

Prediabetes and type 2 diabetes mellitus: Evidence for effect of yoga

Viveka P. Jyotsna

Department of Endocrinology and Metabolism, All India Institute of Medical Sciences, Ansari Nagar, New Delhi, India

INTRODUCTION

The growing epidemic of lifestyle-related diseases like type 2 diabetes in spite of all new drugs that are now available has drawn attention to the research on effects of yoga in diabetes prevention and treatment.^[1-6]

The word Yoga is derived from the Sanskrit word 'Yuj' meaning union of the body, breath and mind. Good health due to Yogic practices could be the effect of right thought and action. Yoga as a way of life is more true to its ancient tenets. It constitutes asanas, regulated breathing (pranayama), and awareness of yoga sutras (principles) that govern the mind.^[7] Regular practice of yoga enhances awareness of mind and body,^[3] which is needed in the self-management of diet and exercise plan in diabetes.

Since change in lifestyle requires more effort on the part of the patient, health care provider and the social system as a whole compared to just popping a pill, more efforts and longer follow-up is required in such research.

How does yoga benefit in diabetes? Landmark studies have shown an important role of lifestyle modification in the prevention of type 2 diabetes.^[8-11] How to bring about change in and sustain a healthy lifestyle in times of urbanization, easy availability of calorie-dense fast food, mechanization, less open space for exercise is the question. Mere awareness about healthy living do not alone amount to implementation at the individual and society level.

Could practice of yoga be a factor to build awareness and then build this gap between awareness and implementation at an individual level in the choice of food and exercise? Patients with diabetes may be unable or unwilling to participate in conventional types of physical activity (gymnasium based and vigorous strength training) due to limited joint mobility, capsulitis, and physical unfitness associated with overweight and sedentary lifestyle. In such a scenario, gentle yogic stretches performed under guidance with mind, body, and breath awareness might bring the body/mind back in condition fit again for more vigorous exercises required to have a direct effect on lowering plasma glucose. Limitations and barriers in enrollment and follow-up from the previous studies^[11] tell us that these stretches and asanas need to be tailored according to the participant's need. Here, we discuss the evidence we have for the different effects of yoga on diabetes.

Evidence of effect of yoga on diet, food intake and glycemic control

Diet intake affects glycemic control: A recent study has shown the effect of mindfulness yoga on eating and exercise in gestational diabetes.^[12] Community-based yoga intervention showed beneficial effect on oxidative stress,^[13] glycemic parameters, weight reduction^[14] and lipids.^[15]

Leptin^[16] plays a pro-inflammatory role while adiponectin has anti-inflammatory properties. Leptin was found to be significantly higher among novices compared to regular practitioners of yoga. Frequency of yoga practice had significant negative relationship with leptin.^[16] Adiponectin levels were higher among practitioners of yoga. This raised the possibility that long-term/more intensive yoga practice could have beneficial health consequences by altering leptin and adiponectin. Apart from these, there are a number of studies that show the beneficial effect of different methods of yoga on glycemic control and lipid profile in diabetes.^[17-22] Could yoga be a trigger in self-awareness and awareness for adapting healthy eating habits? Only studies with long-term follow-up can answer this.

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Corresponding Author: Dr. Viveka P. Jyotsna, Department of Endocrinology and Metabolism, All India Institute of Medical Sciences, Ansari Nagar, New Delhi - 110 029, India. E-mail: vivekajyotsna@gmail.com

Evidence of interrelation of depression/anxiety with metabolic syndrome and of yoga to improve both

Mood affects food intake: Depression and/or anxiety are risk factors for the development of diabetes^[23,24] and vice versa.^[25,26] This may occur due to genetic, epigenetic or environmental conditions. Regular practice of yoga has been shown to be beneficial in reducing depression and anxiety^[27-30] and therefore may affect diabetes in an indirect manner.

Evidence of effects of yoga in improving physical health, weight loss and adherence to physical activity

Physical activity can lower the risk of type 2 diabetes, but it is difficult to establish whether muscle-strengthening, stretching activities are beneficial for the prevention of type 2 diabetes. Total 99,316 women for 8 years from the Nurses' Health Study (aged 53-81 years, 2000-2008) and Nurses' Health Study II (aged 36-55 years, 2001-2009), mainly of European ethnicity, who were free of diabetes, were prospectively followed up. Participants reported weekly time spent on resistance exercise, lower intensity muscular conditioning exercises (yoga, stretching, toning), and aerobic moderate and vigorous physical activity at baseline and in 2004-2005. This is the only long-term follow-up study on yoga and more of this kind is required.

