

Short Communication

Decreased rate pressure product by yoga therapy in the first-degree relatives of type 2 diabetics is linked to the decrease in body mass index

Gopal Krushna Pal, Pravati Pal, Jagadeeswaran Indumathy, Balasubramanian Suchitra, Allampalli Sirisha

Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Abstract

Although cardiovascular (CV) risks are reported in the first-degree relatives (FDRs) of type 2 diabetics, the role of yoga therapy on these CV risks is not known. We investigated the effects of 12 weeks structured yoga therapy on rate pressure product (RPP), the marker of CV risk, in these high-risk subjects. FDRs of type 2 diabetics ($n = 49$) were trained and allowed to practice 12 weeks of structured yoga program. Body mass index (BMI), heart rate (HR), blood pressure (BP), and RPP were measured, and all these parameters were recorded and compared between pre- and post-yoga therapy periods. Bivariate logistic regression was performed to assess the contribution of BMI to change in RPP in these subjects. There was significant reduction in BMI ($P = 0.0002$), HR, BP, and RPP ($P < 0.001$) in these subjects. Bivariate logistic regression demonstrated independent more significant contribution of BMI to RPP in postyoga therapy period as compared to pre-yoga therapy period. It was concluded that FDRs of type 2 diabetics have high RPP and BP that decrease significantly following 12 weeks practice of yoga.

Key words: Body mass index, cardiovascular risks, first-degree relatives of type 2 diabetics, rate pressure product, yoga therapy

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INTRODUCTION

Indian population has been reported to be exceptionally predisposed to develop diabetes because of strong familial predisposition and abrupt change in lifestyle.^[1] India has been declared as the diabetic capital of the world.^[2,3] Recently, it has been witnessed that the cardiovascular disease (CVD) and diabetes in developing countries are quite prevalent in the younger population, which could have severe economic implications.^[4] Diabetes contributes to the high risk of CVD and the risk for CVD,^[4] and therefore, early detection and treatment of diabetes and CVD, especially in younger population, are the main health policies worldwide.^[5] The screening for diabetes and CVD risk in high-risk population is among the major strategies to achieve this goal.^[6] The first-degree relatives (FDRs) of diabetic patients have been identified to have higher risk of

developing diabetes compared to the general population.^[7] Further, reports have confirmed increased CV risks and prevalence of CVD in this high-risk population.^[8,9]

Increase in rate pressure product (RPP) is reported to be an indicator of CV risk.^[10] Recently, we have reported that increased CV risk in FDR of type 2 diabetics is linked to autonomic imbalance, retrograde inflammation, and oxidative stress.^[11-13] We have also reported that practice of yoga decreases blood pressure (BP) and CV risks.^[14,15] Therefore, in the present study, we have assessed the effects of structured yoga therapy on RPP in FDR of type 2 diabetics.

Address for correspondence: Dr. Gopal Krushna Pal, Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry - 605 006, India. E-mail: drgkpal@gmail.com

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MATERIALS AND METHODS

In this cross-sectional blinded study, volunteers who participated in the study were not aware of which group they belonged to during the study as the grouping was done after compiling the family history of diabetes. After obtaining the approval from the Research Council and Institutional Ethics Committee of Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India, out of 176 subjects, 49 subjects who had the family history of type 2 diabetes mellitus were recruited from undergraduate and postgraduate courses of JIPMER of 2012–2013 batch. The FDR of type 2 diabetics was defined as the subject having either of the parents or siblings diagnosed to have type 2 diabetes mellitus for at least 1 year and receiving treatment for the same. This was done through questionnaires and interview.

Healthy subjects (subjects without illness) were included in the study. Subjects receiving any medication, subjects with history of diabetes, smoking, and hypertension, and hypertensive patients receiving medication were excluded from the study. As the level of physical fitness is a major determinant of vagal tone,^[16] subjects performing regular physical exercises were excluded from the study.

Recording of anthropometric and basal cardiovascular parameters

Written informed consent was obtained from all the participants before the commencement of the study procedures. Subjects were asked to report to Autonomic Function Testing (AFT) Laboratory of Physiology Department at about 9 AM following a light breakfast, without tea or coffee. After obtaining the written informed consent, their age, height, and body weight were recorded and body mass index (BMI) was calculated. The temperature of AFT laboratory was maintained at 25°C for all the recordings. Omron (SEM 1 Model) automatic BP monitor (Omron Healthcare Co. Ltd, Kyoto, Japan) was used for systolic BP (SBP), diastolic BP (DBP), and basal heart rate (BHR) recordings, and the mean arterial pressure was calculated. RPP was calculated using the formula, $RPP = SBP \times HR \times 10^{-2}$.^[10]

Yoga therapy

All the subjects were allowed to practice the following yoga module for CVD risks as practiced at Advance Yoga Center of JIPMER.

