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# Distibution of ABO and RH (D) Blood Group System among Phase I MBBS Students in North East Karnataka

**Anitha Lakshmi*, Leena S. Hiremath****

**Abstract**

*Background:* Knowledge of blood group distribution is also important for clinical studies, for reliable geographical information and it will help a lot in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths. *Aims and Objectives:* To study the distibution of ABO and Rh(D) blood group system among phase I MBBS students in North East Karnataka. *Material and Methods:* The retrospective study done by using records of 300 healthy medical students of 2014-15 and 2015-16 batch studying at the Vijayanagar Institute of Medical Sciences belonging to both the sexes volunteered for the study. The study was conducted at the department of Physiology during the month of August 2015. *Results:* Distribution of ABO blood group system among phase I MBBS students. The study shows the distribution of various blood groups in numbers as well as in percentage form. Males constituted 60% and females constituted 40% of this study. 'B' blood group formed the most common with 52% (50.6% B+ and 1.4% B-) followed by 'O' blood group with 22%( 21% O+,1% O-). 'A' blood group with 16%(14.2% A+, 1.8% A-). AB blood group with 10% (9% AB+.1% AB-). *Conclusion:* The study depicts the frequency occurrence of different blood groups among the students in VIMS, Bellary. Also to create awareness as to which blood groups should be stored and given importance.

**Keywords:** Blood Group; ABO System; Students; Percentage; North East Karnataka.

## Introduction

Since the discovery of the ABO blood group by Landsteiner, different blood typing systems have been devised. Blood group antigens are integrated parts of the red blood cell (RBC) membrane and have many essential functions (membrane transporters and protein canals, ligand receptors, adhesion molecules, enzymes, and structural proteins). These surface antigens also have different biochemical compositions [1].

Knowledge of blood group distribution is also important for clinical studies, for reliable geographical information and it will help a lot in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths. Apart from their importance in blood transfusion practice, the ABO and Rh blood groups are useful in population genetic studies, researching population migration patterns as well as resolving certain medico legal issues, particularly of disputed paternity cases. In modern medicine besides their importance in evolution, their relation to disease and environment is being increasingly important. It is, therefore imperative to have information on the distribution of these blood groups in any population group [2].

The ABO and Rh blood group system is the most important system in transfusion and organ transplants [3]. The ABO system derives its importance from the fact that A and B are strongly antigenic and anti A and anti B occur naturally in the plasma of persons lacking the corresponding antigen. These antibodies are capable of producing hemolysis in vivo. From the point of view of transfusion, rhesus blood group system is the second most important blood group [4].

Our aim was to determine the distribution of

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different blood groups in this region. Blood group determination was carried out for 2 year batch phase I MBBS students, from 2014 -15, 2015-16.

*Aims and Objectives*

To study the distibution of ABO and Rh(D) blood group system among phase I MBBS students in North East Karnataka.

## Material and Methods

The retrospective study done by using records of 300 healthy medical students of 2014-15 and 2015-16 batch studying at the Vijayanagar Institute of Medical Sciences belonging to both the sexes volunteered for the study. The study was conducted at the department of Physiology during the month of August 2015.

*Statistical Analysis*

The data analysis was carried out using the Statistics (SPSS). Statistical significance of difference in mean values between groups was assessed using independent samples t-test.

## Results

Table and graph showing distribution of ABO blood group system among phase I MBBS students. Table shows the distribution of various blood groups in numbers as well as in percentage form. Males constituted 60% and females constituted 40% of this study. 'B' blood group formed the most common with 52%(50.6% B+ and 1.4% B-) followed by 'O' blood group with 22%( 21% O+,1% O-). 'A' blood group with 16%( 14.2% A+,1.8% A-). AB blood group with 10%( 9% AB+.1% AB-).

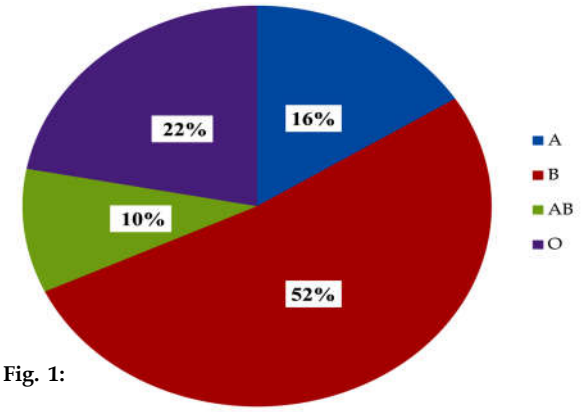


**Fig. 1:**

**Table 1:**

| Blood Groups | Percentage |
|---|---|
| A | 16 |
| B | 52 |
| AB | 10 |
| O | 22 |

## Disscussion

In this study, the distribution of ABO and Rh blood groups. The results of this study were comparable to the studies done at Eastern Ahmedabad, Punjab and Pakistan. All these studies have described 'B' as the most frequent and 'AB' as the least common blood group [2]. In our study also similar findings of 'B' as the most frequent and 'AB' as the least common blood group. The study by Nanu and Thapliyal in North Indian population reports that group B was predominant [5].