This study suggests that engagement in muscle-strengthening and conditioning activities (resistance exercise, yoga, stretching, toning) is associated with a lower risk of type 2 diabetes. Engagement in both aerobic moderate and vigorous physical activity and muscle-strengthening type activity is associated with a substantial reduction in the risk of diabetes in middle-aged and older women.^[31]

Lifestyle changes though difficult to sustain, prevents type 2 diabetes. A randomized trial with one-year follow-up comparing restorative yoga vs. stretching among underactive adults with the metabolic syndrome at the Universities of California, San Francisco and San Diego showed that restorative yoga was marginally better than stretching for improving fasting glucose.^[32]

Yoga has been useful in geriatric type 2 diabetes where vigorous exercise may not be acceptable.^[33]

Though yoga of only 40 days has shown to decrease weight and improve well-being and anxiety^[34] in one study, a two-month yoga program was insufficient to bring about a consistent change in physical activity in another study.^[35] This stresses the need for a follow-up with revision and reinforcement on a regular long-term basis.

Subjective variation of yoga practice limits interpretation. Another factor is the variation of method of yoga being

practiced, which varies across studies. Further research is necessary to explore the influence of yoga on behavioral health outcomes among prediabetes and diabetes.

A review^[36] indicates that yoga has a positive short-term effect on multiple diabetes-related outcomes; however, long-term effects of yoga therapy on diabetes management warrant further research. The context of the social environment, including interpersonal relationships, community characteristics, and discrimination, influences the adoption and maintenance of health behaviors such as physical activity, including yoga practice.

Yoga practice of for 3 months was found to be beneficial as weight loss strategy in a predominately Hispanic population.^[37]

In a randomized controlled study, it was found that participation in a two-month yoga intervention was feasible and resulted in greater weight loss and reduction in waist circumference when compared to controls assigned walking.^[38] They concluded that yoga offers a promising lifestyle intervention for decreasing weight-related type 2 diabetes risk factors and potentially increasing psychological well-being.^[38]

A consensus statement from the British Association of Sports and Exercise recommends that weight training, circuit classes, yoga, and other muscle-strengthening activities offer additional health benefits and may help older adults to maintain physical independence.^[39]

Evidence of benefit of yoga on cardiovascular risk

Long duration practice of yoga has shown to have a beneficial effect on cardiovascular reactivity.^[40,41]

A randomized controlled trial showed that in a 6-month period, practice of comprehensive yogic breathing had beneficial effects on cardiac autonomic functions in patients with diabetes who followed the comprehensive yogic breathing program compared to those who were on standard therapy alone.^[42,43] Since cardiac dysfunction has been implicated in sudden cardiac death in diabetes, this finding may translate to practice of yogic breathing program being useful in delaying sudden cardiac death.

A recent review^[42] observed that most studies have several limitations like lack of adequate controls, small sample size, inconsistencies in baseline, and different methodologies, therefore large trials with improved methodologies are required to confirm these findings. In view of the existing knowledge and yoga being a cost-effective technique without side effects, it appears appropriate to incorporate

yoga/meditation for primary and secondary prevention of cardiovascular disease.^[42] A recent meta-analysis revealed evidence of beneficial effects of yoga on cardiovascular risk and concluded that yoga is beneficial for patients with increased risk of cardiovascular disease.^[43-45]

Evidence of benefit of yoga on quality of life/well-being

Any chronic disease like diabetes leads to a decrease in quality of life. Poor quality of life may affect compliance with treatment. A randomized controlled trial has shown that practice of comprehensive yogic breathing program significantly improves physical, psychological, and social domains, and total quality of life.^[46] Other studies have also shown increased feeling of well-being with practice of yoga.^[11,34,47]

Evidence of mechanism of action of yoga

Apart from the above-discussed mechanisms, other ways by which yoga affects mind-body system have been explored. Sudarshan Kriya yoga and Pranayam program have been found to have a rapid and significantly greater effect on gene expression in peripheral blood mononuclear cells compared with the control regimen, which constituted nature walk and relaxing music.^[48] This suggests that yoga and related practices result in rapid gene expression alterations, which may be the basis for their longer-term health effects.

Evidence for prevention of prediabetes

Lifestyle modification is the most effective, cheaper and safer approach to type 2 diabetes prevention.^[8-11]

Studies^[13,38,49] indicate that a yoga program would be a possible risk reduction option for adults at high risk for type 2 diabetes. 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, we 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.

Lessons learnt for future research

The challenges faced in the previous studies have been in recruitment; practical issues for class attendance; physical barriers for engaging in the exercises; motivation issues, inadequate intensity, and/or duration of yoga intervention; and insufficient personalization of exercises to individual needs. Though community-based studies are found feasible, not only in India but abroad as

well, these factors should be considered when designing future trials.^[50]

CONCLUSION

In a review on prevention of diabetes in developing countries,^[51] it was noted that programs adapted to their specific needs are lacking. Low-cost strategies to identify at-risk individuals, followed by the implementation of group-based, inexpensive lifestyle interventions, seem to be the best options. Widespread implementation of type 2 prevention in developing countries will require coordinated efforts throughout society, along with comprehensive government policies and novel funding sources.

Yoga is being tried for its benefit not only in India^[52] where it is traditionally familiar but in US, UK and Australia as well. In view of the benefits it has shown in short-term studies, long-term studies with support for yoga practice and follow-up are required and this requires a collective effort on the part of the researcher, government, society, and the funding agency.

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