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EFFECT OF ANULOMA–VILOMA PRANAYAMA ON BLOOD PRESSURE IN YOUNG ADULTS

Physiology

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ABSTRACT

Introduction: Breathing is the most important function in the body but it is the most neglected one. Learning to control the breath allows to control body function. "Pranayama" the breathing practice consisting of conscious inhalation, retention and exhalation is often practiced in conjunction with "Dhyana"(Meditation), and "Asanas"(physical posture).
Material and Methods: Present study was a cross sectional study. Fifty (50) normal subject of either sex were selected for the study. They were divided equally in two groups, yoga group A (case) and not practicing yoga group B (control), each comprising of 25 subjects. The blood pressure of the subjects were examined to see the effect of forced nostril breathing on blood pressure by using mercury sphygmomanometer.
Statistical Analysis: Collected data was compared and analyzed by student paired 't' test.
Results: There was significant decrease in systolic blood pressure in yoga group A (case). There was no significant decrease of diastolic blood pressure in yoga group A (Case).
Conclusion: The present study suggest that regular practice of yoga improves cardio-respiratory functions as shown by decrease in SBP and DBP. The Present study revealed that Yoga reduced the sympathetic activity and increased the parasympathetic activity, leading to improvement in vagal tone as shown by decrease in heart rate.

KEYWORDS

Pranayama, Blood Pressure, Dhyana, Asanas, Yoga, Anuloma-viloma, Young Adults.

INTRODUCTION:

Breathing is the most important function in the body but it is the most neglected one. Learning to control the breath allows to control body function.

Nasal cycle is characterized by alternating patency of the nostrils every two to eight hours.[1]

"Yoga" is Sanskrit word derived from the root "yuj" which means union. Yoga is mind-body technique which involves relaxation, meditation and a set of physical exercise performed in sync with breathing. Yogic lifestyle, Yogic diet, Yogic attitude and various Yogic practices help man to strengthen his body and mind and develop positive health, enabling him to withstand stress by normalizing the perception of stress, optimizing the reaction to it and by effectively releasing the pent-up stress though various Yogic practice.[2]

Pranayama, the Fourth limb in the Ashtanga Yoga has its earliest reference in the Vedic literature, which extends back from approximately 1500 BC .Along with passage of time, the concept as well as the techniques of Pranayama have undergone a change indicating definite stages of evolution expansion. [3]

The word "*Pranayama*" is made up of two words, *Prana* and *Ayama*. *Prana* stands for the capacity to keep body alive by air, i.e breath and *Ayama* means expansion, stretching or extension and control of breath. Thus Pranayama means the art of controlling prana.

"Pranayama" the breathing practice consisting of conscious inhalation, retention and exhalation is often practiced in conjunction with "Dhyana" (Meditation), and "Asanas" (physical posture).[4] Pranayama consist of three phases: "puraka" (inhalation); "kumbhaka" (retention) and "rechaka" (exhalation) that can be either fast or slow. Breathing is not only an instinctive reflex to satisfy the need of the body for oxygen but it has been considered that consciously controlled breathing can be used as a technique for enhancing mental and physical power.[5].

Right nostril breathing activates sympathetic nervous system and left activate parasympathetic. Alternate nostril breathing brings about balance in the Autonomous nervous system. A practitioner of anuloma-viloma pranayama not only tries to breathe, but at the same time, also tries to keep his/her attention on the act of breathing, leading to concentration. These acts of concentration remove his attention from worldly worries and de stress him/her. This stress free state of mind evokes relaxed response. In this relaxed state, parasympathetic nerve activity overrides sympathetic nerve activity[6].

The aim of our present study was to study the effect of "Anuloma-viloma" Pranayama on blood pressure in young adults.

MATERIAL AND METHODS:

Study Design

Present study was a cross sectional study.

Sample Size

Fifty (50) normal subject of either sex were selected for the study.

Duration of total study

The study included one month yoga training i.e. alternate nostril breathing and breath awareness that is covered by arbitrary number of breath cycle as per capacity of the subject for total ten minute duration. The subject were tested before and after four weeks of forced nostril breathing training after informed consent.

Place of study

Department of Physiology, Santosh Medical College, Ghaziabad after taking Ethical Clearance from the ethical committee of the institute.

Inclusion Criteria

1. Young healthy subject of either sex having good general physical condition.
2. Age between 17-25 years.
3. Subject of average height, built and weight matched with respect to body mass index.
4. Willing to participate.