In this study, B was the most common blood group followed closely by the O group. This finding is in concordance with other studies published from India [5,7]. However, overall worldwide frequency of the B antigen is low, excluding some areas, such as central Asia and Africa. In studies from Europe, America, and South East Asia, the O antigen has been found to be the most common blood group [8,9]. The study also estimates the gene frequency of ABO and Rh (D) genes under the standard assumption of Hardy Weinberg equilibrium. It was found that while the distribution of ABO blood groups did not differ significantly from those expected under the Hardy Weinberg equilibrium, it differed significantly in case of Rhesus group. These findings were very similar to those reported by Wagner et al [6].

## Conclusion

The present study has a significant implication regarding the management of blood bank and transfusion services in the area. Knowledge of blood group distribution is also important for clinical studies, reliable geographical information and for forensic studies. The different types of information are useful for medical diagnosis, genetic information, genetic counseling and also for the general well-being of individuals [2].

The study depicts the frequency occurrence of different blood groups among the students in VIMS, Bellary. Also to create awareness as to which blood groups should be stored and given importance.

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# Physical Fitness Index among Runners and Healthy Controls, Its Correlation with Resting Heart Rate

**Jyothi Shivalingaiah*, Mangala Gowri S.R.**, Sunil S. Vernekar***, Adarsh S. Naik******

**Abstract**

*Background & Objective:* Practicing exercises on regular basis will reduce the cardiovascular diseases and also reduce death due to cardiac complications. The independent and additional benefit of practicing physical exercises regularly help in improving the aerobic condition of the body and also helps in leading healthy life. Physical fitness index is one of the important parameter which is not given much attention. To measure the physical fitness index among Indian elite runners and compare it with control group, by using Harvard step test. To correlate the PFI of runners with resting heart rate. *Methods:* PFI and BMI, HR of 31 runners at national level was compared with that of 31 controls. Runners were divided into two groups, group A (>2yrs & < 3yrs of training) and group B (>3yrs & < 10yrs of training).Correlation of PFI with resting Heart rate was done. *Results:* PFI was high among runners and showed statistically significant values. Group B players (seniors) showed highly statistically significant PFI value. Correlation analysis has shown negative correlation of PFI with resting Heart rate with statistically significant value in runners. *Conclusion:* Improvement in PFI by regular practice will ultimately improve cardiorespiratory endurance in turn improving the sports performance.

**Keywords**: Runners; Physical Fitness Index (PFI); Harvard Step Test; Heart Rate (HR).

## Introduction

Since ancient times sports has been considered as an important part of extracurricular activity. In India, many competitions are organized to encourage athletes. Many training institutions have been contributing towards the upliftment of an athlete. Due to vast population in sports field whatever contribution is done appears to be less.

Many factors affect the physical fitness of the player like Age group, gender, nutritional status and also the socio economic status. These factors should be properly coordinated so that players can put maximum effort and give the best performance [1].

The physical fitness index (PFI) measures the physical status of the muscle power and nutrition, and also measures the ability of the individual to recover after muscular work. The study was taken up to measure (PFI) using modified Harvard step test [2].

The Harvard step test (HST) was started by Brouha et al (Brouha et al,. 1943). From Harvard fatigue laboratory in USA to select soldiers during World War II. HST has become well known to study cardiovascular fitness by American Alliance for Health physical education research and Dance (AAHPERD). They standardized this test to assess physical fitness program in youth [3,4].

Cardiovascular diseases can be diagnosed or detected by cardiac stress tests like Harvard Step Test. It is a better indicator of fitness and also assesses the ability of a person to recover following a strenuous exercise. The faster the heart rate comes back to resting phase; the person's fitness will be better [5].

The sympathetic and parasympathetic nervous system regulates Heart rate (HR) by acting directly on the sinus node. During resting phase, heart rate is predominantly regulated by vagal activity (parasympathetic), which is gradually inhibited by the beginning of the exercise. Many studies have been

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taken up by researchers to study the variations of heart rate in different conditions and during exercises. In last few decades studies have shown acute and chronic effects of exercises on human body such as higher heart rate in the initial stage of exercise and gradual adjustments for training which showed lower heart rate for same intensity of sub maximal exercises. As heart rate can be easily measured, many studies have been taken up by the researchers on variations in heart rate (HR) in different types of exercise and conditions [5].

