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Effects of Yoga on Oxidative Stress and Blood Pressure in Medical Students.

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ABSTRACT

Background: Oxidative stress has emerged one of the important causes for various chronic diseases including cardiovascular diseases (CVD). Moreover, oxidative stress increased with advancement of age. Increased ROS and decreased antioxidant status of the body leads to enhance aging process. Hypertension has been found associated with increased oxidative stress. Yoga stimulate production of superoxide dismutase (SOD) which in turn decreases superoxide anions (O2--) and increase the nitrous oxide (NO) results in improved endothelial functions. **Methods:** The study was an intervention type of study which was conducted on healthy male medical students of tertiary care institute. Initially, eighty medical voluntarily enrolled for the study. All the students were divided into two groups, group I (yoga group) consisted forty healthy male Students; whereas, group II (control group) included forty healthy male students. Yogic exercise included 'Nadi-shodhana Pranayama' for 20 minutes followed by 'Sudarshan kriya yoga' for 20 minute and 'meditation' for 20 minutes. Marker of oxidative stress Glutathione (GSH), Superoxide dismutase (SOD) and Melanodialdehyde (MDA) were measured before and after yoga program in both groups. **Results:** A significant increase of total glutathione (187.8 ± 18.95 ng/ml vs 194.01 ± 18.82 ng/ml, p= < 0.0001) and supraoxidase dismutase (179.28 ± 20.87 vs 186.09 ± 19.52, p= < 0.0001) in comparison of baseline values were observed in group I yoga group. There was a significant decrease in baseline values of melanodialdehyde in yoga group (1.9 ± 0.57 m mol/ml vs 1.08 ± 0.31 m mol/ml). **Conclusion:** The finding of the present study revealed that daily yoga is not only helpful in reducing oxidative stress as well as blood pressure. Moreover, practice of yoga is easy to follow. However, more researches are warrented on larger population to make generalised yoga module.

Keywords: Medical Student, Oxidative Stress, Yoga.

INTRODUCTION

Oxidative stress has emerged one of the important causes for various chronic diseases including cardiovascular diseases (CVD). Moreover, oxidative stress increased with advancement of age.[1,2] Reactive Oxygen Species (ROS) are known as an oxygen molecule having an unpaired electron. ROS are highly reactive and unstable and induce various pathological conditions in the body which further leads to different type of chronic diseases.[3,4] ROS is knwon as imbalance of oxidants and antioxidant status.[5] DNA, Lipids and protein of central nervous system are strongly influenced by ROS.[6] Increased ROS and decreased antioxidant status of the body leads to enhance aging process.[7] Hypertension has been found associated with increased oxidative stress.[1] Aging is associated with increased ROS level and decreased antioxidant level of body. Mild physical exercise leads to increase mild oxidative stress though, increased oxidative stress further stimulate expression of certain antioxidant enzyme and results in decreased oxidative stress.[9] Moreover, oxidative stress has been found associated with adverse effect of obesity along with CVD.[10] Oxidative stress might be cured during the treatment of essential hypertension.[12] Hypertension is a multiple disciplinary disorders affected by various factors including diet; however, decrease of blood pressure can be attain both in hypertensive patients and normotensive subjects by modification of diet.[13] Moreover, regular yoga exercise can improve antioxidant level even in stressful conditions.[14] Yoga stimulate production of superoxide dismutase (SOD) which in turn decreases superoxide anions (O2--) and increase the nitrous oxide (NO) results in improved endothelial functions.[15] Therefore, the present study was designed to investigate effect of yoga on blood pressure and oxidative stress.

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MATERIALS AND METHODS

The study was an intervention type of study which was conducted on healthy male medical students of

tertiary care institute. Initially, eighty medical voluntarily enrolled for the study. All the students were divided into two groups, group I (yoga group) consisted forty healthy male Students; whereas, group II (control group) included forty healthy male students. However, four students of group I and three students of group II left the study due to various reasons. Thirty six healthy male students (age 20±1.6 yrs) of group I and thirty seven healthy male students (age 21±1.7 yrs) of group II completed yoga training program of six months. Inform written consent of each participant was taken before they participated in the study. [Table 2]

Study protocol

Group I subjects were asked to practice 'Nadi-shodhana Pranayama'16 for 20 minutes followed by 'Sudarshan kriya yoga'17 for 20 minute and 'meditation'14 for 20 minutes. All these yogic exercicese were done under the suparvison of trained yoga teacher for six days in a week.

Group II control subjects were not asked to involve in any type of yoga exercise for six months.

Blood pressure measurement –

Subjects were asked to sit in comfortably in supine position for 10 minutes. After that blood pressure was measured thrice at the interval of 10 minutes by auscaltatory method.[18]

Measurements

Volunteers of both groups were asked to come empty stomach early in the morning up to 6 am for the fasting blood sample collection and measurement of blood pressure. All the blood samples were collected before and after six months yoga trianiing program. GSH, SOD and MDA were measured for biochemical analysis of the subjects.

