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RESEARCH ARTICLE

Effect of 12-week pranayama in the management of type-2 diabetes

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ABSTRACT

Background: Deficiency of insulin generally causes diabetes mellitus, a metabolic disorder with elevated blood glucose levels. Practicing pranayama effects the secretion of insulin and glucagon through neurohormonal modulation. **Aims and Objectives:** The present study was designed to assess effectiveness of 12 weeks pranayama in type 2 diabetes patients. **Materials and Methods:** A total of 24 male participants between age group of 36 and 55 years with type 2 diabetic patients of at least 1 year duration and those on diabetic diet and oral hypoglycemic agents were included in the study. After recording the baseline parameters (pre-intervention values) pranayama was practiced by all the participants once in a day, daily for 12 weeks. After 12 weeks post-intervention values were recorded from all participants and compared. **Results:** Fasting blood glucose was significantly decreased followed by intervention. Postprandial blood glucose was decreased followed by the intervention. However, it is not statistically significant. Hemoglobin A1c and serum cortisol levels were significantly decreased followed by intervention. Systolic, diastolic, and mean arterial blood pressure was significantly decreased followed by intervention. Verbal memory was significantly improved followed by intervention. **Conclusion:** Our study provides further evidence for beneficial effects of pranayama in the management of diabetes. We suggest further detailed studies in this regard to provide strong evidence for implementation of pranayama as a palliative care in the management of diabetes for the benefit of diabetic patients and to the population in general.

KEY WORDS: Vestibular Stimulation; Diabetes; Cognition

INTRODUCTION

Deficiency of insulin generally causes diabetes mellitus, a metabolic disorder with elevated blood glucose levels.[1] In diabetes either there can be absolute deficiency of insulin or the responsiveness of the tissues is decreased for the action of insulin. It was reported that globally 170 million people are affected by diabetes mellitus.[2] In India, there is a rapid increase in number of people diagnosed with diabetes and it was predicted that by 2030 diabetes mellitus may afflict up to 79.4 millions of people.[3] Changes in the lifestyle may be a major cause for increase in the prevalence of diabetes in India. Controlling blood glucose level is the major target for both types of diabetes. The conventional therapies for diabetes include exercise, weight control and medical nutrition therapy, oral glucose lowering drugs, and injections of insulin. If the conventional therapies fail then the pharmacological treatment is required, though it is costly and associated with side effects.[4,5] Hence, it is essential to practice alternative therapies which are affordable and does not cause side effects. Yoga, massage therapy, acupuncture, and herbs are some of the alternative therapies found to be effective in the management of diabetes.[4] Pranayama has beneficial effects on physiological cardiovascular responses. It was reported that, during right nostril pranayama and alternate nostril pranayama, the heart rate increased.[6] Whereas during left

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nostril pranayama, there was a decrease [7] or no change in heart rate.[8] Nadi suddhi pranayama was reported to decrease in pulse rate, diastolic blood pressure, and systolic blood pressure along with significant increase in pulse pressure.[9] The present study was designed to assess effectiveness of 12 weeks pranayama in type 2 diabetes patients.

MATERIALS AND METHODS

This was an experimental study conducted at Yes 4 Health Hospital, Hyderabad, Telangana, India. The study protocol was approved by Institutional Human Ethical Committee. Voluntary, written informed consent was obtained from all the participants after explaining the study details and clarifying the doubts and ensuring confidentiality. 24 male participants between age group of 36 and 55 years, type 2 diabetic patients of at least 1 year duration and those on diabetic diet and oral hypoglycemic agents were included in the study. Unwilling participants and participants with any severe complications, cancer, pulmonary tuberculosis, and rheumatoid arthritis were excluded from the study. The participants acted as self-control. After recording the baseline parameters (pre-intervention values) pranayama was practiced by all the participants once in a day, daily for 12 weeks. After 12 weeks post-intervention values were recorded from all participants and compared. The biochemical parameters recorded are fasting, and postprandial blood glucose, serum cortisol and hemoglobin A1c (HbA1c) (%) and autonomic measures were assessed by blood pressure, and cognitive functions were assessed by spatial and verbal memory test.[10] All the parameters were recorded at 9 am. Serum cortisol was assessed by using chemiluminescent microparticle immune assay ABBOTT. The participants were given alternate nostril breathing training for 15 min daily as mentioned in the literature.

