

Yoga-asanas and pranayama: Is it helpful in management non-insulin-dependent diabetes mellitus

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ABSTRACT

Background: Deficiency of insulin generally causes diabetes mellitus (DM), a metabolic disorder with elevated blood glucose levels. Practicing yoga and pranayama affects the secretion of insulin and glucagon through neurohormonal modulation. **Objectives:** The objectives of the study were to see 16 weeks yoga-asanas and pranayamas helpful in non-insulin-dependent DM (NIDDM) (Type II DM) management. **Materials and Methods:** A total of 50 participants of both gender between 35 and 60 years of age with NIDDM (Type II DM) subjects of at least 12 months duration, those on antidiabetic diet and oral hypoglycemic medicine were included in the study. After recording the baseline parameters (pre-intervention values), yoga and pranayama was practiced by all the participants once in a day, daily for 16 weeks. Blood sample for fasting blood sugar (FBS), post-prandial blood sugar (PPBS), glycosylated hemoglobin A1C (HbA1C), and hemoglobin (Hb) was estimated at day 1 and at the end of each of the 4 months of the study period. After 16 weeks values were compared and analyzed. **Results:** Decreased FBS and PPBS values from 139.2 ± 16.6 and 174.1 ± 7.9 mg/dl to 96.8 ± 15.9 and 134.7 ± 8.4 mg/dl, respectively. HbA1C value decreased from 9.3 ± 1.0 to 6.9 ± 0.7 . Hb value increased from 10.2 ± 1.3 to 12.6 ± 1.6 . **Conclusion:** Our study provides yoga-asanas and pranayamas helpful in the NIDDM (Type II DM) management.


KEY WORDS: Yoga; Asanas; Pranayamas; Diabetes; Glycosylated Hemoglobin; Insulin

INTRODUCTION

Diabetes mellitus (DM) is a one of metabolic disease and stat of hyperglycemia which may result from many environmental, genetic, or both factors produces symptoms such as polyuria, polyphagia, and polydipsia characterized by high blood sugar and high urine sugar levels for prolonged periods.^[1] DM designated as IDDM-insulin-dependent DM

(Type I DM) and non-insulin-dependent DM (NIDDM) (Type II DM). IDDM (Type I DM) or childhood-onset DM is mainly due to complete or nearly complete insulin deficiency. NIDDM (Type II DM) or adult-onset DM is heterogeneous group of disorders, more common than IDDM mainly due to difficulty in insulin secretion, variability in peripheral insulin resistance, increased fat metabolism, and glucose production.^[2-4]

Globally, 382 million people are suffering with diabetes and 90% of them are Type 2 diabetics, it is expected that 592 million people are going to be affected with diabetes by 2035.^[5] The prevalence of Type II diabetes among the individuals over 18 years of age has risen from 4.7% in 1980 to 9.4% in 2019.^[6] In Eastern Mediterranean countries has risen in prevalence of

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Type II diabetes in aged between 40 and 60 years.^[7] DM will be one of the seven cause for mortality in 2030.^[8] India had 69.2 million people living with diabetes as per the 2015 data were predicted that may rise up to 79.4 millions of people by 2030.^[9] India is also called “the diabetes capital” of the world.^[10] In NIDDM (Type II DM) on compare to western country India and people are young and less obese. Indian people have more common chances of hypertension, cardiac disease, etc., compare to western people.^[11] Incidence of DM increased with increased in age, modern man, sedentary life style, physical activity decreased, and mental activity (stress) increased, so it is psychosomatic disorders.^[12,13] During stress adrenaline released which inhibit insulin secretion and also able to overcome the potent stimulant effect of glucose on β -cell islets.^[14]

In the past three decades, our lifestyle changed due to improved facilities and Industrialization so, decreased physical activities, excess food intake with fat dense calories, lacking of acceptance of the disease, resistance to changing the food habits, the course of disease progression is affected by negative attitudes and stress of working contributes to increase prevalence of diabetes in our country. NIDDM is a serious, metabolic, and costly disease with the presentation of microvascular complications such as retinopathy, nephropathy, and neuropathy and macrovascular complications such as coronary artery disease, cerebrovascular stroke, and peripheral vascular disease lead to accelerated development of cardiovascular diseases, end-stage renal disease, loss of vision, limb amputations, etc.

