

Effect of Simplified Kundalini Yoga practices on Haematological and Hormonal variables among medical Students

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ABSTRACT: Stress can have a bad impact on one's physical and mental health, causing unpleasant symptoms including headaches, anxiety, and despair. A curriculum that supports a student's total wellness, encompassing their mental, physical, social, and moral qualities, is thought to be essential. Such a strategy is anticipated to have positive outcomes over the course of their career. The purpose of the study was to find out the effect of simplified kundalini yoga practices on haematological and hormonal variables among medical students of a tertiary care setting. After taking necessary ethical committee permissions from an institution of a tertiary care setting, 120 students were chosen through purposive sampling method and were divided into two 60-membered groups. All the students who accepted to be a part of this study aged greater than 18 years were included in the study. Those who denied consent to be a part of this study were excluded from the study. Simplified Kundalini Yoga (SKY) included Simplified Physical Exercises, Kayakalpa Yoga Exercises, Simplified Kundalini Meditation and Introspection. The subjects were free to withdraw their consent in case of feeling any discomfort during the period of their participation but there was no dropout during the study. 53.33% (n=32) of the study participants in the yoga group constituted females, whereas 55% of the control group (n=33) were females. 73.33% (n=44) of the yoga group participants were in the age group of 20-21 years, whereas 68.33% of the control group participants were in the age group of 20-21 years. The study results indicate that SKY program could be a feasible and acceptable strategy among the students of both medical and non-medical background in maintaining the overall health.

Keywords: Kundalini Yoga, Haematological variables, Hormonal variables.

INTRODUCTION

Globally, the prevalence of psychological stress among both medical and non-medical students have been increasing. Stress can have a bad impact on one's physical and mental health, causing unpleasant symptoms including headaches, anxiety, and despair (Eva *et al.*, 2015). However, stress is a complex phenomenon that requires a multifaceted response. The hypothalamic-pituitary-adrenal axis (HPA) and the autonomic nerve system (ANS) are the two main branches that make up the physiological response to stress (Smith *et al.*, 2006). Adrenergic hormones are released right away by the sympathetic nervous system portion of the ANS. The HPA axis facilitates a delayed response that is sustained over time by secreting glucocorticoids as cortisol (Herman *et al.*, 2016). It has been established that cortisol and adrenergic hormones are accurate indicators of the functioning of the stress-related physiological systems. A curriculum that supports a student's total wellness, encompassing their mental, physical, social, and moral qualities, is thought

to be essential. Such a strategy is anticipated to have positive outcomes over the course of their career (Muradyan *et al.*, 2022). Yogiraj Vethathiri Maharishi developed Simplified Kundalini Yoga (SKY), a physical, mental, and spiritual discipline, to help people build strength, awareness, character, and consciousness (Vethathiri Maharishi, 2012). Simplified Kundalini Yoga consists of Introspection, Kayakalpa Yoga Exercises, Simplified Kundalini Meditation, and Simplified Physical Exercises. The benefit of performing easy workouts on a daily basis is that every body part, from head to toe, becomes healthy (Garcia-Sesnich *et al.*, 2017). The endocrine glands' functioning is in harmony, which improves both physical and mental wellness. The progressive eradication of diseases is accomplished by raising immunity by immune enhancing exercises like these.

Stress is a natural human response to physical and mental adversities or difficulties. Most people experience various degrees of stress during their lifetime. However, the response to stress decides a person's overall well-being and state of happiness.

Excessive stress causes physical and mental illness. Stress in a person may present as altered emotional status, anxiety, irritability, difficulty to concentrating, sadness, and depression, among others. Although stress appears to be a common phenomenon in the modern day, it appears to be increasingly affecting students pursuing professional degrees like the Bachelor of Medicine and Bachelor of Surgery (MBBS). In a recent study among medical students who were assessed based on the perceived stress scale, it was observed that more than 96% of them suffered from moderate to severe stress. Interestingly, this study and a recent one from Syria noticed that the stress trigger was mostly academic nature than other factors like environment, and pandemic (Al-Rouq *et al.*, 2022; Al Hour *et al.*, 2023). Severe stress levels were noticed in 25% of medical students as reported by a Saudi Arabian study. Additionally, female gender and physical health were found associated with stress among medical students (Abdulghani *et al.*, 2011).

