

Original Research Article

Yoga is an effective technique of stress reduction within the medical population: a biochemical study in MBBS students of BRD Medical College, Gorakhpur, Uttar Pradesh, India

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ABSTRACT

Background: Medicine is a profession with high-stress prevalence. There are many stress markers but cortisol is one of the commonly used stress marker. Stress begins in the first year of medical carrier and increases with subsequent years of medical education. There is a decrease in overall academic performance and many health-related adverse effects due to stress. In this study, yoga was performed in the first year MBBS students of BRD Medical College, Gorakhpur and the impact of yoga in stress reduction was studied using serum cortisol as stress a marker.

Methods: Study groups, yoga and control contained 26 and 27 subjects including male and female MBBS students. Yoga group practiced selected yogic asana, pranayama, and yoga nidra for 3 months. The control group as a stress marker had been kept in touch and allowed to go on their usual activity as before. Morning (8.00 AM to 9.00 AM) serum cortisol level was used as a stress marker in both group, pre and post-study.

Results: There was a significant reduction in morning serum cortisol level (stress level) in yoga group (p-value = 0.0271) but there was no significant change in morning serum cortisol level of the control group (p-value = 0.8573).

Conclusions: Yoga is an effective stress reduction technique for medical students. Yoga classes should be introduced in the first year of the medical carrier under the supervision of expert physiologists. This may lead to the implantation of a healthy lifestyle in our future healthcare providers. Yogic practice by health care providers may have long term positive impacts on our healthcare system.

Keywords: Cortisol, Medical students, Stress, Yoga

INTRODUCTION

Stress is a mental status when an individual perceives that environmental demands exceed his or her adaptive capacity. Exposures to chronic stress are most likely to result in long-term or permanent changes in the emotional, physiological, and behavioral responses.¹ Exposure to intense and chronic stressors has long-lasting neurobiological effects. Chronic stress exposure puts one at increased risk for anxiety and mood disorders,

aggressive problems, hypo-immune dysfunction, medical morbidity, structural changes in the CNS, and early death.² A wealth of researches conducted worldwide shows that doctors have high rates of mental health problems. Suicide levels are also high for doctors, particularly female doctors. There appear to be high rates of mental health issues in young doctors. Recent studies in young doctors suggest that their own health care is poor. The doctors with addiction problems in later life tend to manifest vulnerabilities at medical school.³

Stress increases as MBBS students go in first to second and then subsequent years of study. So the first year of medical education is the beginning point of stressful medical carrier and it increases with time.⁴ Factors contributing to high levels of stress in medical colleges could be highly competitive curriculum, intense academic competition, and excessive demands on coping abilities in physical, intellectual, emotional, financial and social terms.⁵ Stress and anxiety along with substance abuse develop early and may increase with time in the medical carriers. Until and unless our students themselves practice health promotional measures, they are very less likely to guide and motivate their patients and the community to do so.⁶

There are many hormones used as stress markers. Stress hormones are produced by the sympathetic nervous system and the hypothalamic-pituitary-adrenocortical axis. The sympathetic nervous system stimulates the adrenal medulla to produce catecholamines and the paraventricular nucleus of the hypothalamus produces corticotropin-releasing factor (CRF), which in turn stimulates the pituitary to produce adrenocorticotropin. Adrenocorticotropin then stimulates the adrenal cortex to secrete cortisol.

Together catecholamines and cortisol increase available sources of energy by promoting lipolysis and the conversion of glycogen into glucose. Energy is then distributed to the organs that need it most. There is an increase in blood pressure and contraction of certain blood vessels while dilation of others depending on the demand of the concerned organ. Blood pressure is increased by either increasing myocardial contraction or increasing peripheral vasoconstriction.⁷

There is several well-known effects of yoga practice such as an enhanced sense of wellbeing, better physical endurance, as well as definite changes suggestive of stress reduction.⁸ Practicing yoga and meditation as a means to manage and relieve both acute and chronic stress helps individuals overcome stress and leads to increased quality of life in many populations. Yoga can increase relaxation and induce a balanced mental state and improves sleep quality and insomnia. Furthermore, participation in yoga classes improved self-reported quality-of-life as well as measures of physical function among an elderly population.⁹ Thus yoga can be a useful tool to reduce the stress among medical students and this reduction in stress may be evident by measurement of serum cortisol level. Thus this study will pave a path towards stress reduction techniques for future health care providers, what even now remains minimally touched issue.

