

Original Research Article

Effect of raja yoga meditation on glycaemic status in type 2 diabetes mellitus

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ABSTRACT

Background: In this modern era stress is a commonly seen phenomenon. Stress affects physiological equilibrium leading to many pathologic conditions including endocrine disorders like diabetes mellitus. Physiological responses to stress including increased glucose production, glucose mobilisation and insulin resistance could partially mediate this risk. Meditation is a behavioural phenomenon which can be used to cause autonomic nervous system alterations and help in reducing stress and its effects.

Methods: In this cross-sectional study 60 patients of type 2 diabetes mellitus (T2DM) were divided into 2 groups, 30 patients who are practicing Raja yoga meditation for more than 5 years and their glycaemic status was compared with the glycaemic status of 30 patients of T2DM who did not practice any form of yogic meditation.

Results: Blood glucose level and glycated haemoglobin levels were significantly lower in yoga practitioners. Lipid profile showed significant reduction in total cholesterol and serum triglycerides.

Conclusions: Thus, a better glycaemic control is achieved with regular practice of Raja yoga meditation which helps in maintaining optimal level of autonomic equilibrium at rest as well as during exposure to stress.

Keywords: Glycaemic status, Lipid profile, Raja yoga meditation, Type 2 diabetes mellitus

INTRODUCTION

Type 2 diabetes (DM2) has become a leading public health issue globally, with estimated 366 million people affected in 2011.¹ This represents a more than twofold rise in the last three decades and parallels the growing pandemic of obesity and the increasingly widespread adoption of Western lifestyles.^{1,2} Worldwide prevalence is expected to continue rising in both industrialized and developing countries, with numbers projected to reach 552 million adults by 2030.¹⁻⁴ Data for the year 2007 showed highest number of DM patients were in India (40.9 million). Cardiovascular disease (CVD) is the primary cause of morbidity and mortality in those with

DM2, accounting for at least 65% of deaths in this population.⁵ DM2 is typified by hyperglycaemia in the presence of insulin resistance.⁶ Other key related hemodynamic and metabolic abnormalities characterizing DM2 include elevated blood pressure, dyslipidemia, and chronic inflammation, as well as hypercoagulation and increased oxidative stress.⁶ Lifestyle factors, particularly, physical inactivity, overnutrition, and related obesity, are thought to be primarily responsible for the current global diabetes epidemic.¹ Other contributing lifestyle-related factors include chronic stress, impaired sleep, and smoking. In fact, lifestyle factors may account for 90% of incident diabetes cases and are significant predictors of DM2-related complications and mortality.² Thus, a

central element of DM2 care is lifestyle management, which is considered critical to the prevention of acute complications and the reduction of risk for long term complications.⁶

A central goal in DM2 management is the reduction of blood glucose levels, which has been shown to reduce risk of microvascular and possibly certain other complications.^{3,5,6} However, while improving glycaemic control remains a priority, the critical importance of multifactorial DM2 management has been increasingly emphasized in recent years.^{3,6} In particular, reducing CVD risk factors is crucial to effective DM management. Additional goals include reducing DM-related distress, alleviating depression, and enhancing emotional well-being and quality of life, factors that are important predictors of glycaemic control, complication rates, treatment adherence, and other outcomes.⁶

In light of the above, identifying sustainable lifestyle interventions with the potential to improve multiple factors of relevance to the management of this complex illness is of clear importance. Mind-body practices such as yoga, which capitalize on the ability of the mind to enhance physical health (and vice versa), appear particularly suited for addressing multifactorial conditions. Yoga is a traditional mind-body system originating in India over 4000 years ago.⁷