In the era of competitions winning is what being honored; for which the performance counts. Performance depends on many factors but PFI and its correlation with HR is one among that which is not given that much importance. Resting HR is very important factors which need to be concentrated more along with other fitness parameters when we look for the performance in a sports event. Studies have been conducted in physical fitness index in normal population, in swimmers, school going girls and boys, but to our knowledge there is paucity in literature regarding the relation between PFI and relation with Heart Rate.

## Materials and Methods

The present cross sectional study was conducted in the Department of Physiology, Jawaharlal Nehru Medical College, Belgaum, between January 2010 and December 2010.

### *Description of Participants*

Using universal sampling 31 runners who regularly practiced for a minimum period of 2 years and who were in the age group of 18-25yrs were included and 31 controls age (18–25 yrs) and sex matched participants from first year MBBS, BDS, AHSC and BPT were selected by randomization. Based on the duration of training the participants were split into two groups. Group A consisted of runners with >2yrs and ≤ 3 years of practice and Group B included the players with > 3 years and < 10 yrs of training. On an average practices were held for four to five hours per day, six times per week. Throughout the year apart from running practices all participants were involved in additional sessions of strength training and conditioning, speed and stretching both pre-season and during the competitive season. Similar training regimens were followed by both the groups. Participants with respiratory, neuromuscular, cardiac, endocrine disorders and students from comparative group who practice regular exercise regime were excluded from study. Descriptive data of the participants age, medical history, training schedule regarding number of years of practice, and dietary history were obtained by questioning the participants. Nature of the study was explained and written informed consent was obtained from them. The study was approved by the Ethical and Research Committee of the institution.

### ***Physical Fitness Index (PFI)*** [4,6,7]

#### *Equipment Required*

Stopwatch, step or platform of 20 inches height, metronome which gives beat every 2 seconds at a rate of 30 per minute.

#### *Procedure*

The runner steps up and down on the platform at a rate of 30 steps per minute (every two seconds) for 5 minutes or till gets tired. Exhaustion is defined as when the athlete cannot maintain the stepping rate for 15 seconds. After completing the test the participant immediately sits down, and the total number of heart beats is counted between 1 to 1.5 minutes after finishing. Total test time in seconds was noted down.

*Scoring:* the Fitness Index score is determined by the following equations

$$\textbf{Physical Fitness Index (PFI)} = \frac{100 \times \text{test duration in seconds}}{5.5 \times \text{pulse count between 1 and 1.5 minutes}}$$

Heart Rate [8].

The radial artery is palpated with the tips of three fingers compressing the vessel against the head of radius bone. The subject's forearm should be slightly pronated and the wrist slightly flexed. The index finger (toward the heart) varies the pressure on the artery, the middle finger feels the pulse, while the distal finger prevents reflections of pulsations from the palmer arch of arteries.

#### *Statistical Analysis*

Statistical analysis involved quantitative variables summarized through mean and standard deviation. Difference between mean of the two groups of runners was tested using Students unpaired, t test, where significance of the p value was < 0.05. To evaluate strength of association between physical fitness index

(PFI) and resting heart rate among runners Karl Pearsons correlation coefficient was used.

## Results

Table 1 and graph 1 summarize the Harvard step test readings of the runners and controls. Mean Heart rate between 1–1.5 min was less in runners than controls and the difference statistically significant ($p < 0.05$). Physical fitness index (PFI) was found to be more in runners than controls and with statistically significant value ($p<0.05$).

Table 2 and graph 2 summarize the Harvard step test readings of the two groups of runners. Mean Heart rate between 1 – 1.5 min was less in group B than group A, which was found to be statistically significant ($p < 0.05$). Physical fitness index (PFI) was found to be more in group B than group A and with statistically significant difference ($p<0.05$).

Table 3 and graph 3 shows correlation between PFI and HR, Negative correlation was found between PFI and HR in runners and was statistically significant ($p<0.01$).

