



A STUDY ON THE EFFECT OF COMBINED YOGA THERAPY AND LIFESTYLE INTERVENTIONS IN PATIENTS WITH PREDIABETES: THE ROLE OF PRANAYAMA AND ASANAS IN DELAYING THE ONSET OF TYPE 2 DIABETES MELLITUS.

Pharmacology

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ABSTRACT

The prevalence of prediabetes leading on to T2DM is reaching alarming proportions. Primary preventive strategies could prove to be the best measures in overcoming the threat imposed by the disorder. This study was done with the aim of studying the effect of combined yoga therapy and lifestyle interventions in patients with prediabetes and their role in preventing the progress to frank diabetes.

Materials & Methods : A prospective study was done. Patients who had impaired glucose tolerance and/or impaired fasting glucose along with the high risk factors for T2DM were included in the study. Totally 32 patients completed the trial. Yoga therapy was initiated under expert guidance along with life style interventions. The results were analysed at the end of 6 months.

Results : The prevalence of prediabetes was found to be 25.55%. The patients were in the age group of 38 -62 years. 56.25 % were male patients and 43.75% were female patients. 46.87 % had a family history of diabetes, 37.50 % had a family history of hypertension, 15.62 % had a family history of diabetes and hypertension, 34.37 % had a family history of CVD, 61.11% had history of smoking and 16.66% had history of alcohol intake. 68.75% were in the obese range. 65.62% had hypertension and 28.12% were on statin therapy. The Hb A 1 c levels were between 5.8 - 6.4 % in 8 patients. There was a post treatment reduction in the number of patients with IFG from 25% to 15.62 %, reduction of IGT from 43.75 % to 21.87% and reduction in patients with both IGT and IFG from 31.25% to 12.5%. In addition obesity range was reduced to 34.37% and the blood pressure was also found to be reduced in 37.5% patients.

Conclusion: This study has shown beneficial effects in lowering the prediabetic status as well as a reduction in the risk factors that can predispose to the development of T2DM.

KEYWORDS

IGT, IFG, CVD, T2DM, Yoga therapy

Diabetes mellitus is a spectrum of metabolic disorder characterised by derangement of carbohydrate, protein and lipid metabolism and chronic hyperglycemia. The World Health Organization (WHO) has commented that there is 'an apparent epidemic of diabetes, which is strongly related to lifestyle and economic change'.^{1,2} The occurrence of impaired glucose tolerance is much higher and the prevalence of IGT is thought to be around 8.7 per cent in urban areas and 7.9 percent in rural areas. It is thought that around 35 per cent of IGT patients may progress on to frank type 2 diabetes (T2DM) and there is definitely a global crisis.³ The term prediabetes refers to impaired glucose tolerance (IGT) and impaired fasting glucose (IFG), both being intermediate stages which when accompanied by genetic and environmental triggers can predispose to the development of type 2 diabetes mellitus. IGT is associated with an increased incidence of cardiovascular risk. Therefore strategies to overcome the predictors such as weight reduction, improving the insulin sensitivity and prevention of declining insulin secretion can to a great extent stop the progress of a prediabetic state to T2DM.

Primary preventive strategies could prove to be the best alternatives in overcoming the threat imposed by the disorder rather than initiating new therapeutic treatment strategies. The various approaches include dietary modifications, physical exercise, behavioral therapy along with medications like metformin and acarbose with avoidance of other individual risk factors. Due to the chronic course of the disease, debilitating complications, threat of death, as well as the complexities of the treatment plans, people with diabetes often work proactively to manage their condition, optimize their health and alleviate complications through the use of complementary therapies.^{4,5} There are various complementary and alternative forms of non-pharmacological therapeutic paradigms that has gained popularity for treating diabetes. Yoga is considered to be a promising, cost-effective option in the treatment and prevention of diabetes, with data from several studies suggesting that yoga and other mind-body therapies can reduce stress-related hyperglycemia and have a positive effect on glycemic control. Yoga, which originated in India more than 5,000 years ago, aims at balancing and harmonizing the body, mind, and emotions.⁶ Increasing evidence suggests that yoga practice tackles the pathophysiologic mechanisms of diabetes and helps in controlling diabetes and its complications.⁷ This study has been planned out with the aim of observing the effect of combined yoga therapy and lifestyle

interventions in patients with prediabetes and their role in preventing the progress to frank diabetes.