Activity in the form of aerobic exercise and a structured intervention is effective in improving glycemic control and is a preventive step towards acute and long-term complications of NIDDM (Type II DM).^[15] Conventional therapies for diabetes include exercise, weight control, medical nutrition therapy, etc., while pharmacological therapy includes oral hypoglycemic drugs and injections of insulin. If the conventional therapies fail then the pharmacological treatment is required, which is costly and have some side effects.^[16,17] Hence, it is essential to practice alternative therapies which are affordable and does not cause side effects. Yoga-asanas, pranayamas, massage therapy, acupuncture, and herbs are some of the alternative therapies found to be effective in the management of diabetes.^[16] Yogasanas and pranayama which can be used as a alternative therapeutic measure in treating physical, psychological elements, endocrine, and physiological it is done for a long period of time.

Indian science of yoga which includes specific techniques such as yoga postures (asanas), breathing practices (pranayamas), and meditation practice lead to change in mental attitude and diet.^[18] A yoga-asanas and pranayama practice in NIDDM patients produces significant benefits in metabolic parameters and anthropometric measurements. Yoga-asana and pranayamas cause muscle absorb excessive

glucose from blood and reduce blood glucose level which helps liver and pancreatic function well to regulate blood sugar level. Asanas help in rejuvenating the pancreatic cells, thereby assisting insulin secretion. The muscular movements also help in bringing down the blood sugar levels.^[19]

Yogasanas

Asana is derived from the verb root *as* which means to sit, to remain static etc. Hence, asana means a state of physically and mentally steady, calm, quiet, and comfortable.^[20] Asanas are postures, which contribute to stability and sense of well-being. Asanas helps in insulin secretion by rejuvenating the pancreatic cells. The blood sugar levels decreased by muscular movements which increased utilization of glucose.

Pranayama

Pranayama means control of life force through the art of breathing. Pranayama means breath control. In Sanskrit, prana means breath and ayama means a control.^[21] Earlier studies have proven that specific yogasanas and pranayama can be used as therapeutic measure in treating endocrine, physical, physiological, and psychological elements if it is done over a period of time.^[22,23]

Aims and Objectives

The objective of the study was to see practicing yogasanas and pranayamas in subjects with NIDDM (Type II DM) for 4 months (16 weeks) helpful in management of by observing biochemical marker of sugar.

MATERIALS AND METHODS

The present study was randomized control interventional study. The study was done on 50 NIDDM (Type II DM) subjects aged 35–60 years of both sexes who were on diet restriction and oral hypoglycemic drugs. Study was conducted after permission of head; subjects were randomly selected from medicine OPD of S.M.S hospital after obtaining written consent. A 16-week yoga training was given to the subjects in the morning for 30–45 min. Subjects were advised to come empty stomach for yogasanas and pranayamas. Subjects were made to practice yogic exercises for 30–45 min for at least 5 days in a week up to 16 weeks. The parameters fasting blood sugar (FBS), post-prandial blood sugar (PPBS), hemoglobin (Hb), and glycosylated hemoglobin A1C (HbA1C) were measured every 4 weekly for 16 weeks of study. Parameters were measured by independent to observer.

Subjects who suffering from NIDDM Type II, who gave informed written consent, history of DM at least 1 year, age between 35 and 60 years, who on oral hypoglycemic medicine and on diet control were included for study. Subjects who

Table 1: Parameters such as FBS, PPBS, HbA1c, hemoglobin at different time interval

Parameters	Time interval				
	0 months/start	1 month/4 weeks	2 months/8 weeks	3 months/12 weeks	4 months/16 weeks
FBS	139.2±1.6.6	134.8±12.6	118.0±22.0	105±18.5	96.8±15.9
PPBS	174.1±7.9	170.8±9.1	162.1±8.3	146±9.5	134.7±8.4
HbA1c	9.3±1.0	8.7±0.9	7.9±0.8	7.4±0.9	6.9±0.7
Hemoglobin	10.2±1.3	10.7±1.5	11.2±0.9	11.9±1.2	12.6±1.6

FBS: Fasting blood sugar, PPBS: Post-prandial blood sugar, HbA1c: Glycosylated hemoglobin A1C

suffering from IDDM Type I, who not gave consent, history of DM more than 10 years, history of smoking and alcoholic, major disease of respiratory, renal, endocrinal, cardiac, or neurological, DM complications, and irregular in follow-up were excluded from study.