Exclusion Criteria

Subject with the history of any of the following were excluded the study:

1. Tuberculosis and major psychiatric illness.
2. Smoking and alcohol intake.
3. Long term drug therapy for any disease.
4. Subject with moderate to severe depression, anxiety or stress.
5. Malignant hypertension.
6. Athletes

Blood pressure :
The blood pressure of the subjects were examined by using mercury sphygmomanometer (Pagoda) with a least count of 2 mmHg using standardized procedure after 5 min rest to the subject in the left arm of the subject which was kept at heart level in the sitting position. Blood pressure examined before pranayama and after five minute of pranayama again blood pressure was examined.

Forced nostril breathing
1. Subjects were asked to close the right nostril with right thumb and inhale through the left nostril for four seconds.
2. Immediately after completion of above, the subjects were asked to closed the left nostril with right ring finger and little finger, and at the same time were asked to remove thumb from the right nostril, and exhale through this nostril for eight seconds. This completed a half round.
3. In order to complete one full round, the subjects were asked to repeat step one and two.

STATISTICALANALYSIS:
The collected data was entered in to Micrososft Excel and both groups were compared and analysed by student paired 't' test using SPSS software 22.0.

RESULT:
Table 1.Anthropometric parameters of Yoga & Non Yoga group comparision

SNo	Parameter	Yoga Group A (N-25)	Non Yoga Group A (N-25)	P Value
1	Age (yrs)	18.40 ± 1.58	19.28 ±2.05	0.0956 NS
2	Height (cm)	157.48 ± 9.11	166.38 ± 6.85	0.0003 S
3	Weight (kg)	54.48 ± 9.67	58.04 ± 8.92	0.1824 NS
4	BMI (kg/cm2)	19.76 ± 4.23	20.91 ± 2.47	0.2500 NS

Table 2.Comparison of SBP & DBP in yoga group A (case) before and after 30 days of Pranayama

Parameters	N	Before	After	p
SBP (mm of Hg)	25	122.56 ± 4.49	116.88 ± 4.20	<0.01 Significant
DBP (mm of Hg)	25	76.24 ± 4.29	74.56 ± 2.61	0.032744 Not Significant

Table 3. Comparison of SBP & DBP in non yoga group B (control) before and after 30 days of Pranayama

Parameters	N	Before	After	P
SBP (mm of Hg)	25	122.72 ± 3.35	121.92 ± 2.27	0.319111 Not Significant
DBP (mm of Hg)	25	75.92 ± 4.91	75.83 ± 3.17	0.101296 Not Significant

Table 4. Comparison of SBP & DBP in yoga group A (case) & non yoga group B(control)

Parameters	N	Yoga Group A	Non Yoga Group B	P
SBP (mm of Hg)	**25**	**116.88 ± 4.20**	**121.92 ± 2.27**	**<0.01 Significant**
DBP (mm of Hg)	**25**	**74.56 ± 2.61**	**76.48 ± 3.17**	**0.023891 Not Significant**

Table 5 . Comparison of SBP in yoga group A (case) before and after 30 days of Pranayama

Parameters	N	Before	After	P
SBP (mm of Hg)	25	122.56 ± 4.49	116.88 ± 4.20	<0.01 Significant

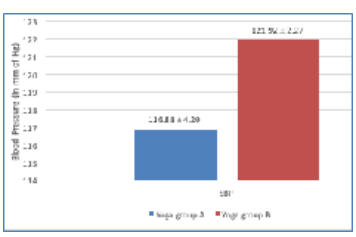

Fig 1. Comparison of SBP in yoga group A & non-yoga group B after 30 days of Pranayama

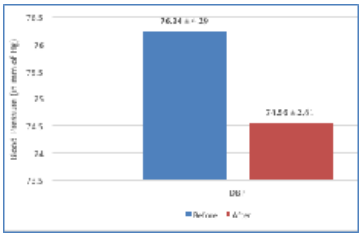

Fig 2. Comparison of DBP in yoga group A (case) before and after 30 days of Pranayama

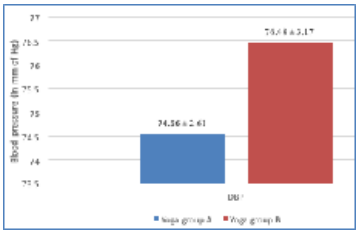

Fig 3. Comparison of DBP in yoga group A & non-yoga group B after 30 days of Pranayama

DISCUSSION:
The present study was conducted among 50 healthy subjects of 17-25 years of age who had never done any kind of Pranayama training. They were divided equally in two groups, yoga group A (case) and non yoga group B (control), each comprising of 25 subjects. Yoga group A was subjected to pranayama training for 30 days and has been compared with non yoga group B who did not undergo Pranayama training. The study was aimed to assess the physiological effect of 30 days of Pranayama training on blood pressure.