MATERIALS AND METHODS: A prospective study was done in a tertiary care set up in Chennai. The trial protocol was submitted to the IEC and the study was initiated on approval from the institutional ethics board. Out of 180 cases screened, a total of 46 patients who had impaired glucose tolerance (IGT) and/or impaired fasting glucose (IFG) or both were included in the study. IGT was a 2 hr post prandial glucose levels of >140 mg/dl & < 200 mg/dl and IFG of >110 mg/dl & < 126 mg/dl was considered as cut off value. All high risk patients for type 2 diabetes mellitus having a positive family history of diabetes, with central obesity measured by waist circumference > 90 cm in men and > 80 cm in women, history of gestational diabetes, hypertension >130/85 mm Hg, triglyceride >150 mg/dl, HDL <35 mg/dl in men, <38 mg/dl in women were included. A thorough cardiovascular risk status assessment was done before inclusion of the patients. Informed consent was obtained before start of the therapy.

Yoga therapy was initiated under expert guidance. The patients were trained in yoga asanas for a period of 30-40 min/day for 30 days under guidance. Pranayama and Asanas consisting of 4-5 well known simple postures, were done in a sequence. These postures included vajrasana, yoga mudra, bhujangasana, dhanurasana, pavana muktasana, nadisuddhi pranayama and brahmari pranayama. Life style modifications included diet therapy, modification of sedentary pattern of day today activity and strict avoidance of smoking and alcohol. The patients were instructed on the continuation of various asanas and they were followed up over a period of 6 months. Appropriate investigations were carried out at regular intervals. The influence and the outcome of treatment was assessed with regard to the age, sex, relation to family history, personal history and other risk factors. A target reduction of fasting blood glucose levels to less than 110 mg/dl and a 2 hour post prandial to less than 140 mg/dl was considered as effective therapy in addition to reduction in weight as indicated by BMI and waist hip ratio.

RESULTS: Totally 32 patients completed the trial period, the data of whom were analysed. The patients were in the age group of 38 -62 years. 18 were male patients and 14 were female patients. 15 patients had a positive family history of diabetes, 12 patients had a positive

family history of hypertension, 5 patients had a positive family history of diabetes and hypertension, 11 had a positive family history of CVD, 11 out of 18 male patients had a history of smoking and 3 had history of regular alcohol intake. Totally 22 were in the obese range with a BMI of more than 32. 21 patients were treated for hypertension and 9 patients were on statin therapy. The Hb A1c levels were between 5.8 - 6.4 % in 8 patients. The fasting and post prandial blood glucose levels were measured at the end of 3 months period and 6 months period in addition to the other tests and investigations. The pretreatment fasting blood glucose was in the IFG range in 8 patients while 14 patients had IGT. Both IFG & IGT occurred in 10 Patients. At the end of the study period 5 patients had IFG, 7 patients had IGT and 4 patients had combined IFG & IGT.

DISCUSSION : A high risk profile for T2DM has been officially recognized for many years by varied names, such as 'borderline diabetes' and is primarily based on an individual's glycaemic state. More recently the term 'prediabetes' or 'intermediate hyperglycaemia' has evolved.⁸ The incidence and prevalence of diabetes mellitus as already mentioned has reached an alarming proportion and it is almost a major epidemic threat. Annually approximately 5-10% prediabetic individuals progress to T2DM with rates varying depending on population characteristics as well as the criteria and cut offs used for defining prediabetes.^{9,10} Therefore an urgent implementation of effective therapy directed towards both preventive modalities and treatment aspects in optimizing the glucose control is essential. Yoga has been studied for controlling both the symptoms and the complications associated with type 2 diabetes mellitus. Yoga can also treat diabetes, or in the case of T2DM, prevent the disease from developing by stimulating the production of insulin-producing beta cells.^{11,12,13} This study has been planned out with the aim of observing the effect of combined yoga therapy and lifestyle interventions in patients with prediabetes and their role in preventing the progress to frank diabetes.

