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EFFECT OF YOGA ON CARDIOVASCULAR SYSTEM IN SUBJECTS ABOVE 40 YEARS

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Abstract : This study was conducted to examine the effect of yoga on cardiovascular function in subjects above 40 yrs of age. Pulse rate, systolic and diastolic blood pressure and Valsalva ratio were studied in 50 control subjects (not doing any type of physical exercise) and 50 study subjects who had been practicing yoga for 5 years.

From the study it was observed that significant reduction in the pulse rate occurs in subjects practicing yoga ($P<0.001$). The difference in the mean values of systolic and diastolic blood pressure between study group and control group was also statistically significant ($P<0.01$ and $P<0.001$ respectively). The systolic and diastolic blood pressure showed significant positive correlation with age in the study group ($r_{1\ systolic} = 0.631$ and $r_{1\ diastolic} = 0.610$) as well as in the control group ($r_{2\ systolic} = 0.981$ and $r_{2\ diastolic} = 0.864$). The significance of difference between correlation coefficient of both the groups was also tested with the use of Z transformation and the difference was significant ($Z_{systolic} = 4.041$ and $Z_{diastolic} = 2.901$). Valsalva ratio was also found to be significantly higher in yoga practitioners than in controls ($P<0.001$). Our results indicate that yoga reduces the age related deterioration in cardiovascular functions.

Key words : ageing pulse rate blood pressure valsalva ratio

INTRODUCTION

Yoga is a science practiced in India over thousands of years. It produces consistent physiological changes and have sound scientific basis (1). All over the world scientists have extensively studied Yoga and claimed that it increases longevity (1, 2, 3, 4), it has therapeutic (5, 6, 7) and rehabilitative effects (6, 7, 8).

Aging is inevitable and no system is spared of its changes. Still cardiovascular system holds a key position in interpretation of age changes throughout the body. As the age advances cardiovascular regulatory mechanisms (baroreceptor reflex activity) reduces their efficiency (9). In this the noninvasive technique 'Valsalva maneuver', that challenges the reflex control of the circulation, gains continued interest (10, 11, 12).

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The present study however was undertaken to ascertain whether Yoga in long term has any effect on slowing the aging changes in cardiovascular system, considering the possibility of advocating this simple and easy technique for reducing the morbidity and mortality from cardiovascular diseases.

METHODS

Present study was a case-control study. There were 100 subjects above 40 years of age of both sexes. Study group included 50 subjects (mean age in years 53.04 ± 9.974), randomly selected from Janardanswami Yogabhyasi Mandal Ramnagar, Nagpur, performing "Yoga" i.e. 'Asanas' (postural exercises), 'Pranayamas' (breathing techniques), and 'Savasana' (meditation), since 5 years under proper guidance of the instructor. The control group consisted of 50 subjects (mean age in years 51.4 ± 6.536) from the non-teaching staff members of Government Medical College and hospital Nagpur, who were not doing Yoga or any type of physical exercise on regular basis.

On detail history, all subjects were non-alcoholic, non-smokers, not taking any drug and were having similar dietary habits, physical and mental activities in working and home atmosphere. They were subjected to clinical examination and found healthy. Data on physical characteristics was obtained such as age, height, weight and Body Mass Index (BMI), which was showing no significant difference in between Yoga and control group when subjected to Student's 't' test (Table I).

All the subjects were investigated by the same person in the Department of Physiology, Government Medical College and Hospital, Nagpur, around 11 a.m. under similar conditions of rest and fasting. The pulse was recorded after a rest for 30 minutes in right radial artery by palpatory method. Resting blood pressure was recorded in left arm in supine position by ausclutatory method. Three readings were taken after the time interval of 15 minutes and average was taken as final reading.

Prior to the investigation of valsalva maneuver the procedure was explained, history of fainting attack was asked, ill-fitting dentures were removed and then the subjects were made to practice the same. In this the subject was asked to blow out in the rubber tube of the mercury manometer (40 mm test or Flack's Airforce test instrument) to create a pressure of 40 mm of Hg and maintain it for 10 seconds. During the 'Valsalva Maneuver' and 30 seconds after finishing it, ECG was recorded in supine position in standard limb lead II. Three such readings were taken and average was taken as a final reading. The 'Valsalva Ratio' was calculated as under (10).

$$\text{Valsalva ratio} = \frac{\text{Maximum RR distance after Valsalva Maneuver}}{\text{Minimum RR distance during Valsalva Maneuver}}$$

Statistical methods used: Difference in the mean values for age, height, weight, BMI, resting pulse, systolic BP, diastolic BP, and valsalva ratio was subjected to Student's t test. The coefficient of correlation with age was obtained for pulse, systolic BP, diastolic BP and valsalva ratio. The test of significance for the difference in coefficient of correlation of two groups was analyzed by Z transformation (13).