Systolic Blood pressure
We observed significant decrease in systolic blood pressure in our study in yoga group A (case). Significant decrease in systolic blood pressure in our study is in according with findings of Singh et al , A Singh et al[18] and Dandekar Pradnya Deepak[9]. The former studies suggested that significant change in the result after yoga might be due to immediate effect on peripheral vascular resistance to reduce heart rate.

Dandekar Pradnya Deepak[9] attributed the decrease in systolic blood pressure to balance in autonomic nervous system by Anulom Vilom Pranayama and also suggested that short term practice of Anulom Vilom could get better parasympathetic control over heart.

Indla Devsana et al[10] showed highly significant decrease in systolic blood pressure as well as significant decrease in diastolic blood pressure after practicing Asana, Pranayama and Meditations for 6 months.

Yoga practice increase vagal tone, decrease the work load on heart leading to decrease in cardiac output and hence systolic blood pressure and it also affects the hypothalamus directly and brings about decrease in blood pressure (in both systolic and diastolic blood pressure) through its influence on vasomotor centre which leads to reduction in sympathetic tone and peripheral resistance[11].

Diastolic Blood Pressure
Our study reported non significant decrease of diastolic blood pressure in yoga group A (Case) and the findings are in accordance with study of Singh et al[18] and Danekar Pradnya Deepak[9].

Diastolic blood pressure mainly varies with the degree of peripheral resistance Guyton,1996 [7] and heart rate. Non significant change in diastolic blood pressure observed in the present study suggested that Nadi-shodhana Pranayama might have no long term effect on peripheral vascular resistance or it has some roles, but is obscured by a slow heart rate but it may need practice for longer periods[12].

The following reasons may be possible for the significant decrease in heart rate and blood pressure;
Blood pressure and pulse rate are controlled by autonomic nervous system. Pranayama increases cardiac output, decreases hepato-renal

blood flow and increases peripheral blood vessels blood flow[12].Nadi-suddhi brings a balance in autonomic nervous system[13].Yoga practitioner not only tries to breathe, but also tries to keep his attention on act of breathing leading to concentration. This diverts his attention from wordly worries and destresses him. In this relaxed position, parasympathetic activity overrides sympathetic activity[8].Lung inflation has been known to decrease sympathetic vascular resistance. This response is initiated by pulmonary stretch receptors which bring about withdrawal of sympathetic tone in skeletal muscle, blood vessels leading to wide spread vasodilatation thus bringing up decrease in peripheral resistance[14].

Such breathing is economical because it reduces dead space ventilation and refreshes air throughout the lungs, In contrast,shallow breathing refreshes air only at base of lungs Bijlani,2004 [15]. Deep breathing is called "diaphragmatic" because it emphasizes the use of the diaphragm [16]. Due to training, respiratory centre is acclimatized to withstand lower pO2 and higher pCO2 in blood [17].

Thus by practicing yoga for few weeks, the respiratory centre is adjusted to a new pattern of breathing which is slower than it's basal rhythm leading to decrease in respiratory rate. Jerath et al,2006 [19] has explained the mechanism of how pranayamic breathing interacts with the nervous system affecting metabolism and autonomic functions remains to be clearly understood.

It is our hypothesis that voluntary slow deep breathing functionally resets the autonomic nervous system through stretch – induced inhibitory signals and hyperpolarization currents propagated through both neural and non neural tissue which synchronizes neural elements in the heart, lungs limbic system and cortex. During inspiration, stretching of lung tissue produces inhibitory signals by action of slowly adapting stretch receptors and hyperpolarization current by action of fibroblasts. Both inhibitory impulses and hyperpolarization current are known to synchronize neural elements leading to the modulation of the nervous system and decreased metabolic activity indicative of the parasympathetic state [20]. Other authors have also proposed that pranayama acts through a cellular and systems level perspective, involving both neural and non neural elements[18]. So it was concluded from the present study that during yoga practices, one consciously and consistently overrides the stimuli to respiratory centers, thus acquiring some degree of control over the respiration [17].

CONCLUSION:

Making Yoga a part and parcel of our day to day routine may condition the cardiac and respiratory system leading to prevention and onset of diseases like Asthma COPD and Hypertension more importantly in the later stages of life.

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