**Table 1:** Comparison of Physical Fitness Index (PFI) between runners & controls

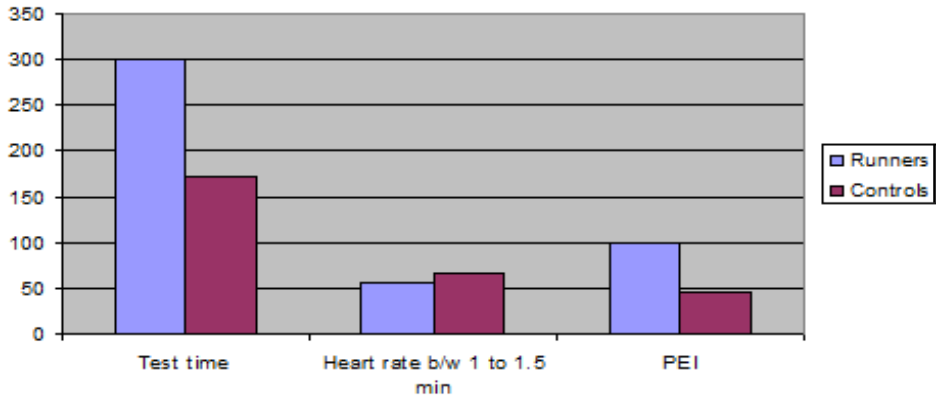
| | Runners | Controls | P-value |
|---|---|---|---|
| Test time | 300±0 | 171.9±55.70 | 0.000* |
| Heart rate b/w 1 to 1.5 min | 56.1±10.16 | 66.2±6.94 | 0.000* |
| PEI | 100.4±18.87 | 46.7±14.35 | 0.000* |

(*) p value significance<0.05

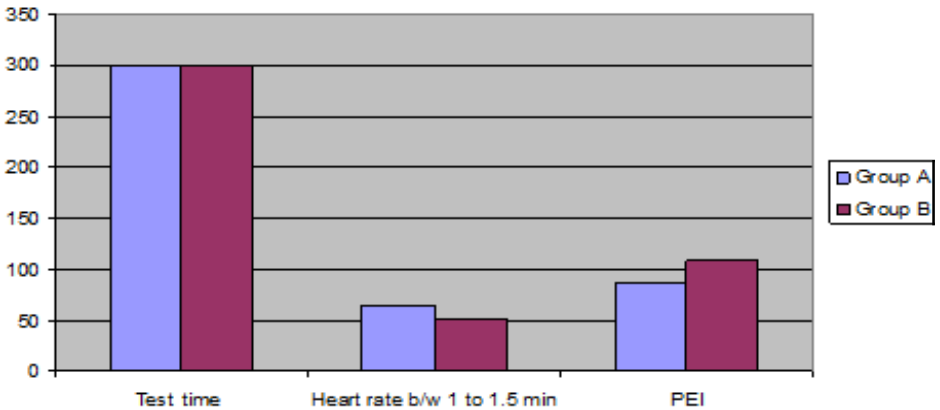
**Table 2:** Comparison of Physical Fitness Index (PFI) between two groups of runners

| | Group A | Group B | P-value |
|---|---|---|---|
| Test time | 300±0 | 300±0 | 1 |
| Heart rate b/w 1 to 1.5 min | 64.1±8.51 | 51.1±7.59 | 0.000* |
| PEI | 86.5±13.02 | 109.2±16.70 | 0.000* |

(*) p value significance<0.05




**Graph 1:** Comparison of Physical Fitness Index (PFI) between runners & controls



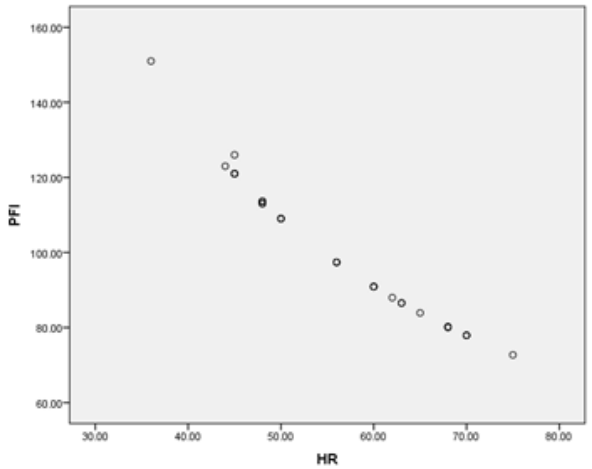

**Graph 2:** Comparison of Physical Fitness Index (PFI) between two groups of runners

**Table 3:** Correlation of Physical Fitness Index with Heart Rate in runners

| Correlations | | |
|---|---|---|
| | **PFI** | **HR** |
| PFI | 1 | -.982** |
| | | .000 |
| HR | -.982** | 1 |
| | .000 | |

**. Correlation is significant at the 0.01 level.

**. Correlation is significant at the 0.01 level.




**Graph 3:** Correlation of Physical Fitness Index with Heart Rate in runners

## Discussion

We have done our study on national and international runners. We have got significantly higher PFI in more trained runners and in comparison with controls the mean value is greater for runners.

In our study PFI Score of runners was higher than controls and between runner groups more years of training had a higher PFI score.