Management of stress appears to be an integral part of education and practice of medicine as observed by a recent suggestion to integrate undergraduate medical education with yoga. This was inevitable since prolonged stress could predispose medical professionals to burnout and dissatisfaction (Pitta *et al.*, 2022). Meditation, yoga, and pranayama were found to be increasingly effective in alleviating stress among medical students. Additionally, meditation was comparatively more effective than yoga and pranayama in controlling stress among medical students (Sunita, *et al.*, 2022). A recent study that assessed the role of stress and its relationship with the performance of medical students in the United States medical schools recommended the integration of yoga with the course of study (Horiuchi, *et al.*, 2022). Reduction in the levels of stress was noticed among the students pursuing professional courses like the Doctor of Pharmacy program after a non-pharmacological six-week yoga and meditation activity (Lemay, *et al.*, 2019).

Students who suffer from stress could be predisposed to an increase in the concentration of white blood cells and a decrease in red blood cell counts. The mechanism behind such haematological abnormalities is the release of reactive oxygen species causing oxidative stress. Oxidative stress could harm the whole body including the brain and gastrointestinal tract. Additionally, it was noted that stress could impact the brain-gut axis and gut-brain axis (Al-Hatamleh, *et al.*, 2017). Not only mental stress, but even physical stress was also responsible for the development of hematological abnormalities. In previous research among bakers who were exposed constantly to heat, it was observed that stress markers like malondialdehyde (MDA), nitric oxide (NO), total antioxidant capacity (TAC) were influencing the hematological parameters like mean cell volume (MCV), white blood cell (WBC) count, mean cell hemoglobin concentration (MCHC), red blood cell (RBC) count, WBC count, lymphocyte counts, hemoglobin concentration, and platelet counts (Gharibi *et al.*, 2020; Al-Otaibi *et al.*, 2022).

The potential mechanism behind the cause of haematological disorders during stress can be depicted in Fig. 1.

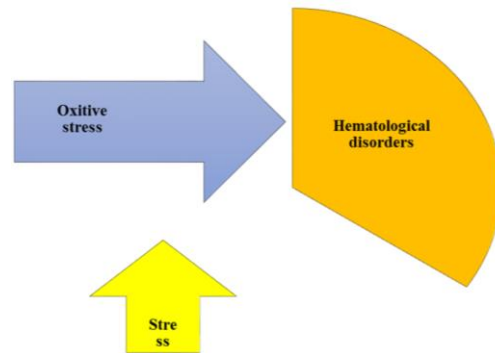


Fig. 1. The mechanism involved in the development of haematological disorders.

The purpose of the study was to find out the effect of simplified kundalini yoga practices on haematological and hormonal variables among medical and non-medical students of a tertiary care setting.

MATERIALS AND METHODS

This study has been undertaken as quasi-experimental research, wherein 120 medical and non-medical students were divided randomly into two groups, one experimental and one control group and studied prospectively. After taking necessary ethical committee permissions from an institution of a tertiary care setting, 120 students were chosen through purposive sampling method and were divided into two 60-membered groups. All the students who accepted to be a part of this study aged greater than 18 years were included in the study. Those who denied consent to be a part of this study were excluded from the study. Simplified Kundalini Yoga included Simplified Physical Exercises, Kayakalpa Yoga Exercises, Simplified Kundalini Meditation and Introspection. The sixty members to whom the SKY intervention was given, were termed as test group and in the other sixty members where there is no intervention given were termed as control group. Pre-test was conducted by collected the parameters including physiological components like body mass index (BMI), heart rate and blood pressure, haematological components like haemoglobin, complete blood cell count, erythrocyte sedimentation rate, lipid profile, blood sugar, and HbA1C, selected hormonal component including serum cortisol hormone level. The experimental group had undergone the training program under the supervision of the investigator. The subjects have been carefully monitored and questioned about their health status throughout the training period. The control group were not given any treatment apart from their regular routine. Further, all the participants have been instructed neither to change their life style nor to change their dietary intake for the entire duration of the training.

