

Effects of Yoga on Blood Pressure and MDA in Mild Hypertensive Patients.

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Abstract

Background: Cardiovascular diseases (CVD) have emerged as the leading cause of mortality throughout the world. Essential hypertension is one of the important risk factors for CVD in modern society despite advanced and effective management. Malondialdehyde (MDA) is a well known marker of oxidative stress, which is produced by oxidation of poly unsaturated fatty acid. Nadishodhan pranayam leads to decrease stress as well as blood pressure. **Subjects and Methods:** It was an interventional type of study. Ninety seven mild hypertensive patients (53 males and 44 females) of group I completed the yoga program. While, fifty normotensive subjects were included as control in group II. Blood pressure and MDA was measured of every participants before and after three months of yoga program. **Results:** Total ninety seven mild hypertensive patients of age 33.6 ± 8.66 years of group I completed three months yoga program. However, fifty subjects (34.7 ± 7.73 years) of group II had not done any yogic exercise during three months. Results of the present study showed that there was a significant difference in SBP ($p < 0.001$), DBP ($p < 0.001$), HR ($p < 0.001$), PP ($p < 0.001$) and MAP ($p < 0.001$) group I mild hypertensive patients after following three months yoga program. There was a significant difference between before and after yoga program MDA level of group I mild hypertensive patients. However, there was an insignificant difference between before and after three months level of MDA in group II control subjects. **Conclusion:** In this study, it has been observed that daily practice of yoga improves the blood pressure of mild hypertensive patients. Moreover, it substantially decreases the oxidative stress. Yoga can be an effective alternative to reduce the blood pressure in mild hypertensive patients either with medication or without medication.

Keywords: Yoga, hypertension, MDA, CVD.

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Introduction

Cardiovascular diseases (CVD) have emerged as the leading cause of mortality throughout the world.^[1] Essential hypertension is one of the important risk factors for CVD in modern society despite advanced and effective management.^[2] Disturbance of endothelium functioning leads to loss of dilating ability of endothelium results in increased blood pressure.^[3] Hypertension is a multi factorial disorder including various aetiological factors like obesity, high lipids diet, smoking, stress, sedentary lifestyle, excessive alcohol and high sodium diet etc.^[4,5] Imbalance between oxidants and antioxidants status of body leads to a well known condition known as Oxidative stress which in turn play a pivotal role in development of variety of pathological conditions including hypertension.^[7,8] Malondialdehyde (MDA) is a well known marker of oxidative stress, which is produced by oxidation of poly unsaturated fatty acid. Moreover, MDA is considered as one of the important marker for coronary artery disease. Increased reactive oxygen species play an important role in

pathogenesis of hypertension.^[8-10]

Daily practice of Yoga causes decrease of mental stress and increase of memory.⁸ Yoga has been found effective in improving weight, BMI, dyslipidaemia, hypertension and heart rate.^[11-15] Psychological stress has been found associated with high level of oxidative stress; however relaxation of stress causes decrease oxidative stress.^[8] Nadishodhan pranayam leads to decrease stress as well as blood pressure.^[16,17] That is why the present study was designed to investigate the effect of yoga on blood pressure and MDA of mild hypertensive patients.

Subjects and Methods

Type of study

It was an interventional type of study.

Study Population

Study population was divided into two groups. Group I consisted one hundred nine mild hypertensive patients (60 males and 49 females), between 20 and 40 years of age while group II included 50 normotensive subjects of same age and

sex matched. All the patients were recruited from TMMC & RC, Moradabad. However, twelve mild hypertensive patients (7 males and 5 females) left the study in between due to various reasons and ninety seven mild hypertensive patients (53 males and 44 females) completed the yoga program. Inclusion criteria for the study were blood pressure from >140/90 mm Hg to <160/110 mm of Hg, 18 body mass index 18.5–25 kg/m². Exclusion criteria were hypertensive patients on any type of anti hypertensive medicines or suffering from any type of chronic disease, any type of disability. All the participant of the study gave their inform consent before participating in the study.

