

Effect of yoga therapy on fasting blood sugar and to study the distribution of anthropometric measures in type-2 diabetes

Abstract

Diabetes has become one of the most dreaded diseases in the modern world. In the case of India, it has become the diabetes capital of the world. In the future it will increase, making one out of six a diabetic person. Further a majority of the people are not aware that they are diabetic. Diabetes leads to complications like risk of heart attack, kidney failure, stroke, nerve damage etc. Yoga therapy strikes at the root of the problem which is life style. It is greatly useful for pre diabetics. It is cost effective and safe. Studies have brought out the role of yoga therapy in creating positive emotions and in the management of diabetes mellitus. The aim of the study is to assess the effect of SVYASA prescribed yoga module on fasting blood sugar in type 2 diabetes.^{1,2}

60 participants with diabetes within the age group of 25-65 in and around Bengaluru city limit namely Yelahanka and Matthikere in Karnataka. All the participants were given the yoga module which included asana, pranayama, relaxation practices, and meditation classes, for a period of two weeks. An introduction to the study, a comprehensive questionnaire, and written informed signed consent was got from all participants at the beginning of the study. Assessments were done using calibrated electronic glucometer. Fasting and postprandial blood sugars were measured before and after yoga intervention. The study also focused on personalization of the yoga module based on profiling of the participants leading to better outcomes as opposed to a standard protocol based therapy.

Keywords: type-2 diabetes, obesity, yoga, fasting blood sugar, anthropometric measures, stress

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Abbreviations: FBS, fasting blood sugar; DM, diabetes mellitus; IDF, international diabetes federation; WPR, western pacific region; WHO, world health organization; IR, insulin resistance; PSS, perceived stress scale

Introduction

Diabetes (diabetes mellitus) is a metabolic disorder, where blood sugar levels spike over a prolonged period. According to statistics from the International Diabetes Federation (IDF), India has more diabetics than any other nation of the world. Current estimates peg the number of diabetics in the country at about 62 million. Lifestyle is strongly associated with the development of Type 2 Diabetes, and lifestyle change is the cornerstone of its management. Considering the far-reaching social, psychological and economic costs associated with this condition, extensive research on effectiveness of Yoga therapy on diabetes has already been conducted. The research in this paper restricts itself to determining the effectiveness of S-Vyasa prescribed yoga module for diabetics in managing diabetes, employing the well-known measurement criteria such as Fasting Blood Sugar.

How are diabetes and obesity related?

Cardiovascular disease remains the leading cause of death in women. Both obesity and diabetes mellitus are important independent risk factors for the development of cardiovascular disease. Obesity is the leading risk factor for type 2 diabetes. Women with a body mass

index (BMI) of 30kg/m² have a 28times greater risk of developing diabetes than do women of normal weight. The risk of diabetes is 93times greater if the BMI is 35kg/m². The national prevalence rates of diabetes have increased in parallel with the rates of obesity. The best treatment for diabetes is prevention. Prevention of diabetes can be accomplished through a 7% weight loss through intensive lifestyle interventions that include caloric reduction and approximately 30min of daily moderate physical activity. (The Epidemic of Obesity and Diabetes-Trends and Treatments by Ann Smith Barnes, MD, MPH Stephanie A. Coulter, MD, Section Editor). Current literature suggests a high burden of generalized obesity among Indian children and adolescents, with a definite socioeconomic gradient. Asian-Indian children are increasingly susceptible to unfavourable body composition, as well as regional adiposity. The conventional BMI criteria for obesity are inadequate to identify these differences in body fat composition or distribution. Hence, ethnicity-specific, metabolically relevant cut-off values should be considered while diagnosing obesity and adiposity. Available evidence on the natural history of type 2 diabetes in India suggests the need for a life-course approach in the prevention and control of childhood obesity. A comprehensive multilevel, multicomponent obesity-prevention strategy addressing a wide range of issues, starting from maternal and childhood undernutrition, and including sociodemographic and environmental factors, is a necessity in India. (Childhood obesity and type 2 diabetes in India by Pradeep A Praveen, Nikhil Tandon).

Diabetes and patient education

There was a study that investigated the influence of a number of psychological factors upon the practice and outcome of diabetic self-management among young adults with insulin-dependent diabetes mellitus. The results demonstrated that the sample members perceived that they were responsible for the control of their diabetes, that the benefits of following treatment were greater than any barriers and that they were knowledgeable about their diabetes Vivien E Coate et al.³ Patients' adherence, attitude, beliefs, and knowledge about diabetes may affect diabetes self-management. Culture and language capabilities influence the patient's health beliefs, attitudes, health literacy, thereby affecting diabetes self-management Soohyun Nam et al.⁴ In another study, randomized control trial study to improve diabetes self-management through acceptance, mindfulness, and values was conducted. It was observed that after three months there was improvement in their coping skills acceptance coping and self-management behavior mediated the impact of treatment on changes in HbA1c Jennifer AG, et al. in 2012. Another study showed that subjects characterized by strong beliefs in their self-efficacy and an optimistic outlook on life were more likely to be satisfied with their doctor-patient relationships. They demonstrated more active coping behavior and proved to have a higher quality of life. Active coping behavior was the only psychological variable significant for the HbA1c values Matthias Rose et al.⁵