Regularity has been monitored by the research personnel both by checking attendance (yoga monitoring sheet) and follow-up calls. The SKY training was given for seven days to the test group. After training, SKY was practiced as two sessions a

day, for 60 minutes in the morning and 35 minutes in the evening. The SKY practice was done for six days per week, totally for a period of 4 weeks. After the four weeks of yoga practice, post-test has been conducted by recording physiological components like BMI, heart rate and blood pressure, haematological components like haemoglobin, complete blood cell count, erythrocyte sedimentation rate, lipid profile, blood sugar, and HbA1C, and selected hormonal component, serum cortisol hormone level. All these tested parameters were recorded and entered into Microsoft Excel for further analysis.

Statistical Analysis. The categorical data like the demographic variables were presented in frequencies with their percentages. The haematological, hormonal and sociological variables were given in mean and standard deviation. Similarity of the demographic distribution among the test and control was assessed by Chi square test. Quantitative variables difference between test and control group was assessed using Mann whitney U-test (non-parametric) and Student independent t-test (parametric). Qualitative variables difference between experiment and control was assessed using Chi square test. A p-value of ≤ 0.05 was considered statistically significant, and two-tailed tests will be used for testing the significance. Statistical analysis was carried out using the Statistical Package for Social Sciences IBM Corp. Released 2016. IBM

SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.

RESULTS

120 students of both medical and non-medical backgrounds were included in the study, where 60 students constituted the yoga group and 60 students constituted the control group. 53.33% (n=32) of the study participants in the yoga group constituted females, whereas 55% of the control group (n=33) were females. 73.33% (n=44) of the yoga group participants were in the age group of 20-21 years, whereas 68.33% of the control group participants were in the age group of 20-21 years (Table 1). The cholesterol levels decreased from 151.08 ± 1.03 to 127.08 ± 17.75 . In yoga group, a statistically significant difference between pre-test and post-test score was observed among the blood parameters like High Density Lipoprotein (HDL), Total Cholesterol, amylase and blood urea, which was calculated using student paired t- test (Table 2). There was no statistically significant difference among the blood parameters between pre-test and post-test score in the control group (Table 3). The cortisol levels have decreased from 17.06 ± 0.86 to 12.82 ± 0.79 in the yoga group after the yoga practise. There is a statistically significant difference (p value: 0.001) of cortisol levels between pre-test and post-test in the yoga group but it was not observed in the control group (Table 4).

Table 1: Sociodemographic variables of study participants.

Demographic variables		Group			
		Yoga group (n=60)		Control group (n=60)	
		N	%	N	%
Gender	Male	28	41.67%	27	45%
	Female	32	53.33%	33	55%
Age	19 years	9	15%	10	16.67%
	20 years	20	33.33%	19	31.67%
	21 years	24	40%	22	36.66%
	22 years	7	11.66%	9	15%
Course of Study	Medical	30	50%	30	50%
	Non-Medical	30	50%	30	50%
Year of study	First year	18	30%	19	31.67%
	Second year	25	41.67%	27	45%
	Third year	17	28.33%	14	23.33%
Place of living	Urban	35	58.33%	37	61.67%
	Rural	25	41.67%	23	28.33%

Table 2: Comparison of Pre-test and Post-test haematological parameters in the Yoga group.

	Group				Student independent t-test
	Pre-test		Post-test		
	Mean	SD	Mean	SD	
Blood urea mg/dl	21.33	3.87	14.25	1.71	t=7.95 p=0.001*** (HS)
Amylase U/L	34.92	5.79	26.08	3.26	t=7.11 p=0.001*** (HS)
Total cholesterol mg/dl	151.08	21.03	127.08	17.75	t=4.64 p=0.001*** (HS)
HDL mg/dl	53.08	5.50	47.17	5.41	t=5.29 p=0.001*** (HS)
Triglyceride mg/dl	148.58	40.88	118.83	61.78	t=1.78 p=0.10 (NS)
LDL mg/dl	74.08	16.57	61.17	12.06	t=2.00 p=0.07 (NS)
VLDL mg/dl	33.75	11.19	23.08	10.50	t=3.40 p=0.01** (S)
Fasting Blood Sugar mg/dl	88.83	8.82	73.83	4.28	t=7.27 p=0.001*** (HS)
HbA1c %	5.10	.44	4.61	.46	t=3.58 p=0.01** (S)