Out of 180 cases screened a total of 46 patients had impaired glucose tolerance (IGT) and/or impaired fasting glucose (IFG) or both. The prevalence of prediabetes was found to be 25.55%. 32 patients completed the trial period, the data of whom were analysed. The patients were in the age group of 38 -62 years. 56.25 % were male patients and 43.75% were female patients. 46.87 % had a positive family history of diabetes, 37.50 % patients had a positive family history of hypertension, 15.62 % patients had a positive family history of diabetes and hypertension, 34.37 % had a positive family history of CVD, 61.11% had a history of smoking and 16.66% had history of regular alcohol intake. 68.75% were in the obese range with a BMI of more than 32. 65.62% were treated for hypertension and 28.12% were on statin therapy. Obesity, hypertension, dyslipidaemia, smoking, CVD, sedentary habits and unhealthy dietary patterns along with psychological stress have all been considered as risk factors for development of diabetes. Yoga can reduce body weight and improve weight control, both of which are beneficial in T2DM. Yoga therapy in addition reduces insulin resistance, corrects hyperinsulinemia and dyslipidemia, reduces stress and blood pressure. Lack of physical activity was found to increase the risk of diabetes by 3 times and the risk of coronary artery disease by 2.4 times.^{14,15}

Table 1 : Variables Assessed (n=32)

Variables	Frequency	Percentage
Male	18	56.25
Female	14	43.75
Obesity	22	68.75
Smoking	11	61.11
Alcohol	3	16.66
Family h/o DM	15	46.87
Family h/o Htn	12	37.50
Family h/o DM & Htn	5	15.62
Family h/o CVD	11	34.37
Htn	21	65.62
Statin therapy	9	28.12
IFG	8	25
IGT	14	43.75
IFG & IGT	10	31.25

Graph 1: Pretreatment Assessment

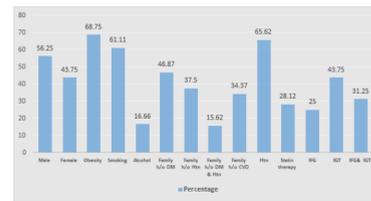
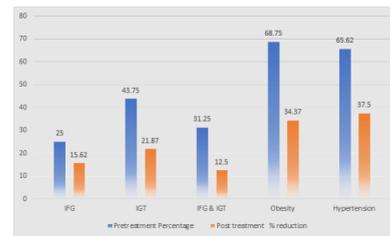


Table 2 : Reduction in IFG & IGT level

Variables	Pretreatment frequency n=32	Pretreatment Percentage	Posttreatment reduction n=32	% reduction
IFG	8	25	5	15.62
IGT	14	43.75	7	21.87
IFG & IGT	10	31.25	4	12.5
Obesity	22	68.75	11	34.37
Hypertension	21	65.62	12	37.5

Graph 2: Pretreatment & Post Treatment %



The Hb A1c levels were between 5.8 - 6.4 % in 8 patients. A recent large meta-analysis based on studies that adopted the WHO and/or ADA criteria for prediabetes reported that isolated HbA1c is neither sensitive nor specific for diagnosing the intermediate state of prediabetes.¹⁶ Yoga, which originated in India more than 5,000 years ago, aims at balancing and harmonizing the body, mind, and emotions.¹⁷ There are several hypotheses for the biological mechanisms that link the benefits of yoga to diabetes management.¹⁸