METHODS

This study was conducted in the Yoga lab of Physiology Department, BRD Medical College, Gorakhpur for a period of 3 months between March and June 2016.

Inclusion criteria

- Willing to participate and continue the yoga practice.
- Physically able to do yoga practice.
- Normal health status

Exclusion criteria

- Practicing Yoga in past.
- History of medical conditions like stroke, seizure, vertigo, hypertension, coronary artery disease, congenital heart diseases, history of status asthmaticus, peptic ulcer disease, spondylitis, joint pain, disc prolapse, CSOM, hernia, physical inability to practice yoga, any other disease condition
- Any addiction (excluding nicotine).

First-year medical students were counseled and motivated for taking part in the study. Both yoga and control groups were informed about the study. Informed consent was taken on paper. Each participant was interviewed for health history and demographic details before the start of the study. The participants (N = 60, including male and female) were randomized into two groups (yoga group and control group) by the computer-generated list of random numbers. Randomization was done by an independent assistant with allocation concealment. There were 30 (20 Male and 10 Female) participants in the yoga group and 30 (19 Male and 11 Female) in the control group. The serum cortisol levels of both yoga and control groups were measured a day before the start of the study in the morning 8.00 AM. Yoga instructor taught yoga group a specific yoga module 1 hour/ day, 6 days a week for 3 months. Subjects in the control group received no specific intervention but kept in touch for final evaluation.

All participating medical students were assessed again at the end of 3 months by measuring morning serum cortisol level. Serum cortisol level was measured by chemiluminescent microparticle immunoassay (CMIA) on ARCHITECT i-system using ARCHITECT cortisol reagent kit (8D15) produced by Fisher Diagnostics USA and distributed by Abbott Laboratories USA. Evaluation of control and yoga group, pre and post-yoga morning serum cortisol level provide the biochemical support of change in stress level of subjects. There was 4 dropouts in yoga and 3 in the control group.

Data was collected in the form of mean±SD of morning serum cortisol level. Data of morning serum cortisol level was compared before and after yogic practices and analyzed using SPSS V-20. Data related to yoga and control groups were compared using t-test and p-value <0.05 was considered statistically significant. Graph Pad Prism V6 was used to prepare figures.

RESULTS

Higher serum cortisol level is associated with high-stress level. Table 1, Table 3 summarizes findings of yoga group in present study. Pre-study serum cortisol level in yoga group (N=26) was 13.76±4.69 µg/dl. Post-study (after 3 months of yogic practices) serum cortisol level in yoga group was 12.41±4.10 µg/dl. There was a 1.35 µg/dl (9.81%) decrease in the mean serum cortisol level of

yoga group. Thus there was an overall decreasing pattern in yoga group. Observed difference in yoga group was statistically significant (p-value = 0.0271). There were 69% (18) participants in yoga group where serum cortisol decreased from 15.20±4.70 µg/dl to 12.58±4.23 µg/dl (17.24% decrease) while in only 31% (8) participants of yoga group serum cortisol increased from 10.52±4.31 to 12.01±4.04 µg/dl (14.16% increase).

Table 1: Distribution of serum cortisol level (µg/ dl) in yoga group (N = 26).

Yoga group	Pre-study (mean±SD)	Post-study (mean±SD)	Percentage change in cortisol level
Total sample (N=26)	13.76±4.69	12.41±4.10	9.81% decrease
Decreasing pattern (N=18)	15.20±4.70	12.58±4.23	17.24% decrease
Increasing Pattern (N=8)	10.52±4.31	12.01±4.04	14.16% increase

Table 2: Distribution of serum cortisol level (µg/ dl) in control group ((N = 27).

Control group	Pre-study (mean±sd)	Post-study (mean±sd)	Percentage change in cortisol level
Total sample (n = 27)	13.01 ± 2.44	13.22 ± 2.50	1.61% increase
Decreasing pattern (n = 10)	14.80 ± 1.86	12.03 ± 2.16	18.72% decrease
Increasing pattern (n = 17)	11.95 ± 2.14	13.94 ± 2.47	16.65% increase

Table 3: Pre and post study pattern of change in serum cortisol level in yoga and control group.