Yogic intervention

Group I mild hypertensive patients were asked to perform yogic exercise “Nadi Shodhan Pranayama”^[16,17] (forced one side nostril breathing) early in the morning for 30 minutes, 6 days in a week.

Measurements of blood pressure

Measurement of blood pressure was done twice before yoga intervention and three months after yoga intervention. Blood pressure was measured three times by auscultatory method at every 10 min interval by Sphygmomanometer.

Collection of sample

Fasting sample were collected early in the morning before and after yogic intervention.

Biochemical Parameters

MDA in serum was estimated by thiobarbituric acid method (TBA).19 TBARS assay kit Cayman chemical company Ann Arbor, USA and Biochemistry Analyser E-C5VZ(10k) manufactured by Transasia (India) were used for the biochemistry analysis.

Statistical Analysis

The results of the present study were expressed as mean ± SD. Unpaired student t test was used to evaluate the results. A p-value < 0.05 was considered statistically significant. IBM SPSS Statistics 21 manufactured by IBM USA was used for entire calculations.

Results

Table 1: Comparison of pre and post yoga values of blood pressure in group I mild hypertensive patients.

Parameters	Before Yoga	After Yoga	P-value
Systolic blood pressure mmHg	148.08 ± 10.04	142.17 ± 12.46	<0.0001
Diastolic blood pressure mmHg	104.15 ± 7.82	98.27 ± 6.78	<0.0001
HR	76.13 ± 6.58	72.26 ± 5.29	<0.0001
PP	56.17 ± 6.43	53.19 ± 6.67	<0.0001
MAP	126.3 ± 8.72	119.42 ± 8.35	<0.0001

Total ninety-seven mild hypertensive patients of age 33.6± 8.66 years of group I completed three months yoga program. However, fifty subjects (34.7± 7.73 years)of group II had not done any yogic exercise during three months. Results of the present study showed that there was a significant difference in SBP (p<0.001), DBP (p<0.001), HR (p<0.001), PP (p<0.001) and MAP (p<0.001) group I mild hypertensive patients after following three months yoga program. [Table 1]

[Table 2] shows that there was an insignificant change in

SBP (p>0.05), DBP (p>0.05), HR (p>0.05), PP (p>0.05) and MAP (p>0.05) of group II after three months.

Table 2: Comparison of pre and post yoga values of blood pressure group II control subjects.

Parameters	Before Yoga	After Yoga	P value
Systolic blood pressure mmHg	126.28 ± 9.04	127.17 ± 12.46	NS
Diastolic blood pressure mmHg	87.25 ± 8.32	88.17 ± 7.58	NS
HR	72.44 ± 5.6	72.26 ± 6.19	NS
PP	48.17 ± 4.27	49.35 ± 4.69	NS
MAP	112.8 ± 6.66	112.89 ± 7.22	NS

[Table 3] reveals that there was a significant difference between before and after yoga program MDA level of group I mild hypertensive patients. However, there was an insignificant difference between before and after three months level of MDA in group II control subjects.

Table 3: Comparison of pre and post yoga values of MDA in both group I mild hypertensive patients and group II control subjects.

Parameters	Group I		Group II	
	Pre yoga values	Post yoga values	Pre yoga values	Post yoga values
MDA (m mol/ml)	5.16 ± 0.78	4.26 ± 0.56	2.86 ± 0.54	2.96 ± 0.67
P value	<0.0001		NS	

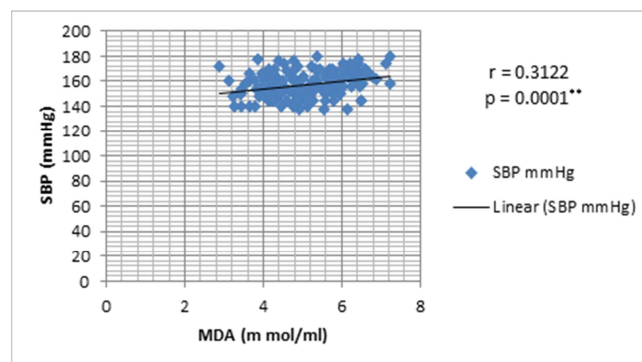


Figure 1a: Correlation of MDA & SBP. Where MDA = Melanodialdehyde, SBP = Systolic blood pressure, ** p = <0.01 (comparison of post value with pre value).