Capability of an organism to release higher quantities of energy during the period of time allows elaborating more intensive physical activities. This seems very important to majority of athletes and, what is more, it could be even decisive for one's championship level. It is generally agreed that aerobic capability is best reflected on the cardiopulmonary function and other components of oxygen transport capacity [9]. Many studies have showed aerobic power as the major criteria for assessing physical fitness as it can be measured quantitatively. The maximal aerobic power is defined as the maximum amount of oxygen uptake an individual can attain during physical work at sea level. Physical activity ranging from repeated work periods of a few seconds duration up to hours of continuous work may involve a major load on the oxygen transport organs and there by induce a training effect. Three tests are used to measure maximal aerobic power namely, – 1) running on a treadmill 2) Bicycle ergometer 3) Step test. The Harvard step is a sub maximal fitness test, as it predicts cardiovascular endurance from the increase in the heart rate during moderate exercise, rather than exercise to exertion [10].

In our study finding of Harvard step test was significant suggesting faster recovery in senior players (B group) due to aerobic training. Longer duration of practice might be contributing to the high PFI in senior group. Fitness index is directly proportional to the duration of exercise and inversely proportional to post exercise pulse counts. The higher PFI score in player group than controls proves that definitely the players are more physically fit than the controls that is attributed to the effect of their training sessions.

There was a statistically significant negative correlation of Physical Fitness Index with resting Heart rate. Lower resting HR reflects a healthy and fit body, whereas higher values are apparently related to a increased risk of morbidity and mortality [11]. In sports, mistake is made in using the resting-HR as an indicator of the degree of aerobic conditioning, since the association between low resting-HR and maximal aerobic power is quite modest, and may be due to higher resting vagal activity [5], reducing diastolic depolarization rate and prolonging duration of the cardiac cycle, primarily on account of a proportionally longer diastole [5,12]. However, can training induce higher resting vagal activity, and therefore be accountable for lower resting-HR [5].

## Conclusion

Physical Fitness Index score improving training sessions have to be held for athletes to develop their cardiorespiratory endurance and in turn to increase the performance. Apparently, in comparison with sedentary individuals aerobically well-fit individuals have more effective autonomic activity, there is indication that individuals with better cardiac vagal

tone have a better response to aerobic training, which lead us to question whether aerobically well-fit athletes have a higher cardiac vagal tone due to training or those individuals with genetically higher cardiac vagal tone have a higher potential to become elite athletes if properly trained.

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Original Research Paper

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# Evaluation of Pulmonary Function in Traffic Policemen

**Muniyappanavar N.S.*, Rajkumar R. Banner****

**Abstract**

*Introduction*: The nature of some jobs and the related exposures predispose certain groups of workers to considerably larger risk of developing occupational lung diseases. Occupational lung disorders studies in India have mostly been among industrial workers exposed to occupational hazards. Traffic police, who are continuously exposed to high levels of ambient air pollution, however has attracted less attention. This study was done in this context, among 40 traffic policemen to assess effect of exposure to traffic pollution on pulmonary function. *Aims and Objectives*: To study the pulmonary functions in traffic policemen and to compare the same with matched control group. *Materials and Methods*: In this study pulmonary functions such as FVC, $FEV_{1,}$ $FEV_1$/FVC, MVV, PEFR parameters were studied in 40 traffic policemen in the age group of 30-45 years. These parameters were compared with matched apparently normal healthy control group selected from general population using unpaired 't' test. *Results*: The present study shows that among traffic policemen and controls, traffic policemen have statistically significant low values of forced vital capacity (FVC) (P=0.0015), Forced expiratory volume in first second ($FEV_1$) (P=0.0012), $FEV_1$/FVC (P=0.0001), Maximum Voluntary Ventilation (MVV) (P=0.0153) and Peak Expiratory Flow Rate (PEFR) (P=0.0016). *Conclusion*: There is significant decrement in pulmonary function parameters in the traffic policemen exposed to vehicle exhaust as compared to control group. This reduction in pulmonary function can be detected with spirometry before pulmonary functions are grossly impaired.

**Keywords:** Traffic Policemen; FEV1; FVC; PEFR; Pulmonary Function.

## Introduction

Health of a person is mainly affected by the atmosphere in which they work, thus making occupation an important determinant of health [1]. Air pollution in cities is mainly due to emissions from automobile vehicles. Indian cities are growing rapidly. This has led to an increase in the use of motor vehicles with a subsequent rise in the levels of air pollution. Exposure to air pollutants is known to be harmful to health in general, and to the lungs. Especially traffic policemen are at high risk [2]. Airborne dust constitutes most significant source of ultrafine particles in urban environment. Automobile exhaust is a major hazard for traffic policemen.