Biochemical analysis

Oxidative stress markers Glutathione (GSH) and SOD were estimated by Enzyme Linked Immunosorbent Assay (ELISA) (kits manufactured by Qayee-Biotechnology Co. Ltd).[19] MDA was investigated by TBARS method (TBARS kit manufactured by Cayman chemical company).[19]

Statistical analysis

Results of the present study were expressed as Mean+/-SD (Standard deviation of Mean). Unpaired students t- test was used to evaluate significance of the data obtained before and after yoga program. Pearson correlation coefficient was used to assess correlation between blood pressure and oxidative stress. A p value < 0.05 was considered statistically significant.

RESULTS

A significant increase of total glutathione (187.8 ± 18.95 ng/ml vs 194.01 ± 18.82 ng/ml, p= < 0.0001) and supraoxidase dismutase (179.28 ± 20.87 vs 186.09 ± 19.52, p= < 0.0001) in comparison of baseline values were observed in group I yoga group [Figure 2]. Further, there was an insignificant change in total glutathione (186.67 ± 19.21 ng/ml vs 185.95 ± 19.59 ng/ml, p= > 0.0001) and supraoxidase dismutase (177.48 ± 23.08 vs 178.16 ± 22.82, p= > 0.0001) of group 2 control group subjects. [Figure 1] Further, there was a significant decrease in baseline values of melanodialdehyde in yoga group (1.9 ± 0.57 m mol/ml vs 1.08 ± 0.31 m mol/ml) while there was an insignificant increase in melanodialdehyde of control group (1.97 ± 0.48 m mol/ml vs 2.07± 0.45 m mol/ml). [Figure 2].

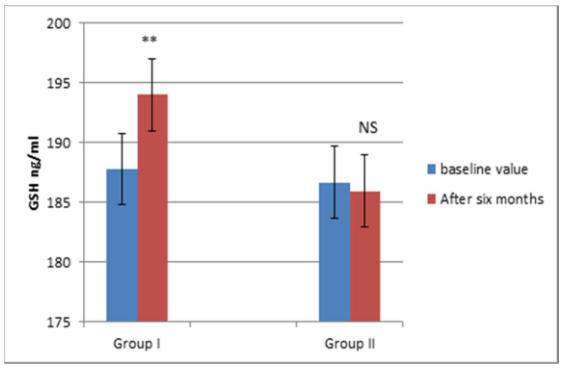

Figure 1: Comprison of GSH in both group before and after six months.

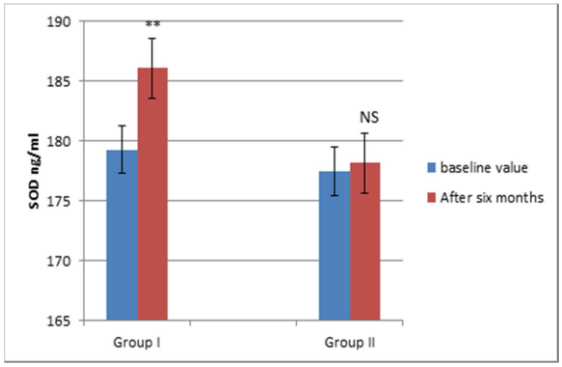

Figure 2: Comprison of SOD in both group before and after six months.

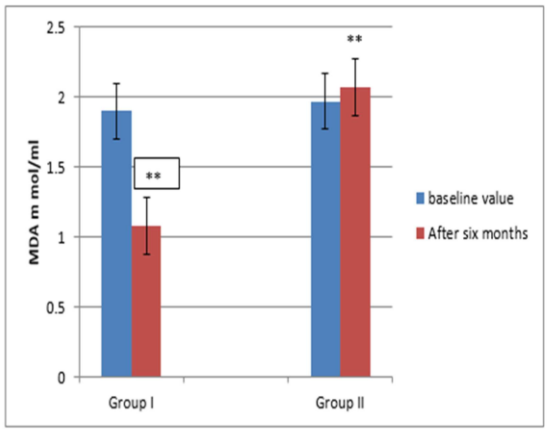

Figure 3: Comprison of MDA in both group before and after six months.

Thirty six healthy male students (age 20±1.6 yrs, wt-55.3 kg, BMI- 22.3 kg/m2) of group I (yoga group) completed yoga program for six months. Thirty seven healthy male students (age 21±1.7 yrs, wt-54.9 kg, BMI- 22.12 kg/m2) of group II (control group) did not participate in any yoga activity for six months. Table 1 shows a significant decrease of blood pressure (SBP 125.48± 5.79 mm Hg vs 120.35± 5.71 mm Hg, p= <0.01, DBP 81.16± 6.14 mm Hg vs 78.77 ± 5.32 mm Hg, p= <0.01) in comparison to baseline values of group I yoga subjects. Furthermore, a significant decrease was observed in mean arterial pressure (p= <0.0001), pulse pressure (p= <0.0001), and heart rate (p= <0.01) of yoga sroup subjects after following six months yoga program. [Table 1] [Table 2] shows there was an insignificant decrease of SBP (p>0.05), DBP (p>0.05), MAP (p>0.05), PP (p>0.05) and HR (p>0.05) in control group II.