In recent decades, the practice of yoga has been rising in both developed and developing countries worldwide, and the field of yoga therapy is now growing rapidly. The goals of yoga, a Sanskrit term meaning “yoke or union,” do not center primarily on physical fitness, but rather on integration of mind, body, and spirit, cultivation of balance, calm, harmony, and awareness, and, in classic yoga traditions, the attainment of selflessness and spiritual enlightenment.^{8,9} Of the several major branches of yoga, the most widely practiced forms include Raja (royal or classical) yoga and the closely related Hatha yoga, sometimes known as the yoga of activity.^{8,9}

A growing body of evidence suggests yoga practice may reduce risk for CVD and lead to improvements in physical health and well-being in a range of populations, potentially including those with DM2.¹⁰ The present study endeavours to outline the effects of practice of Raja yoga meditation in obtaining glycaemic control and correcting dyslipidemia in T2DM patients.

METHODS

The present study was carried out in Department of Physiology. After approval from institutional ethics committee written informed consent was obtained from all the participants of the study. The sample size was calculated to be 30 for each group keeping 5% alpha error and 80% power. Sixty patients of T2DM, 40-60 years of age were selected for the study. Thirty ages matched non-diabetic subjects served as controls. The T2DM patients were divided equally into 2 groups as nonmeditators and meditators.

All patients were diagnosed as T2DM for more than 5 years. Meditators practiced Raja yoga meditation for 1 hour daily for more than 5 years. Exclusion criteria were: age outside the specified range, pregnant women, athletes and sports persons, smokers, alcoholics, T1DM patients, patients with complications of DM.

All participants belonged to the same community and had similar dietary habits and working conditions. The participants were asked to remain fasting for 10-12 hours and report to department of physiology at 9a.m. After detailed history and clinical examination anthropometric parameters were recorded. Fasting blood sample was collected. Post prandial blood sample was collected 2 hours after meal on the same day.

Fasting blood sugar (FBS) and postprandial blood sugar (PPBS) was quantitatively estimated using semiauto analyzer (Transasia, ERBA, Chem-5 plus). Lipid profile was done on fasting blood sample on same auto analyzer using kits. For total cholesterol and triglyceride Accurex Biomedical Pvt. Ltd Thane and for HDL-C and LDL-C Aspen laboratories Pvt. Ltd. New Delhi. Mean and Std. deviation was calculated using SPSS software. One-way analysis of variance was performed to find the significance between the means. In addition, Bonferroni test of multiple comparisons was used to identify pairs in which means were significantly different.

RESULTS

The differences in mean age, height and weight of all participants were not statistically significant. ($p > 0.05$) Table 1.

Table 1: Anthropometric parameters in controls and study groups (Mean±SD).

| Parameter | Group I (n=30) | Group II (n=30) | Group III (n=30) |
|--------------|----------------|-----------------|------------------|
| Age (Years) | 51.43±5.39 | 50.33±6.21 | 53.23±5.43 |
| Height (cms) | 157.71±6.20 | 158.58±6.68 | 157.16±6.20 |
| Weight (Kgs) | 64.16±7.22 | 66.06±11.00 | 66.16±9.77 |

The comparison of glycaemic status shown in Table 2. The mean values of FBS, PMBS was significantly higher in diabetics as compared to controls ($p<0.05$), but these values in yoga practitioners was significantly lower than

in non-practitioners ($p<0.05$). The mean glycosylated haemoglobin was also significantly lower in this group ($p<0.05$).

Table 2: Comparison of glycaemic status in controls and study groups (Mean±SD).

| Parameter | Group I (n=30) | Group II (n=30) | Group III (n=30) |
|--------------|----------------|-----------------|------------------|
| FBS (mg/dl) | 85.83±8.12 | 160.66±33.0 | 132.75±36.43 |
| PMBS (mg/dl) | 120.93±8.79 | 263.8±35.29 | 198.47±40.11 |
| GHb (%) | ---- | 8.13±0.82 | 7.2±2.00 |

The comparison of lipid profile is shown in Table 3. The mean values of TC, TG, VLDL-C, LDL-C were significantly higher in diabetic non-practitioners as compared to controls ($p<0.05$) but were not significantly different from controls in diabetic yoga practitioners ($p>0.05$). The mean HDL-C was significantly lower than

controls in all diabetics ($p<0.05$). On comparing the mean values of lipid profile in diabetic yoga practitioners and diabetic non-practitioners it was found that only TC and TG were significantly lower in yoga practitioners ($p<0.05$) and other parameters were statistically non-significant in both groups ($p<0.05$).