Diabetes and social support

Adults with type 2 diabetes (N=119; 29 % Latino, 61% Black, 25% White) completed validated measures of diabetes distress and social support. Multiple linear regression evaluated the moderating role of social support in the relationship between diabetes burden, indicated by prescription of insulin and presence of complications, and distress. Findings support the stress-buffering hypothesis and suggest that social support may protect against diabetes distress. Rachel N Baek et al.⁶

Diabetes and yoga

Yoga is considered as one of the preventive and alternative treatment in diabetes management. Yoga has been studied for controlling both the symptoms and complications associated with Diabetes Mellitus Type 2. The results of the study suggested a statistically significant role of yoga in controlling diabetes. It shows that diabetics may benefit from yoga's ability to improve quality of life, Aljasir et al.⁷ Yoga therapy has been useful in treatment of negative symptoms and improving the socio- occupational functioning and emotion recognition deficits in antipsychotic- stabilized schizophrenia patients, Jayaram et al.⁸ Yoga has proved to be an effective tool as an add-on therapy in chronic depression patients, Naveen et al.⁹ Yoga has also proved its efficacy in psychological determinants such as mood disturbances and stress symptoms in cancer patients Mackenzie et al.¹⁰ Hatha yoga practices have proved its benefits in stress reduction in middle aged women which is shown by a stress reduction scale called PSS (Perceived Stress Scale), Moliver et al.¹¹

The integrated approach of yoga comprising of physical postures, breathing and meditation helped to manage psychological stress and thereby leading to the physical benefits, which is described through the Adhija Vyadhi model. We also found that IYN protocol was easy to adhere to and the results were sustained for 2months following the discharge of the patient. We plan to follow-up with the patient further to understand the long-term benefits of Yoga and Naturopathy based lifestyle interventions in MetS. This case also adds to growing clinical

evidence of the use of Yoga and Naturopathy therapies in chronic non-communicable degenerative disorders. The significant changes we found may be attributed to an integrated approach of Naturopathy and Yoga, as well as the whole hearted adherence of the patient. The case report shows remarkable changes in MetS status that improved the quality of life following a 6 week IYN intervention. The change was sustainable for 12weeks through simple lifestyle modifications. Considering the effects achieved in this case, IYN could be used as a safe and beneficial intervention to integrate into the management of MetS. Swathi Gowda et al.¹² A group of 44 accomplished diabetes patients in the age group of 40-55years with diabetes 1 to 10years were included. Test group and control group were each divided with 22 patients. The test group was taught yoga in the mornings by a yoga expert. The result showed significant decline in metabolic parameters, FBS, PPBS, triglycerides and LDL. Group also showed significant decrease in weight, BMI and waist hip ratio in the test group Balaji, et al. in 2011.

41 participants with high risk type 2 diabetes were randomized in yoga (n=21) and a walking control (20) in Bangalore, India. Participants were asked to either attend yoga classes or complete monitored walking 3-6days per week for eight weeks. Among people with elevated fasting blood glucose, it was found that participation in an 8week yoga intervention was feasible and resulted in greater weight loss and reduction in waist circumference when compared to the walking control group Dermott, et al. in 2014. A randomized control trial with the patients having HbA1c between 6 to 9% with minimum 3month history, lifestyle modification and oral and anti-diabetic medication were included. Patients were divided into two groups- 1st standard diabetes treatment and 2nd standard diabetes treatment with Sudarshana kriya yoga and Pranayama. There was significant improvement in physical, psychological and social domains, and total QOL post intervention in the group practising the comprehensive yogic breathing program as compared to the group following the standard treatment alone Jyotsna et al.¹³ 227 type 2 diabetes patients of both genders aged above 28years in and around Bengaluru were allocated to a yoga based lifestyle modification program and exercise based life style modification program. Medication score, blood glucose, HbA1c and lipid profile were assessed at baseline and after 9months. It showed better reduction in the dosage of hypoglycemic medication required and increase in HDL in the Yoga group as compared to the control group. FBG reduced only in the yoga group Nagarathna, et al.¹⁴ A total of 77 normal healthy individuals and those having hypertension, coronary artery disease, diabetes mellitus and a number of other illnesses were provided yoga for 10days. The outcome measure were subjective wellbeing inventory scores (SUBI) taken on the first and the last days of the course. There was a significant improvement in the subjective wellbeing scores of the 77 subjects in the intervention group within a period of 10 days as compared to the control group Sharma et al.¹⁵ A brief but comprehensive lifestyle modification programs based on yoga for prevention and management of chronic diseases, of 8 days period was conducted. The study found that fasting plasma glucose, cholesterol, etc were lower on the last day of the course, compared to the first day Ramesh L Bijilani, et al. in 2005.