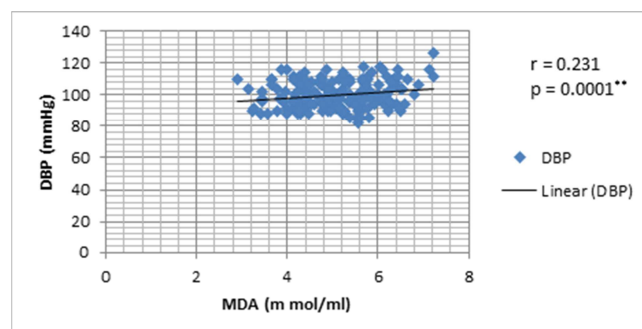


Figure 1b: Correlation of MDA & DBP. Where MDA = Melanodialdehyde, DBP = Diastolic blood pressure, ** p = <0.01 (comparison of post value with pre value).

In the [Figure 1a] Pearson correlation coefficient for MDA and SBP in mild hypertensive patients of group I has been presented. It is evident from the Figure 12a that there was a positive correlation of MDA with SBP.

In the [Figure 1b] Pearson correlation coefficient for MDA and DBP in hypertensive elderly patients of group II has been presented. It is evident from the Figure 12b that there was a positive correlation of MDA with DBP.

Discussion

Finding of the present study suggest that yoga program for three months have substantially decrease blood pressure in mild hypertensive patients. Findings of the current study are on consistent with the results of the previous study of Svetkey et al.^[20] Similarly Jiro et al.^[21] recorded that regular exercise significantly reduces systolic and diastolic blood pressure in mild hypertensive patients. Likewise Pal GK et al recorded significant decrease of blood pressure after following yoga program.^[22] This decrease of blood pressure seems to be due yoga improves balance of autonomic nervous system via decreasing sympathetic activity and increasing parasympathetic nervous system.^[22,23]

Further, results of the current study showed that there was a significant decrease of heart rate, pulse pressure, and mean arterial pressure which is consistent with the findings of Pal GK et al.^[22] This decrease of HR, PP and MAP seems to be due to yoga affects the baroreflex sensitivity which in turn reduces heart rate and blood pressure.^[24]

It has been suggested in literature that uncontrolled reactive oxygen species has been found involve in production and progression of various pathological conditions like CVD.^[25,26] Moreover, increased oxidative stress has been reported in early stage of hypertension; though, development of hypertension is caused by various factors. However, role of ROS cannot be picked out.^[27-29] MDA has been found elevated in hypertensive patients due to increased level of ROS which results in increased lipid peroxidation.^[26] Furthermore, present study recorded there was a significant decrease of MDA in mild hypertensive subjects. Findings of the present study are consistent with results of the previous study of Gordon et al.^[30] Patil et al.^[31] and Singh et al.^[32] as they observed a significant decrease of blood pressure after following yoga for different time periods of time. This decrease MDA level seems to be due decrease of ROS as regular yoga practice induces the production antioxidant like glutathione and super oxide dismutase which in turn decreases the lipid peroxidation.^[32] This decrease of MDA in mild hypertensive patients may decrease the risk of CVD in hypertensive patients as MDA is an independent risk factor for the CVD.⁸

Conclusion

In this study, it has been observed that daily practice of yoga improves the blood pressure of mild hypertensive patients. Moreover, it substantially decreases the oxidative stress. Yoga can be an effective alternative to reduce the blood pressure in mild hypertensive patients either with medication or without medication. We emphasize more researches on

larger population should be done to make effective module of yoga program to control blood pressure.

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