Present day urban environment is polluted by vehicular exhaust due to increase in number of automobile vehicles working on diesel and petrol fuels. They emit hydrocarbons, carbon monoxide, lead, nitrogen oxides and particulate matters. Carbon monoxide is one of the common and widely distributed air pollutants produced by incomplete combustion of carbon containing materials. Coarse particle of size more than 2.5 μm usually contains earth's crustal material and fugative dust from vehicular source mainly. Smaller particles less than 2.5 μm contain secondarily formed aerosols, combustion particles and recondensed organic and metal vapours [3].

According to the World Health Organization (WHO), air pollution is responsible for increase in morbidity and mortality due to respiratory diseases [4]. Chronic exposure to air pollution may cause reversible reduction in lung function and can produce symptoms of asthma and chronic obstructive lung disease [5]. Many studies have shown significant reduction of pulmonary function parameters (FVC,

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FEV1, FEV1/FVC% etc) in traffic policemen [2,6,7].

High concentrations of traffic fumes affects urban workers such as traffic policemen, street sweepers, postman, and newspaper vendors, indicating health risks related to outdoor environment.. Traffic policemen are in outdoor environment exposed to dust and other pollutants without any preventive measures makes them susceptible for reduced pulmonary functions [8].

The present study is conducted to evaluate the pulmonary functional status in traffic policemen of Bidar city, Karnataka, India who have exposed to long term vehicular pollution and to compare the findings with normal healthy matched controls.

## Materials and Methods

The present comparative cross sectional study was conducted on randomly selected 40 male policemen from those engaged in traffic control in Bidar city, Karnataka, India. A similar number of age and sex matched persons were randomly selected from general population as controls who were not occupationally exposed to ambient air pollution at work place. Strict inclusion criteria was followed which included - age group of 30 to 45 years, service period above 3 years, non-smokers. The informed consent was taken after the detailed procedure and purpose of the study was explained. Ethical committee clearance was taken from ethical committee.

Those with history of chronic respiratory disorders, cardiac disease, systemic disorders affecting respiratory system, mentally handicapped and smokers were excluded from the study. A thorough history taking & clinical examination was carried out to rule out the exclusion criteria and the vital data was recorded.

Various spirometric measurements were made on both control and study groups with a portable, computerized spirolyzer. The recordings were carried out between 10am-12noon. All the manoeuvres were performed in sitting position. Thorough instructions were given to each subject regarding the test and sufficient time was provided to practice the manoeuvres. A soft nose clip was put over the nose to occlude the nostrils and disposable mouthpieces were used to minimize cross infection.

*Statistical Analysis*

The data obtained were expressed as mean $\pm$ standard deviation and analyzed using the student unpaired t-test. A 'p' value less than 0.05 was considered to be statistically significant.

## Results

The recorded anthropometric data in traffic police personnel and control groups did not show any statistical significance as shown in Table 1. The present study shows that among traffic policemen and controls, traffic policemen have statistically significant low values of forced vital capacity (FVC) (P=0.0015), Forced expiratory volume in first second ($FEV_1$) (P=0.0012), $FEV_1$/FVC (P=0.0001), Maximum Voluntary Ventilation (MVV) (P=0.0153) and Peak Expiratory Flow Rate (PEFR) (P=0.0016) as shown in Table 2.

**Table 1:** Anthropometric Data.

| Parameters | Traffic Police Mean ± SD | Controls Mean ± SD | P value |
|---|---|---|---|
| Age(yr) | 35.30 ± 2.10 | 36.22 ± 2.16 | P=0.0571 |
| Height(cm) | 169.33 ± 2.44 | 168.19 ± 4.24 | P=0.1445 |
| Weight(kg) | 69.35 ± 6.48 | 68.66 ± 22.14 | P=0.8505 |
| BMI ($kg/m^2$) | 24.15± 40.26 | 24.09± 42.26 | P=0.9948 |

**Table 2:** Pulmonary Function Parameters of Traffic policemen and controls

| Parameters (Ltrs) | Traffic police Mean ± SD | Controls Mean ± SD | P value |
|---|---|---|---|
| FVC(L) | 2.62 ± 2.40 | 3.10 ± 2.61 | P=0.0015 |
| $FEV_1$(L/sec) | 2.12±0.84 | 2.62±0.42 | P=0.0012 |
| $FEV_1$/FVC (%) | 80.91 ± 3.21 | 84.51 ± 1.21 | P=0.0001 |
| PEFR(L/sec) | 7.48 ± 0.88 | 8.34 ± 1.41 | P=0.0016 |
| MVV(L) | 131.46±22.62 | 144.42 ±24.10 | P=0.0153 |

## Discussion

Traffic police are one of the major groups who are exposed to toxic fumes and exhaust from vehicles throughout their work. Out of the 40 traffic police personnel studied, no one reported the use of an appropriate respirator during their duty hours. Thus

there are many health and safety issues surrounding them as they are involved in traffic control activity in a polluted atmosphere. Health of traffic police personnel, who serves the need of the public, is very important because it could affect the well being of the community. In this regard this study was conducted to evaluate pulmonary functions in traffic police personnel. A computerized portable spirometer was used in this study. Similar spirometers are used in hospitals and research labs to evaluate pulmonary parameters.