Materials and methods

Convenient sampling method, with a single group pre-post design was followed, with a sample size of 60 Type-2 diabetic subjects on medication, from the stop diabetes movement camp conducted at Yelahanka and Matthikere localities in Bangalore. The subjects were in the age group of 20-70, both male and female. -All of them were

willing to take up yogic management of Type2 diabetes and interested in knowing its effect on the disease. Those on psychiatric medication, physical disabilities and those who had recently undergone any surgeries were excluded from the study.

The S-VYASA prescribed Integrated Yoga module for diabetes, which included the below regimen was used for intervention:

- i. **Breathing practices:** Rabbit breathing, Tiger breathing
- ii. **Shithilikarana vyayama (loosening exercises):** Trikonasana bending, Twisting, Dhanurasana swing, Pavanamuktasana kriya, Surya namaskara, Quick Relaxation Technique
- iii. **Asanas:** Parivrita Trikonasana, Vakrasana/ Ardhamatsyendrasana, Ushtrasana, Bhujangasana, Shalabhasana, Dhanurasana, Sarvangasana, Matsyasana, Deep Relaxation Technique
- iv. **Bandhas:** Uddiyana Bandha, Mula Bandha, Jalandhara Bandha
- v. **Kriyas:** Jala Neti, Sutra Neti, Vamana Dhouthi, Shankha Prakshalana, Agnisara Kriya, Kapalabhati
- vi. **Pranayama:** Vibhagiya Pranayama (Sectional Breathing), Surya Anuloma Pranayama, Nadi Shuddha Pranayama, Sitali/ Sitakari/Sadanta Pranayama, Brahmari Pranayama
- vii. **Meditation (Dharana and Dhyana):** Nadasandhana, OM Meditation

Assessment was done using a calibrated electronic glucometer - same batch of strips as well as using the same electronic batch chip- and fasting blood sugar was collected before and after yoga module intervention. The systolic and diastolic readings were assessed using the standard sphygmomanometer. For measuring the Body Mass Index, weight was measured using the standard weighing scale and height was measured using the standard measuring stick.

Data analysis was done using SPSS version 2.

Results and discussion

Body mass index

Parameter	Mean	Standard deviation
BMI	26.6176	4.1565

The mean of 26.6 being greater than 25, indicates that majority of the participants are overweight.

Waist circumference

Parameter	Mean	Standard deviation
WC in cms	67.04386	30.95854

As the mean of 67 is less than the thresholds of 94cms for men and 80cms for women, the participants do not fall under the high risk category.

Blood pressure

Parameter	Mean	Standard deviation
BP Systolic	138.2203	21.555116
BP Diastolic	82.27119	8.8275246

The mean of 138/ 82 Hg for the blood pressure in the above table indicates that the participants fell under the low risk category.

Fasting blood sugar

Parameter	Mean	Standard deviation	Normality	p-value
FBS Pre Intervention	164.2881	58.09358	0.001	0.012
FBS Post Intervention	155.5392	50.64893	0.008	

Wilcoxon test

Wilcoxon Test (FBS Pre and FBS Post)	Asymp Sig (2-tailed)
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Interpretation of the results of analysis

The mean of the fasting blood sugar has reduced from 164.2881 to 155.5392. The standard deviation has also shown a reduction from 58.09358 to 50.64893. The p-value is 0.012 which is less than 0.05, which indicates significant difference between pre and post measurements. Physical exercises and yoga practices especially those which give a twist to the vertebral column is very good for diabetic patients as it stimulates the liver and pancreas. Vajrasana, Shashankasana is very good for digestion and diabetic patient. Breathing practices and Pranayama specially cooling practices Sheetal, Sitkari, Sadanta is emphasized which gives a sense of satisfaction and normalizes the increased appetite and thirst. Frequent urination is also controlled as sympathetic and parasympathetic nervous system is balanced. It energizes the whole body and removes tardiness. Bhramari Pranayama soothes and calms down the mind. Cyclic meditation and Nadasandhana help in reducing stress.¹⁶⁻²⁰

Conclusion

Yoga is effective in reducing fasting blood sugar levels.

Acknowledgments

The Institute Ethics Committee Approval (SVYASA) was obtained before the starting of the study. The participants were explained the details of the study and their consent was sought to conduct the survey. Each participant who participated in IAYT was also explained in detail about the study and written informed consent was obtained from them before their participation.

Conflict of interest

The authors declare that they have no conflict of interest in the publication.

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