpaired "t" test. When the p value is less than 0.05 and the confidence interval is less than 95%, the results were deemed significant.

## RESULTS AND DISCUSSION

**Results.** [Table 2] presents the results in tabular form. Both the yoga and control groups had similar initial values. After 4 months of intervention comparisons

within each group showed a significant decline ( $p < 0.001$ ) in all blood sugar levels in subjects undergoing yoga therapy. There was a significant reduction in PPBS and HbA1c but insignificant in FBS in the control group.

**Table 2: Comparison of blood sugar - fasting blood sugar (FBS), postprandial blood sugar (PPBS) and glycosylated haemoglobin (HbA1c) among 109 subjects before and after 4 months of study period.**

Parameters	Group A		Group B		Delta %		P values
	Pre	Post	Pre	Post	Group A	Group B	
FBS (mg/dl)	178.92±50.77	159.94±44.0**	174.15±51.29	161.13±48.05	-7.8±19.43	-2.8±29.80	0.36
PPBS (mg/dl)	271.14±70.68	233.55±64.0**	277.32±72.88	242.58±70.91**	-11.26±23.86	-9.96±24.55	0.70
HbA1c (%)	8.327±1.04	7.324±1.00**	8.243±1.00	7.566±1.18**	-14.67±13.67	-10.71±13.61	0.15

Values are given as mean±SD. \* $P < 0.05$ , \*\* $P < 0.01$  and \*\*\* $P < 0.001$  for intra group (pre-post) comparisons by Student's paired *t*-test. Delta % Mann Whitney test was applied for intergroup comparisons

**Discussion.** This study was designed to evaluate the effectiveness of integrating yoga therapy with Siddha medicine in the treatment of type 2 diabetes, to strengthen the knowledge, build evidence, safety and effectiveness of traditional system of medicine as recommended by WHO (World Health Organisation, 2013). In this Randomized control study, the effect of integrated yoga therapy and siddha medicine was evaluated on glycemic indices among 109 diabetic subjects, randomized into two groups. Group A (Yoga group) undergone Yoga therapy for 4 months with standard siddha medication ( $n = 54$ ) and Group B (Control group) with standard siddha medication ( $n = 55$ ).

**Yoga therapy's impact on blood sugar.** In the current study, we found that Group A (Yoga group) demonstrated a statistically significant difference in FBS between the pre- and post-assessment, whereas Group B (Control group) showed no statistical significance. PPBS and HbA1c proved statistical significance in both the groups

**Allopathy and yoga.** A randomized interventional study among diabetes individuals was conducted (Mangala Gowri *et al.*, 2022) for 120 days proved evident that integrated yoga therapy leads to significant improvement in glycemic control. A similar study conducted in a tertiary care hospital (Chimkode *et al.*, 2015) showed reduction in FBS and PPBS after intervention for 90 days. One study (Kudigram *et al.*, 2018) demonstrated that yoga is efficient in lowering fasting blood sugar. In another study (Balaji *et al.*, 2011) conducted an intervention on subjects with oral hypoglycemic drugs in group 1 and oral hypoglycemic drugs with insulin in group 2. They concluded that yoga therapy was effective more in group 1 in comparison to group 2. Another study suggests that altering diet and life style changes along with yoga intervention can be an economical approach in treating diabetes (Bali *et al.*, 2020) A pilot study also concludes that adjuvant yoga therapy is secure, cost effective and advantageous for sustaining health and lowering metabolic risk factors (Balaji *et al.*, 2021).

**Integration of Indian system of medicine.** Studies found that the inhibition of inflammatory signaling

pathways by bioactive compounds derived from natural products has been shown to reduce insulin resistance and other associated problems (Wal *et al.*, 2021). One study recommends that to improve access to health care needs, Indian traditional herbal medicine must be scientifically integrated into evidence-based clinical management of disorders (Sen & Chakraborty 2015).

Studies also showed antidiabetic activity in Siddha formulations. One review study made an effort to demonstrate that regular use of Siddha anti-diabetic formulations reduces the incidence and early manifestation of diabetes (Gaddam *et al.*, 2019).

An observational study with 10 subjects conducted in South Indian population integrating Siddha medicine with yoga practices and dietary modifications along with allopathic medicines showed beneficial results in FBS, PPBS and HbA1c on type 2 diabetes which recommends for clinical trials and long-term studies (Mirunaleni *et al.*, 2018) Even there are studies integrating Ayurveda and yoga which exhibits potential benefits in integrative management of diabetes along with lifestyle modifications (Sharma *et al.*, 2019; Kumari *et al.*, 2022) also patients with type 2 diabetes mellitus who underwent yoga and naturopathic treatments had adequate glycemic control. Which also suggest long term studies (Bairy *et al.*, 2016; Gowda *et al.*, 2017)

In our study we found that in Group A (yoga group), all parameters had statistically significant difference between pre and post intervention whereas in Group B (control group) PPBS and HbA1c showed statistical significance. As recommended by previous studies this study is a randomized control study integrating Siddha medicines and yoga which proves that siddha medication is beneficial but the potentiality of siddha medication is further enhanced by adding yoga therapy, maybe it acts as a catalyst to it and which may reduce the risk of diabetic complications.

Our study is unique as it integrates traditional systems of medicine, namely Siddha medicine and yoga therapy without any modern medicine which has shown to be effective in the treatment of diabetes. This RCT is one of its kind to the best of our knowledge in integrating Siddha and yoga and this traditional integration helps to

decrease insulin resistance and enhances insulin sensitivity. According to one study on integrating traditional medicine, it helps to attain the goal of "health for all" when it is used in clinical practice (Sen & Chakraborty 2017) and also a study suggests that early integrating AYUSH with various health programmes will be a helpful tool for managing and preventing NCDs in the years to come (Singh *et al.*, 2018). This study is a work in progress and the follow up period is yet to get completed. Evaluation of all parameters including Neikuri is in progress and results of those study findings will be published very soon.

**Strength of study.** The main strength of this randomized control trial may be this was the first study to evaluate the effect of the Indian traditional medicine by integrating Siddha medicine and Yoga therapy.

**Limitations of the study.** This research is restricted to a single centre, and larger multicentric studies with longer period of intervention needed in future.

## CONCLUSION

This present study wherein the Siddha and Yoga have been integrated shows effective reduction in FBS, PPBS and Hb1Ac while siddha treatment showed significant reduction in PPBS and Hb1Ac. It may be concluded that by integrating both traditional systems of medicine which complement each other, there is a holistic benefit attained by the patient resulting in overall wellness.

## FUTURE SCOPE

This study is a work in progress. This study may initiate further extensive long term- studies to assess the effect of integration of Indian systems of medicine. Research is needed in areas of fundamental principles, diagnostic tools and clinical trials specific for each individual Indian systems of medicine so that it provides scientific evidence for development and promotion of AYUSH

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**Conflict of Interest.** None.

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