RESULTS

The mean value of height, weight and BMI in study group was not significantly less than in controls (P>0.05) as shown in Table I. The mean value of pulse rate was lower in study than control group statistically to the significant extent (P<0.001). The statistical difference in the mean systolic and diastolic BP in between study and control group was significant (P<0.01, P<0.001 respectively). Valsalva ratio in the study group was statistically less than controls to the significant extent (P<0.001) (Table II).

The difference in coefficient of correlation of various parameters with age in study group (r_1) and in control group (r_2) was compared by using z transformation. It was statistically significant for systolic and diastolic BP, however it was not significant for pulse rate and valsalva ratio (Table III).

TABLE I: Depicting the physical characteristics of study and control group.

Physical characteristics	*Study (Mean ± SD)*	*Control (Mean ± SD)*	*'t' value*	*'P' value*
Age (yrs)	53.04±9.974	51.4±6.536	1.233	P>0.05*
Height (cm)	163.2±7.33	160.66±5.587	1.947	P>0.05*
Weight (kg)	60.02±7.01	57.34±7.248	1.879	P>0.05*
BMI	22.67±3.44	22.26±2.95	0.64	P>0.05*

*Not Significant

TABLE II: Showing comparison between the mean values of cardiovascular parameters in study and control group.

Parameters	*Study (Mean ± SD)*	*Control (Mean ± SD)*	*'t' value*	*'P' value*
Pulse rate (beats/min)	078.04±4.551	083.92±6.229	5.35	P<0.001**
Systolic B.P. (mm Hg)	131.72±7.354	138.20±11.61	3.333	P<0.01*
Diastolic B.P. (mm Hg)	083.88±4.970	089.00±5.4	4.932	P<0.001**
Valsalva Ratio	01.440±0.217	01.240±0.147	5.37	P<0.001**

**Highly significant, *Significant

TABLE III: Showing the comparison between the coefficient of correlation of parameters with age in study and control group.

Parameters	*Study 'r_1'*	*Control 'r_2'*	*'z' value*	*'P' value*	*Remark*
Pulse rate	0.488	0.539	0.1942	P>0.05	Not significant
Systolic B.P.	0.610	0.864	2.901	P>0.01	Significant
Diastolic B.P.	0.610	0.864	2.901	P>0.01	Significant
Valsalva Ratio	-0.454	-0.335	0.691	P>0.05	Significant

DISCUSSION

The mean values of pulse rate, systolic blood pressure, diastolic blood pressure and valsalva ratio were less in study group than those in control group. The difference in coefficient of correlation of systolic and diastolic blood pressure with age was significant statistically. But why it was not so for pulse rate and valsalva ratio remains unclear.

To the best of our knowledge no study has been carried out showing effect of long term yoga on parameters which are also influenced by age. However numerous longitudinal studies on effect of short term yoga on cardiovascular system in various age groups showed similar results (14, 15, 16, 6).

Environmental conditions and variety of behavioural factors such as stress, anxiety, affective and attitudinal dispositions of the individual influence the cardiovascular responses. Yogic exercise involves physical, mental and spiritual task in a comprehensive manner. It brings about the behavioural changes. Yoga in long duration affects hypothalamus and brings about decrease in the systolic and diastolic BP through its influence on vasomotor centre, which leads to reduction in sympathetic tone and peripheral resistance (6).

The correlation of age with blood pressure, both systolic and diastolic is stronger in the control group than in the study group (Table III). This suggests that rise in blood pressure is not an inevitable consequence of increase in age, but is a result of the aging process which may be slower in practitioners of yoga.

The significant negative correlation of valsalva ratio with age was observed in both the groups, which indicates reduced baroreflex sensitivity with age (9, 12, 17). This non-invasive technique marks the parasympathetic activity and is increased in the study group as shown in Table II. Yoga involves pranayama i.e. voluntary alteration of the breathing pattern and scientists working on yoga found increased parasympathetic tone in yoga practitioners especially trained in pranayama (18, 19).

Thus from our study it seems that cardiovascular parameters alters with age but these alterations are slower in persons aging with yoga.

So yoga can be used as an intervention in aging persons to reduce the morbidity and mortality from cardiovascular diseases which are now toping the lists.

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