Loosening practices (2 min)

- Shoulder joint rotation
- Elbow extension and flexion
- Elbow supination and pronation

- Wrist joints extension and flexion
- Knee joints extension and flexion.

Asana (3 min)

- Tadasana
- Makarasana
- Bhujangasana.

Pranayama (30 min)

- Sukha pranayama
- Nadi shodhana pranayama
- Chandranadi pranayama
- Ujjayi pranayama
- Bhramari pranayama
- Sitkari pranayama.

Meditation (4 min)

- Pranava dhyana (A-U-M).

Relaxation (6 min)

- Savasana
- Yoga-nidra.

After 12 weeks of yoga practice, all variables were recorded and were compared and analyzed with the pre-yoga recordings.

RESULTS

Following 12 weeks of yoga therapy, there was significant reduction in BMI ($P = 0.0002$) in FDR of type 2 diabetics [Table 1]. In addition, there was significant reduction ($P < 0.0001$) in HR, SBP, DBP, and RPP among these subjects. Bivariate logistic regression demonstrated independent contribution of BMI to RPP, which was more significant in post-yoga therapy as compared to pre-yoga therapy period [Table 2].

Table 1: Age, body mass index, and cardiovascular parameters of the first-degree relatives of type 2 diabetics ($n=49$) before and after yoga therapy

Parameters	Before yoga	After yoga	P
Age (years)	18.92±1.571	NA	
BMI (kg/m ²)	26.85±4.64	23.56±3.70	0.0002
Cardiovascular parameters			
Heart rate (beats/min)	77.83±11.39	68.36±8.11	<0.0001
Systolic blood pressure (mmHg)	129.85±10.20	110.15±10.06	<0.0001
Diastolic blood pressure (mmHg)	85.91±8.65	69.13±5.62	<0.0001
Mean arterial pressure (mmHg)	100.50±9.78	82.82±8.50	<0.0001
Rate pressure product (mmHg/min)	101.10±10.15	76.10±8.95	<0.0001

$P < 0.05$ considered statistically significant. NA: Not available, BMI: Body mass index

Table 2: Bivariate logistic regression analysis of body mass index (as dependent variable) with rate pressure product (as independent variables) in the first-degree relatives of type 2 diabetics before and after yoga therapy

	Before yoga		After yoga	
	OR (95% CI)	P	OR (95% CI)	P
RPP	2.14 (1.105-4.560)	0.039	2.90 (1.750-7.962)	0.007

$P < 0.05$ considered statistically significant. OR: Odds ratio, RPP: Rate pressure product, CI: Confidence interval

DISCUSSION

RPP is a measure of myocardial workload and oxygen consumption, and increased RPP has been documented a CV risk.^[10] In the present study, RPP was significantly decreased after 12 weeks yoga therapy compared to the pre-yoga therapy values [Table 1], indicating that 12 weeks yoga therapy is helpful in decreasing CV risks in these subjects. Obesity has been reported to be more prevalent in individuals with family history of diabetes.^[17] In the present study, BMI was significantly high in FDR of type 2 diabetics before the practice of yoga, and obesity *per se* is a CV risk factor. The BMI was decreased significantly after 12 weeks of practice of yoga. Therefore, we assessed the independent association of RPP with BMI by logistic regression [Table 2], and we found significant association of RPP with decreased BMI. Thus, it appears that BMI contributes to RPP in FDR of type 2 diabetics and decrease in BMI following yoga practice is linked to decrease in RPP in these subjects.

Resting HR is an index of vagal tone,^[18] and increased BHR has recently been reported to be associated with increased CV risks.^[19] In FDR of diabetic patients, heart and BP parameters were significantly reduced after yoga therapy for 12 weeks, further establishing the evidence of decreased CV risks. The present study is the first of its kind to report decreased CV risks in FDR of diabetic patients following 12 weeks of structured yoga practice. The subjects of our study belonged to the younger age group. Decreased obesity, BP, and CV risks among these subjects following yoga therapy unravel the promising nonpharmacological method of improving CV health of this population. Further study should be conducted to assess the details of other markers of CV risks and molecular and metabolic mechanisms of decrease in CV risks in these subjects. Limitation of the study is that we have not taken an age- and BMI-matched control group for comparison of these improvements in normal healthy population.

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Conflicts of interest

There are no conflicts of interest.

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