



Effect of pranayama on blood glucose level in medical students: A case control study

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Abstract:

Introduction: While medical students are trained to improve the health of others, they often lose sight of their own. They are under constant physical and psychological stress due to strenuous medical programs. Stress disturbs the homeostatic mechanisms of the body and has damaging effects on various parameters of the body; one of the parameter is blood glucose. Pranayama is one of the stress relaxation technique which helps in maintaining the homeostasis. **Aim:** The objective of the present study is to study the effects of pranayama on blood glucose level in medical students. **Materials and Methods:** The case-control study was conducted on 60 medical students of 17-20 years of age from tertiary hospital for 8 weeks. Students were divided into two equal groups (Study group & Control group). Study group subjects practiced pranayama for 8 weeks whereas control group subjects were busy in their routine work. Blood glucose levels were measured before and after intervention period from all participants. All necessary ethical clearance & consents were taken from relevant authorities before conducting study. **Results:** Both fasting as well as post meal blood glucose levels were significantly reduced (p value <0.05) in subjects after practicing pranayama for 8 weeks, whereas in control group subjects changes were statistically non significant. **Conclusion:** Observations of the present study suggest that short term interventions like pranayama helps in reducing blood glucose level.

Keywords: Fasting blood glucose, Post meal blood glucose, Medical students, Stress

Introduction

Stress is a universal phenomenon. The chemical, physical, biological, instinctual, emotional and intellectual stressors cause stress. Most of the time stress is not perceived or identified but operates during embryological, sleeping or wakeful state at unconscious level. It is usually observed that medical students undergo tremendous stress during various stages of the MBBS course; Stress in medical students is common and is process oriented. Academic factors are greater perceived cause of stress in medical students at Seth G S medical college. Emotional factors are found to be significantly more in First MBBS. It is dependent on person's ways of coping and social support [1]. Medical students are constantly under various stressors such as isolation from the herd, change in habitat, change in type of food, irregular diet,

academic performance, self expectations, expectations from family and peers etc. All these stressors have adverse effects on ANS, pineal and hypothalamo-pituitary-adrenal axis which disturbs the homeostatic mechanisms of the body. This has damaging effects on various parameters of the body and one of the common parameter is blood glucose. It is observed that stress increases both short-term and long-term blood glucose levels and if it increases beyond the normal limits [2], then it can cause persistent high blood glucose levels resulting into diabetes mellitus. A yoga intervention may be effective in decreasing stress and improving general well-being in medical students [3]. There are various ways to reduce stress, one of them is pranayama. The word pranayama is derived from two Sanskrit words – Prana (life force) and Ayama (control), in simple

words pranayama is the art of controlled breathing. However there are variations in different types of pranayama. Pranayama in general is thought to harmonize the activity of reticular activating system and skeletal muscle control. It is thought to influence the autonomic centers, limbic system and pineal gland beneficially and re-establish proper functioning of target organ systems. Thus different types of pranayama are expected to improve regulation of blood glucose metabolism in diabetes mellitus, altered glucose tolerance (which may be subclinical) and also normal blood glucose values. Hence in the present study, an attempt has been made to evaluate the effect of pranayama (Kapalbhati, Anulom Vilom, Bhramari and Udgeeth) on fasting and post meal blood glucose levels of medical students.

Materials and Methods

Study Participants: The present case-control study was conducted in Dept of Physiology at Seth G S Medical College Mumbai. Study participants were medical students of age group 17 to 20 years. 60 medical students were recruited in the study for a period of 8 weeks. The volunteers were first explained about the purpose and usefulness of the study and they were selected according to preset criteria for selection. The permission to conduct the said study was taken from the institutional ethical committee and written informed consent was obtained from each study participant. **Study Design:** Study participants were divided into two equal groups. Each group consists of 30 subjects (19 male and 11 female). Both male and female medical students who have given the written informed consent were included in this study. Volunteers who had not been engaged in yoga practice at least during 3 years preceding the study as assessed by enquiring in detail were included in the study. Participants having family history of diabetes mellitus, cardio-respiratory problems such as valvular heart disease, asthma, participants suffering from hernia or who has undergone any surgery were excluded from the study. Participants with a history of respiratory tract infection symptoms during previous 6 weeks and subjects suggestive of any active respiratory disorder were excluded by thorough history and clinical examination. Detailed medical history and physical examination was done as per proforma. Each participant was given the questionnaire regarding the stress. Fasting blood glucose and post meal blood glucose levels were measured from each of 60 participants before the start of the study. Each individual from the study group was explained about the procedure of pranayama (Kapalbhati pranayama,

Anulom Vilom pranayama, Bhramari pranayama and Udgeeth pranayama) in detail and sufficient trials were given for proper understanding. The above set of pranayama was practiced by study group subjects for 30 min daily and for a period of 8 weeks. Iyengar yoga techniques were followed by the yoga trainers [4]. No exercises were given to the control group.