Table 1: Comparison of Blood Pressure pre and post lifestyle modifications values in total normotensive subjects.

Group I subjects (n = 36)			
Total Subjects Age 20±1.6 yrs	**Before Life style modifications**	**After Life style modifications**	**P value**
Systolic blood pressure mm Hg	125.48± 5.79	120.35± 5.71	<0.01***
Diastolic blood pressure mm Hg	81.16± 6.14	78.77 ± 5.32	<0.01***
MAP mm Hg	91.6 ± 5.17	88.2 ± 4.39	<0.01***
PP mm Hg	35.34 ± 5.62	32.6 ± 4.59	<0.01***
HR (BPM)	79.15 ± 4.59	76.46 ± 5.21	<0.01***

Values expressed as Mean+/-SD. MAP=mean arterial pressure, PP=pulse pressure, HR=heart rate, SD= Standard deviation of Mean, BPM = beats per minute. *** = (p<0.01) highly significant, ** = (p<0.05) significant.

Table 2: Comparison of Blood Pressure pre and post yoga program values in total hypertensive patients.

Group II control subjects (n = 37)			
Total Patients Age 21±1.7 yrs	**Before Life style modifications**	**After Life style modifications**	**P value**
Systolic blood pressure mm Hg	126.88± 6.59	127.45± 5.82	NS
Diastolic blood pressure mm Hg	80.25± 5.64	80.75 ± 4	NS
MAP mm Hg	92.4 ± 4.47	92.7 ± 3.9	NS
PP mm Hg	35.46 ± 6.22	35.6 ± 5.49	NS
HR (BPM)	78.25 ± 5.59	77.46 ± 5.83	NS

Values expressed as Mean+/-SD. MAP=mean arterial pressure, PP=pulse pressure, HR=heart rate, SD= Standard deviation of Mean, BPM = beats per minute. *** = (p<0.01) highly significant, ** = (p<0.05) significant.

DISCUSSION

It is well known fact that increased oxidative stress is an injuries condition in which there is an imbalance between antioxidants and oxidants.[4] Further, increased ROS has been found associated with various chronic diseases in different degree.[20,21]

The findings of the present study showed a significant decrease of GSH and SOD [Figure 1,2] Findings of the current study are consistent with the previous studies of Cheong et al,[22] Gordon et al,[14] and Sinha et al.[23] as they have recorded similar enhancement of both GSH and SOD after yoga practice.

Superoxide radical (O2--) is highly active oxidant however, SOD convert the superoxide radical (O2--) into hydrogen peroxide (H2O2); further, GSH converts the toxic hydrogen peroxide into water and alcohol.[24] This increase of antioxidant level may be due to exercise stimulate various redox singling pathway and increase the production of antioxidant enzymes.[9] In addition increased SOD leads to decrease of superoxide results in increase of NO and improvement of endothelial functions.[15] Moreover, exercise leads to remodelling of blood vessels facilitate improve functioning of endothelium via enhancing NO.[25,26] Increased level of ROS cause hypertension moreover, increased oxidative is associated with progression of CVD.[1] Therefore, increased antioxidant level in the present study after following yoga program may decrease the risk of various chronic diseases and future hypertension along with CVD.[6] Moreover, daily yoga practice can decrease the age related oxidative damage

including lipidperoxidation, deterioration of muscles and DNA damage.[27] Apart from this, increase of antioxidant via yoga practice is far beneficial then the oral antioxidant therapy.[28]

MDA is the end product of lipid peroxidation and lipid peroxidation is stimulated by increased level of ROS. Moreover, MDA induces various cellular reaction results in destruction of DNA and protein.[29,30] Finding of the present study has shown decrease of MDA after following yoga practice which are consistent with the previous study of Patil et al.[31] and Singh et al.[32] This decrease of MDA as observed in the present study may be due to decrease of lipid peroxidation via increased antioxidant level.[22] Further, decrease MDA level may reduce the risk of CVD as MDA is an independent risk factor for CVD.[33]

Results of the current study showed that yoga practice significantly decreased the SBP, DBP, PP, HR and MAP in yoga group [Table 1]. Findings of the present study are very similar to the previous studies of LP Svetkey et al Jiro et al and Murthy et al This decrease of blood pressure,[34-36] PP and MAP as observed in the present study might be due to yoga leads to improve balance between sympathetic nervous system and parasympathetic nervous system.[37] Yoga helps to reduce stress, which in turn improve balance of autonomic nervous system which leads to alteration in baroreceptors sensitivity results in decrease of blood pressure.[38]

CONCLUSION

The finding of the present study revealed that daily yoga is not only helpful in reducing oxidative stress as well as blood pressure. Moreover, practice of yoga is easy to follow. However, more researches are warrented on larger population to make generalised yoga module

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