Average blood glucose level mg/dl	106.00	13.44	91.42	9.81	t=4.58 p=0.001*** (HS)
ESR mm/hr	15.17	4.02	15.75	5.75	t=0.31 p=0.76 (NS)
WBC 10 ⁹ /L	8.28	1.22	8.29	2.41	t=0.02 p=0.98 (NS)
Lymphocyte %	38.19	6.34	37.53	6.85	t=0.58 p=0.57 (NS)
GRAN %	59.40	5.78	57.23	7.19	t=2.46 p=0.03* (S)
RBC 10 ¹² /L	5.09	.42	4.93	.37	t=1.61 p=0.13 (NS)
HGB g/dl	14.52	.77	13.94	1.08	t=1.77 p=0.10 (NS)
HCT %	47.14	3.20	46.79	3.11	t=1.00 p=0.33 (NS)
MCV fL	95.74	3.68	95.25	5.31	t=0.74 p=0.48 (NS)
MCH pg	29.10	1.63	28.30	1.76	t=2.35 p=0.05* (S)
MCHC g/dl	29.83	.72	29.66	.66	t=0.84 p=0.41 (NS)
PLT 10 ⁹ /L	294.17	60.92	304.50	70.65	t=10.87 p=0.001*** (HS)

* (S): significant, *** (HS)- highly significant, NS- no significant

Table 3: Comparison of Pre-test and Post-test haematological parameters in the Control group.

	Group				Student paired t-test
	Pre-test		Post-test		
	Mean	SD	Mean	SD	
Blood urea mg/dl	21.92	1.71	20.83	2.72	t=1.93 p=0.06 (NS)
Amylase U/L	36.08	3.26	35.75	4.92	t=1.06 p=0.33 (NS)
Total cholesterol mg/dl	157.67	17.75	155.83	16.69	t=1.56 p=0.13 (NS)
HDL mg/dl	51.83	5.41	51.17	7.02	t=1.23 p=0.24 (NS)
Triglyceride mg/dl	159.75	61.78	153.83	26.77	t=1.65 p=0.12 (NS)
LDL mg/dl	78.58	12.06	76.83	12.71	t=1.60 p=0.14 (NS)
VLDL mg/dl	37.25	10.50	35.67	7.24	t=1.70 p=0.13 (NS)
Fasting Blood Sugar mg/dl	90.83	4.28	88.17	5.97	t=1.76 p=0.12 (NS)
HbA1c %	5.20	.46	5.08	.36	t=2.03 p=0.06 (NS)
Average blood glucose level mg/dl	108.50	9.81	106.67	11.40	t=2.01 p=0.06 (NS)
ESR mm/hr	17.50	5.75	16.92	4.12	t=1.20 p=0.25 (NS)
WBC 10 ⁹ /L	8.63	2.41	8.66	1.94	t=1.00 p=0.33 (NS)
Lymphocyte %	37.70	6.85	37.13	7.05	t=1.04 p=0.11 (NS)
GRAN %	57.39	7.19	57.20	6.97	t=0.91 p=0.39 (NS)
RBC 10 ¹² /L	4.94	.37	4.73	.45	t=1.95 p=0.06 (NS)
HGB g/dl	13.98	1.08	13.50	1.00	t=1.03 p=0.31 (NS)
HCT %	46.85	3.11	46.39	2.85	t=0.32 p=0.74 (NS)
MCV fL	95.41	5.31	95.25	5.23	t=0.04 p=0.97 (NS)
MCH pg	28.47	1.76	28.33	1.61	t=1.35 p=0.20 (NS)
MCHC g/dl	29.66	.66	29.75	.45	t=0.40 p=0.70 (NS)
PLT 10 ⁹ /L	308.67	70.65	306.42	68.09	t=1.07 p=0.32 (NS)

NS- no significant

Table 4: Comparison of Pre-test and Post-test cortisol levels among study participants.