Assessment: The parameters evaluated in the present study are Fasting and Post meal blood glucose level. The blood glucose levels were measured from all 60 participants both before commencement of the study and also after the yogic intervention is over. The blood glucose levels were measured by Digital Glucometer (ACCU-CHEK, Sr no-GN20606850 manufactured by Roche Diagnostics India Pvt. Ltd, Mumbai).

Statistical analysis:

The statistical calculations were done using Data Analysis tool of Microsoft Excel and Systat 12 (Systat Software, Inc. Chicago). The statistical significance was considered at probability value less than 0.05.

Results

Both study and control group contain 30 students each with age group of 17-20 years. They were matched for gender distribution. Both these groups consisted of 36.7% female (11) and 63.3% male (19) students. Mean fasting blood glucose level (mg %) before practicing pranayama in study group was 88.8 ± 11 while that in control group was 90.4 ± 13.0 whereas mean post meal blood glucose level was 118.4 ± 12.2 and 118.1 ± 14.8 in study and control groups respectively. Readings of fasting and post meal blood glucose level before intervention in control and study group were compared by using Student 't' test. It was statistically not significant (p value = 0.617) as shown in table 1.

Table 1: Blood glucose levels before practicing pranayama

Blood Glucose level	Study group	Control group	P value
Fasting blood glucose	88.8 ± 11.0	90.4 ± 13	0.617 (Non significant)
Post-meal blood glucose	118.4 ± 12.2	118.1 ± 14.8	0.924 (Non significant)

Values are expressed as mean \pm SD. * $P < 0.05$.

Study group was found to have significant decline in fasting and post meal blood glucose level compared to controls after practicing pranayama as shown in table 2.($P < 0.05$)

Table 2: Blood glucose levels after practicing pranayama

Blood Glucose level	Study group	Control group	P value
Fasting blood glucose	83.4 ± 9.5	91.0 ± 11.4	0.007* (Significant)
Post meal blood glucose	110.3 ± 9.4	118.3 ± 12.2	0.006* (Significant)

Values are expressed as mean ± SD. * $P < 0.05$.

Discussion

The blood glucose level reflect the efficiency of homeostatic activity. Homeostasis is influenced by the internal and external environment. The effect of this influence depends upon the genotype and phenotype (i.e. constitution) of an individual. Hence the interaction or transaction between the individual and environment is called as stress and determines the outcome. Hence stress management means any activity or procedure or efforts to make the environment individual friendly (i.e. within the reach of physiological tolerance) and improving the ability of individual to cope up with the environment. Pranayama is one of the techniques to improve the ability of individual to manage (i.e. overcome) stress. In the present study both fasting as well as post-prandial blood glucose levels were significantly improved (p value < 0.05) in the study group practicing pranayama whereas there is no significant improvement (p value > 0.05) in fasting and post-prandial blood glucose level in control group not practicing pranayama. Beneficial effects of yoga and pranayama on fasting as well as post-prandial blood glucose levels are well documented [5-11]. However most of these studies are done on patients of known diseases, but there is very few data available on the effect of pranayama on blood glucose levels in healthy subjects. The results of present study are comparable with that of Sahay BK [9]. They assessed the effect of pranayama on blood glucose level in 50 normal individuals and found that there is significant fall in the blood sugar level. The findings of our study are comparable with that of Bijlani et al [12]. 98 subjects from a heterogeneous group of subjects

were studied for 8-day lifestyle modification programs based on yoga for prevention and management of chronic disease. They found that the fasting blood sugar level were significantly lower after the intervention. The observations suggest that a short lifestyle modification and stress management education program leads to favorable metabolic effects within a period of 9 days. Manjunatha S et al [13] studied the effect of four sets of asanas in random order for 5 consecutive days and observed that the performance of asanas led to increased sensitivity of B cells of the pancreas to the glucose signal. They proposed that this increased sensitivity is likely to be a sustained change resulting from a progressive long-term effect of asanas. It was also found that brief yoga-based relaxation training normalizes the function of the autonomic nervous system by deviating both sympathetic and parasympathetic indices toward more “normal” middle region of the reference values [14]. Numerous studies have shown yoga to have an immediate down-regulating effect on both the HPA axis responses to stress. Effectiveness of yoga against stress management is well established [15]. Systematic review of 32 articles published between 1980 and 2007 found that yoga interventions are generally effective in reducing body weight, blood pressure, glucose level and high cholesterol [16].

Conclusion

From results obtained, we conclude that short term intervention of yogic exercises (pranayama) helps in reducing the stress in medical students reflected by improvement in both fasting and post meal blood glucose level.

Limitations of study

The present study has some limitations. The low proportion of female subjects meant that we could not make exact comparisons between male and female. The exact glycemic status of participants was not known. The participants were not on strict and uniform diet plan which may influence the study results. Readings were not taken during different intervals of study duration which may influence the study results.

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