	Yoga group	Control group
Sample size	26 participants	27 participants
Decreasing pattern	69% participants (n = 18)	31% participants (n = 10)
Increasing pattern	37% participants (n = 8)	63% participants (n = 17)
Overall change in cortisol level	9.81 % decrease (p value = 0.0271)	1.61 % increase (p value = 0.8573)

Table 2, Table 3 summarizes findings of control group in present study. Pre-study serum cortisol level in control group (N = 27) was 13.01±2.44 µg/dl. Post-study (after 3 months of their regular life) serum cortisol level in control group was 13.22±2.50 µg/dl.

There was a 0.21 µg/dl (1.61%) increase in mean serum cortisol level of control group. Thus there was an overall increasing pattern in control group. Observed difference in control group was not statistically significant (p-value = 0.8573). There were 37% (10) participants in control group where serum cortisol decreased from 14.80±1.86 to 12.03±2.16 µg/dl (18.72% decrease) and in 63% (17) participants of control group serum cortisol increased from 11.95±2.14 to 13.94±2.47 µg/dl (16.65% increase).

Tables 1, 2, 3 summarize the overall findings of the present study. Thus it is clear that there were more

participants (69%) in the yoga group as compared to the control group (37%) where cortisol levels decreased. There were only 31% of participants in the yoga group where cortisol levels increased while cortisol level increased in 63% of participants in the control group. Overall there was a statistically significant decrease in serum cortisol level (p-value = 0.0271) in the yoga group while the observed difference in the control group was not statistically significant (p-value = 0.8573).

DISCUSSION

Potey GG et al, studied the effect of yoga on serum cortisol level in medical students. They found in their study that Regular practice of yoga for 3 months significantly reduced the cortisol level.¹⁰ A study conducted by Zivdar Z et al, results of this study indicated that yoga training significantly reduced the plasma cortisol level.¹¹ In a study conducted by Thirthalli J. et al they concluded that yoga decreases the cortisol level in patients of depression and thereby stress. Yoga may act at the level of the hypothalamus by its 'anti-stress' effects and reduces the cortisol.¹² Messripour M. et al, concluded in their one study involving young Iranian women that yoga decreases serum cortisol level.¹³

Lin SL et al, found that yoga decreases work related stress in mental health professionals in his weekly yoga program of 12 weeks.¹⁴ Similarly in 2015 Oron G, et al concluded in his study that yoga decreases stress in women waiting for IVF.¹⁵ Multiple studies conducted in

different population by different researchers like Serpa JG. et al, Gard T. et al, Brown RP. et al proved the efficacy of yoga practices in stress reduction.¹⁶⁻¹⁸

Emotions, mood, anxiety, stress, and fear can all alter ANS output. The autonomic nervous system is activated mainly by centers located in the spinal cord, brain stem, hypothalamus, and limbic cortex.¹⁹ Hypothalamus coordinates autonomic function with many physiological variables like feeding, thermoregulation, circadian rhythms, water balance, emotions, sexual drive, reproduction, motivation, etc. Thus hypothalamus plays a dominant role in the integration of higher cortical and limbic systems with autonomic control. So the hypothalamus is the major integrative center for stress response. Suppression of the HPA axis at the hypothalamic level may be the key effect of yoga in the case of perceived stress.^{20, 21}

Strength

All subjects of the study were staying within the hostels of college. They all were 1st-year MBBS students with an age range between 18 to 22 years. Subjects with any confounding factor were not included in the study. The study was started almost after 6 months of their entry into medical college, thereby in equilibrium with medical college life. Thus, all subjects were almost similar and were facing similar social and academic stress within college premises.

Limitation of the study was the sample size and duration of the study were small. The cortisol level was measured only at the start and end of the study, so the trend of change during study cannot be predicted.

CONCLUSION

Stress is very common in the medical professionals. As stress adversely affects the work outcome, so medical professional needs some basic stress reduction techniques. Here in this study, there was a significant decrease in serum cortisol level in the yoga group; it concludes that yoga may be instituted as basic stress reduction techniques in health care professionals.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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