Our study clearly shows that among traffic policemen and controls, traffic policemen have statistically significant low values of forced vital capacity (FVC) (P=0.0015), Forced expiratory volume in first second ($FEV_1$) (P=0.0012), $FEV_1$/FVC (P=0.0001), Maximum Voluntary Ventilation (MVV) (P=0.0153) and Peak Expiratory Flow Rate (PEFR) (P=0.0016).

We observed significantly low FVC values in traffic policemen as compared to control group. There may be some degree of restriction present in the lungs of study group. This might be due to chronic irritation of lungs by air pollutants. $FEV_1$ values which denote strength of expiratory muscles were also reduced in the study group than controls possibly due to obstruction of air ways during expiration.

A better indicator of the condition of the bronchial musculature $FEV_1$/FVC was also reduced significantly in traffic policemen than controls. It indicates that they suffer from combined obstructive and restrictive type of pulmonary disorder. These findings are in agreement with findings of other investigators [9-15].

Maximum voluntary ventilation (MVV) which depend both on the patency of airways and strength of respiratory musculature was significantly low in the study group than the control group. MVV reduction might be due to increased resistance to air movement in the lungs [16].

Peak expiratory flow rate (PEFR) was significantly decreased in case of study group than controls. The PEFR is an effort dependent parameter emerging from the large airways within about 100–120 ms of the start of the forced expiration [17-18] thus indicates the capacity of expiratory muscles. In this study the low PEFR values denote presence of some obstruction during expiration. This is in agreement with the findings of other investigators [2,19,20].

Reduced pulmonary parameters in apparently healthy traffic policemen compared to control group signify the harmful effect of exposure to polluted air on pulmonary function. From this study the exact cause of decreased pulmonary function due to inhalation of polluted air is not clear. But some studies conducted show that inhaled noxious particles and gases cause inflammatory response in the lungs that cause activation of proteinase and inactivation of antiproteinase. This cause destruction of pulmonary parenchyma, increased secretion of mucous and hyperplasia of epithelial cells [21]. The particulate matter of automobile exhaust enters into the trachea and bronchi and deposit there. Particles of less than 2.5 microns can reach the small airways and the alveoli thus may cause lung disorders like asthma, bronchitis, COPD and interstitial lung disease [22].

## Conclusion

In the present study, pulmonary function parameters FVC, $FEV_1$, $FEV_1$/FVC, PEFR and MVV were significantly reduced in the traffic policemen. Thus it may be concluded that air pollution has harmful effect on pulmonary function of traffic policemen. This is a matter of concern since it may be due to their occupational exposure to vehicular exhaust related air pollution. Periodic medical check up could be made more structured including serial pulmonary function measurements using spirometry to detect those at risk and initiate appropriate preventive measures. Periodic monitoring can detect early signs of dysfunctions and measures including supply of appropriate and acceptable personal protective equipments could be taken. Such interventions will improve the overall health and productivity of a critical work force like the traffic police.

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Original Research Paper

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# Intraocular Pressure Changes in Smokers

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**Abstract**

*Background:* Tobacco is one of the most abused drugs of all ages. It is said to alter the Intraocular Pressure and hence vulnerable to cause ocular disease. *Aim:* To study the Intraocular Pressure changes in smokers. *Materials and Methods:* A cross sectional study was conducted at Dept. of ophthalmology, Navodaya medical college on 20 healthy male smokers and 20 controls in age group of 20-50 years. Smokers included with history of smoking 10-20 cigarettes per day for duration of >5 years. Exclusion criteria involved any ocular pathology, hypertension, diabetes. Intraocular pressure (IOP) was measured using schiotz tonometer. Statistical analysis done by student t test. *Results:* The mean difference in right eye smokers is 17.08 ±3.06, right eye non-smokers is 13.70±2.66. The mean difference in left eye smokers is 17.25±2.75 , left eye non-smokers is 14.29±3.03.Thus it was observed that the mean difference in IOP changes amongst smokers was significantly increased in both right and left eye ($p<0.05$) when compared to non-smokers. *Conclusion:* It was observed that tobacco in the form of smoking increases intraocular pressure. Measuring intraocular pressure by schiotz tonometer is simple technique which can be done at periphery centers to detect high risk group for glaucoma.