Table 3: Comparison of lipid profile in controls and study groups (Mean±SD).

| Parameters (mg/dl) | Group I (n=30) | Group II (n=30) | Group III (n=30) | P value I versus II | P value I versus III | P value II versus III |
|--------------------|----------------|-----------------|------------------|---------------------|----------------------|-----------------------|
| TC | 176.23±30.4 | 215.9±24.93 | 159.3±27.78 | 0.00 | 0.062 | 0.00 |
| TG | 145.9±36.7 | 172.03±42.07 | 147.5±37.85 | 0.033 | 1.00 | 0.040 |
| VLDL-C | 28.12±7.59 | 33.63±8.68 | 32.24±6.72 | 0.021 | 0.124 | 1.00 |
| HDL-C | 47.73±5.7 | 41.86±4.68 | 42.1±6.48 | 0.00 | 0.001 | 1.00 |
| LDL-C | 121.78±25.89 | 138.21±25.3 | 135.82±23.87 | 0.038 | 0.098 | 1.00 |

$p<0.05$ Significant, $p<0.01$ highly significant, $p<0.001$ very highly significant, $p>0.05$ non-significant.

DISCUSSION

Yoga-based practices may have significant beneficial effects on many factors important in DM2 management and prevention, including glycaemic control and lipid profiles. Raja yoga meditation is a superior form of meditation in which flow of thoughts is encouraged by using the mind in a natural way to relieve stress. Yoga practices can influence outcomes in those with and at risk for type 2 diabetes (DM2).

Yoga may lessen the negative impact of stress and promote multiple positive downstream effects on metabolic function, neuroendocrine status, and related inflammatory responses and, ultimately, reduce risk for CVD and other vascular complications, by enhancing well-being and reducing reactivity and activation of the HPA axis and the sympathoadrenal system.¹⁰ Even short term yoga training programs can reduce perceived stress, improve mood, and lower catecholamine and cortisol levels, cardiovascular response to stress, blood pressure,

and other indices of sympathetic activation in both healthy and adults with diabetes.^{10,11}

Yogic practices help to shift the autonomic nervous system balance from sympathetic to parasympathetic, by directly enhancing parasympathetic output, possibly via vagal stimulation, resulting in positive changes in cardiovagal function and associated neuroendocrine, hemodynamic, and inflammatory profiles, in sleep and affect, and in related downstream metabolic parameters.^{10,11}

Yoga promotes these favourable changes by selectively activating specific brain structures and neurochemical systems related to attention and positive affect, as suggested by recent neurophysiological and neuroimaging research findings.¹¹ Yoga may also increase resilience to stress, a factor that has been linked to improved outcomes in DM2.^{11,12} Yoga may indirectly benefit those with DM2 by encouraging improvements in health-related attitudes and lifestyle choices and by

providing a source of social support, a factor linked to improved diabetes self-care and clinical outcomes.^{12,13}

CONCLUSION

Several recent genomic investigations have shown that yogic meditative practices can slow cellular aging and induce beneficial epigenetic changes in pathways regulating inflammation, oxidative stress, energy metabolism, insulin secretion, mitochondrial function, and other related factors. These changes help to buffer the deleterious effects of stress, improve glucose control, enhance mood, sleep, and autonomic function, reduce blood pressure, and promote improvements in other related risk factors of relevance to DM2 management.¹¹⁻¹³

Thus, Raja yoga meditation can form an important supplementary therapy in conjunction with conventional therapeutic measures for T2DM.

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