RESULTS

Demographic parameters were presented in Table 1. Fasting blood glucose was significantly decreased followed by intervention [Table 2]. Postprandial blood glucose was decreased followed by the intervention; however, it is not statistically significant [Table 2]. HbA1c and serum cortisol levels were significantly decreased followed by intervention [Table 2]. Systolic, diastolic, and mean arterial blood pressure was significantly decreased followed by intervention [Table 3]. Verbal memory was significantly improved followed by intervention [Table 4].

Table 1: Demographic data of the participants

Parameter	Mean±SD
Age (years)	44.45±6.55
Height (cm)	172.28±7.16
Weight (kg)	93.7±10.6

SD: Standard deviation

DISCUSSION

Diabetes is a metabolic disorder characterized by chronic hyperglycemia with disturbances of carbohydrates, fat and protein metabolism. Practicing yoga includes mental attitude, diet, and the practice of specific techniques such as yoga asanas, pranayama, and meditation.[12] Among different yoga techniques, pranayama is a simple method which can be performed in sitting posture. It can be performed by the people who are physically inactive. Pranayama was reported to be effective in the management of diabetes.[11] Pranayama reduces the blood sugar levels and the blood pressure, weight, and limits the progression to the complications.

From the current study results, and their comparison with other published reports, it may be concluded that yoga helps in reducing the blood sugar level and regulates diabetes.[13,14] Earlier studies conducted by Manjunatha *et al*. reported that Asanas increases the release of insulin from the pancreas.[15] The possible mechanisms by which pranayama is by decreasing the blood sugar and regeneration of cells of pancreas due to abdominal breathing, which may increase use of glucose in the tissues through an enzymatic process. Further, the muscular relaxation, during pranayama, improves blood supply to muscles and enhances insulin receptor expression on muscles causes increase in the glucose uptake by muscles and thus reduces blood sugar. Further, practicing asanas increases the sensitivity of the B cells of pancreas to the glucose signals for a longer duration. In the current study, fasting blood glucose was significantly decreased followed by intervention. Postprandial blood glucose was decreased followed by the intervention. However, it is not statistically significant. HbA1c and serum cortisol levels were significantly decreased followed by intervention. Systolic, diastolic, and mean arterial blood pressure was significantly decreased followed by intervention. Verbal memory was significantly improved followed by intervention. These findings are

Table 2: Biochemical parameters before and after intervention

Parameter	Pre-intervention	Post-intervention	*P* value
Fasting blood glucose (mg/dl)	153.04±19.9	138.67±18.1	0.0004***
Post prandial blood glucose (mg/dl)	223.21±42.072	195.75±29.3	0.0058**
HbA1c (%)	11.38±1.975	8.31±1.588	<0.00001***
Serum cortisol (µg/dl)	14.53±3.56	11.44±2.86	0.0009***

*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant. HbA1c: Hemoglobin A1c

Table 3: Autonomic parameters before and after intervention

Parameter (mmHg)	Pre-intervention	Post-intervention	*P* value
Systolic blood pressure	150.625±8.515	136.25±8.593	<0.0001***
Diastolic blood pressure	94.8±9.55	83.4±6.17	<0.0001***
Pulse pressure	55.7±11.2	52.9±10.0	0.3657
Mean blood pressure	113±7.6	101±5.27	<0.0001***

*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant

Table 4: Cognitive functions before and after intervention

Parameter	Pre-intervention	Post-intervention	*P* value
Spatial memory	5.458±2.126	6.333±2.099	0.7905
Verbal memory	4.063±1.938	5.936±1.834	0.0013**

*P<0.05 is significant, **P<0.01 is significant, ***P<0.001 is significant

similar to earlier studies.[16] The major limitation in our study was less sample size, and we have not maintained a healthy control group. The current study highlights the importance of practicing the pranayama in the routine daily lifestyle.

CONCLUSION

Our study provides further evidence for beneficial effects of pranayama in the management of diabetes. We suggest further detailed, long-term studies in this regard to provide strong evidence for implementation of pranayama as a palliative care in the management of diabetes for the benefit of diabetic patients and to the population in general.

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