Serum cortisol	Group				Student independent t-test
	Pre-test		Post-test		
	Mean	SD	Mean	SD	
Yoga group	17.06	0.86	12.82	0.79	t=16.39 p=0.001*** (HS)
Control group	16.58	1.19	15.92	1.27	t=1.90 p=0.06 (NS)

*** (HS)- highly significant, NS- no significant

DISCUSSION

This study evaluated the effect of the SKY on the haematological and cortisol levels among the undergraduate students. Stress has been found to influence hormones like growth hormones, cortisol, vasopressin, gonadotropins, adrenaline, insulin,

thyroidal hormones, and prolactin, among others. Additionally, the abnormalities of such hormones could predispose people to long-term diseases like Grave's disease, and obesity among others including adverse effects on sexual health (Ranabir and Reetu 2011). Additionally, examination stress among academic

students was noted to alter blood pressure, dysphoria, social withdrawal, and altered physiological status axis (Koudela-Hamila *et al.*, 2022). Alternatively, it was demonstrated that physical activity, and stress hormones (cortisol, serotonin) were influencing the academic performances of students (Alghadir *et al.*, 2020). The effects of stress hormones and the mechanisms of their excessive secretion can be depicted in Fig. 2.

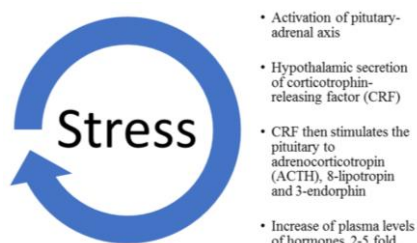


Fig. 2. Mechanism depicting the role of stress in hormonal disturbances.

This study has observed significant reduction in lipid parameters like Cholesterol and HDL among the yoga group, which was in accordance with a study by Shantakumari *et al.*, 2013). While other researcher (Manchnada *et al.*, 2000) noticed that yoga practise induces a considerable reduction in free fatty acids, LDL, and VLDL and an increase in HDL. Vyas *et al.*, observed that yoga meditation practise lowers serum cholesterol (Manchnada *et al.*, 2000; Bijlani *et al.*, 2005; Vyas *et al.*, 2001). Hepatic lipase and lipoprotein lipase may have increased with yoga practise, which would explain the improvement in lipid profile. This would alter the metabolism of lipoproteins and enhance the absorption of triglycerides by adipose tissue (Duchemin *et al.*, 2015). Cortisol levels are frequently used as indicators of psychological stress and indicate the activity of sympathetic adrenal medullary system. According to Duchemin's study and Sieverdes *et al* mindfulness-based interventions resulted in a substantial drop in cortisol levels in the intervention group between the 1st and 2nd evaluations (Duchemin *et al.*, 2010; Sieverdes *et al.*, 2014). This study has observed the similar findings, as the cortisol levels decreased significantly in the yoga practised group when compared to the control group. The practise of yoga has also been shown to have a positive impact on one's mental equilibrium, reducing anxiety and tension while promoting hormone balance and feelings of well-being. Its capacity to boost endogenous melatonin release is credited with contributing to this feeling of wellbeing (Harinath *et al.*, 2004).

CONCLUSION

The study results indicate that SKY program could be a feasible and acceptable strategy among the students of both medical and non-medical background in maintaining the overall health.

FUTURE SCOPE

The findings of this study proved that isolated SKY yogic practices significantly altered selected haematological and hormonal variables among medical and non-medical college students. 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 stress and enhance mental health.

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Conflict of Interest. Nil

Author's Contribution. Vajiravelu Suganthi: Conceptualization, Formal analysis, Project administration, Writing-original draft, Validation, Investigation. and drafted the manuscript. Panneerselvam Periyasamy: Conceptualization, Writing-review and editing, Formal analysis, Validation, Investigation, Visualization and Performed data collection. Arumugam Chandrabose: Conceptualization, Methodology, Writing-review and editing, Validation, Resources. Sasikala Gunasekaran: Conceptualization, Methodology, Writing-review and editing, Supervision.

IEC APPROVAL – Institutional Ethics Committee Approval from Government Erode Medical College & Hospital Perundurai obtained with vide reference IEC/001/GEMC&H/2020 on 31.07.2020.

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