One hypothesis points to the role of stress and relaxation, while others suggest that the non-invasive nature of yoga provides excellent support and few side effects to the patients already taking medication for the disease.^{19,20,21} Landmark studies have shown an important role of lifestyle modification in the prevention of type 2 diabetes and lifestyle modification is the most effective, cheaper and safer approach to type 2 diabetes prevention.^{22,23,24} Studies indicate that a yoga program would be a possible risk reduction option for adults at high risk for type 2 diabetes.^{25,26,27} In addition, yoga holds promise as an approach to reducing cardiometabolic risk factors and increasing exercise self-efficacy for this group. Among Indians with elevated fasting blood glucose, it was found that participation in an 8-week yoga intervention was feasible and resulted in greater weight loss and reduction in waist circumference when compared to a walking control. Yoga offers a promising lifestyle intervention for decreasing weight-related type 2 diabetes risk factors and potentially increasing psychological well-being.²⁸ Many yoga practices have been found to be beneficial in the management of type 2 diabetes mellitus; however, their judicious use is recommended after a careful assessment of a patient's overall health, individual requirements, associated risk factors, and contraindications. By considering the person as a whole, including physical inactivity and poor health behaviours, yoga practices of high or low intensity may be prescribed.²⁹ Surya Namaskar, Trikonasana, Tadasana, Sukhasana, Padmasana, Bhastrika Pranayama, Pashimottanasana, Ardhamatsyendrasana, Pawanmuktasana, Bhujangasana, Vajrasana, Dhanurasana and Shavasana are all beneficial for diabetes mellitus and yoga postures have a positive effect on glucose utilization and fat redistribution in individuals with type 2 diabetes.³⁰

In our study the patients were trained in yoga asanas for a period of 30-40 min/day for 30 days under guidance. Pranayama and Asanas consisting of 4-5 well known simple postures, done in a sequence was included. Pranayama is controlled or regulated yogic breathing practice. Asanas or yoga postures emphasize the relationship of body, mind, and awareness, focusing on the synchronization of breathing and movement. These postures included vajrasana, yoga mudra,

bhujangasana , dhanurasana, pavana muktasana , nadisuddhi pranayama and brahmari pranayama all of which have been found to be beneficial for diabetes mellitus . The fasting and post prandial blood glucose levels were measured at the end of 3 months period and 6 months period in addition to the other tests and investigations. The pretreatment fasting blood glucose was in the IFG range in 25% patients while 43.75% patients had IGT . Both IFG & IGT occurred in 31.25% Patients. There was a post treatment reduction to 15.62 % from 25 % in IFG, reduction to 21.87% from 43.75 % with IGT levels and reduction to 12.5% from 31.25 % values in patient with both IFG & IGT. In addition obesity range was also reduced from 68.75% to 34.37% and the blood pressure was also found to be reduced to near normal values in comparison to pretreatment values in 37.5% patients . Many studies have reported beneficial effects after 3 months of the intervention^{31,32,33}

This study has shown beneficial effects in lowering the prediabetic status as well as a reduction in the risk factors that can predispose to the development of T2DM. The incidence and prevalence of diabetes mellitus as already mentioned has reached an alarming proportion and it is almost a major epidemic threat. Globally, according to the International Diabetes Federation diabetes atlas, in 2017 there were roughly 425 million people with diabetes, a figure that is projected to increase to 629 million by 2045.³⁴ An urgent strategy directed towards both preventive modalities and treatment aspects in optimizing the glucose control with the aim of maintaining the quality of life measures at the same time decreasing the economic burden associated with the complications and treatment is the need of the hour. Even though the beneficial effects of yoga have been well documented through various studies, the routine practice of yoga therapy in a clinical setting is not being followed as a part of conventional therapy. Therefore, a large-scale initiative towards complementary care of therapy along with lifestyle modifications can prove to be a fruitful option towards handling the menace of the epidemic of Diabetes mellitus.

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