RESULTS

A total of 50 subjects in 35–60 years of age group with an average age were 46.2 ± 8.7 years and 32 males and 18 females. All parameters for DM such as FBS, PPBS and glycosylated hemoglobin were gradually decrease and Hb gradually increase [Table 1].

DISCUSSION

FBS and PPBS gradually reduced from $139.2 \pm 1.6.6$ and 174.1 ± 7.9 to 96.8 ± 15.9 and 134.7 ± 8.4 , respectively, after 4 months of yogasanas and pranayama. HbA1c also decreased from 9.3 ± 1.0 to 6.9 ± 0.7 after 4 months of yoga and pranayamas practice. Hemoglobin increased from 10.2 ± 1.3 to 12.6 ± 1.6 after 4 months of yoga and pranayamas practice.

FBS and PPBS gradually reduced in diabetic subjects who do practice of yoga-asanas and pranayamas for 16 weeks which correlate with Balaji *et al.*^[19] Decrease in HbA1c seen after 4 months of yoga and pranayamas practice which correlate with Sahay,^[24] Mukherjee *et al.*,^[25] and Bijlani *et al.*^[26] Reduction in HbA1c is seen which protect the diabetic subjects from early development of macrovascular and microvascular complications, but exact cause of reduction of HbA1c not known. Increased in Hb explained by practice of yoga-asanas and pranayamas increase in erythropoietin production due to the low oxygen state (hypoxia). Erythropoietin system enhances RBC production, which may rise up to 10 times more than normal until the hypoxia is relieved.^[27]

Diabetes is a metabolic disorder presented with polyuria, polyphagia, polydipsia, etc., characterized by chronic high sugar levels with disturbances in carbohydrate, fat, and protein metabolism. Practicing yoga include specific technique such as yoga, asanas, meditation, and pranayamas.^[28] Pranayama is a simple method which can be performed in sitting posture. It can be performed by the people who are

physically inactive. Pranayamas also reported as useful in the management of DM.^[29] Pranayamas helps in reduction of weights, blood pressure, blood sugar value, etc., and also prevent complication of it. Routine activity of yoga-asanas and pranayamas lead to increased sensitivity of beta cells of pancreases to glucose signals and maintain blood sugar levels.^[30,31] Yoga-asanas and pranayamas practice causes reduction in body fat and increase of lean body mass may help in improving insulin sensitivity. People with NIDDM had an increased cardiovascular morbidity and mortality, when compared with non-diabetics.^[32] The possible mechanisms may be (a) during yoga-asanas and pranayamas abdominal stretching lead to direct rejuvenation/regeneration of beta cells of pancreas, increase sensitivity, increase utilization, and metabolism of glucose in peripheral tissues, liver, and adipose tissues through enzymatic process.^[33,34] (b) Active practice of yoga-asanas and pranayamas followed by relaxing one lead to deeper relaxation followed by relaxing practice alone causes possibility of neuroplasticity bringing about changes in the hypothalamic-pituitary pancreatic axis.^[24] (c) Muscular relaxation, development, and improve blood supply to muscle increase insulin receptors activity causes increased glucose replaces by muscles and decreased blood sugar levels.^[35]

The major limitation in our study was small sample size, age more than 60 years, Type I DM, history of diabetes <1 year and more than 10 years not enrolled. Finally, after study suggested that yoga-asanas and pranayamas helpful in NIDDM (Type II DM) in increased sensitivity of beta cell of pancreases, decreased peripheral resistance, increase in rate of transport of glucose, and increase in release of insulin such as substance from muscle into the circulation, and decrease in secretion of adrenaline resulting from diminished sympathetic tone leading to inhibition of glycogenolysis, change in biochemical profile lactate, pyruvate, adrenaline, noradrenaline, etc., in antioxidant status.^[36-38]

CONCLUSION

Blood investigation for DM may improve after yoga-asanas and pranayamas along with medical therapy. In patients with DM routine practice of yoga-asana and pranayamas causes reduced drug dose, mentally and physically person become strong and less complication due to DM.

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