**Keywords:** Intra Ocular Pressure; Smokers.

## Introduction

Tobacco consumption is increasing in today's modern world by both sexes in all socioeconomic classes among developed and developing countries [1]. Recent statistics from India have shown that while smoking is very common in men, the rates in women have doubled. Usually its consumption starts in teen age and continues throughout the life as tobacco causes dependence. Cigarette smoking has both ocular and systemic changes. Cigarette smoke contains toxic chemicals such as polycyclic aromatic hydrocarbons, tar, carbon monoxide and heavy metals [2]. Nicotine is a primary active ingredient of tobacco. Nicotine stimulates the release of nor epinephrine and partially accounts for the stimulatory effect of the drug. At a dose absorbed by a typical cigarette smoker, the effect seemed to be on the central nervous system activity while at higher doses, there is direct effect on the nervous system. Normal intra ocular pressures (IOPs) have been reported to vary in both eyes even in the same individual [3]. Nicotine is a psychoactive component of tobacco that can affect eye causing cataracts and macular degeneration leading to loss of vision [4]. Smoking is an important preventable health risk. The incidence of smoking-related illness, including atherosclerotic changes in the coronary, aortic and cerebral circulations, chronic obstructive pulmonary disease, and death from cancer is reduced by cessation of smoking. Widespread circulatory changes in several organs, as a result of local metabolic and vascular effects of nicotine exposure, have been documented, including vasospastic effects on peripheral small vessels such as the ophthalmic artery [5]. Tobacco alters the Intraocular Pressure [IOP] and hence vulnerable to cause ocular diseases leading to total blindness. IOP is determined by the balance between the rate of aqueous humor production of the ciliary body, resistance to the aqueous flow at the angle of anterior chamber and the level of episcleral venous pressure. Cigarette smoking has been associated with transient rise in intraocular pressure. It has been hypothesized that nicotine in tobacco induces vasonstriction which leads to raised episcleral venous pressure thereby

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reducing aqueous outflow and hence rise in IOP [1]. Current consensus among ophthalmologists define normal intraocular pressure as that between 10-20 mmHg. Ocular hypertension is defined as IOP above 21mm Hg and is risk factor for open angle glaucoma [6,7]. Glaucoma, a resultant effect of increased IOP irrespective of its prevalence, remains a multifactorial optic neuropathy of unknown aetiology. There is conflicting epidemiological data on whether tobacco smoking affects IOP. Whereas some studies have found no association between smoking and IOP, others reported a relationship. Thus, this study was taken up to determine the effects of cigarette smoking on intra ocular pressure.

*Aim and Objectives*

To know the effect of smoking on Intraocular Pressure and compare it among smokers and non smokers.

## Materials and Methods

A cross sectional study was conducted at Dept. of ophthalmology, Navodaya medical college, Raichur.Ethical clearance was obtained from the institution ethical committee.

Inclusion criteria involved 20 healthy male smokers and 20 non-smokers in age group of 20-50 years. Smokers included with history of smoking 10-20 cigarettes per day for duration of >5 years. Questionnaire was given and subjects were selected accordingly. Exclusion criteria involved any ocular pathology, hypertension, diabetes. IOP was measured using schiotz tonometer.

## Methodology

With the subject in supine position the cornea of both the eyes were anaesthetized with 4% topical Xylocaine. Then the lids were separated with the left hand and by keeping the foot plates of the Schiotz tonometer vertically on the centre of the cornea, the reading on the scale was recorded. A conversion table was used to derive the IOP in mm Hg from scale reading and the plunger weight. IOP was measured in both the eyes. IOP recorded first in the right eye and than in the left eye. 3 consecutive readings were taken in both right and left eye. The mean of 3 readings was computed separately for each eye.

Statistical analysis was done by using, unpaired "t" test.

## Results

Mean age group of smokers is 37.6yrs and Non-smokers is 34.9 yrs.

**Table 1:** Comparison of IOP in both control and smoker group results are presented in Mean ± SD, P value obtained by student t test.

| Variable | | Mean | SD | T | p | DF | Inference |
|---|---|---|---|---|---|---|---|
| RE | Smokers | 17.08 | 3.06 | | 0.001 | | significant |
| | Non-smokers | 13.70 | 2.66 | 3.72 | (p<0.05) | 38 | |
| LE | Smokers | 17.25 | 2.75 | 3.23 | 0.003 | 38 | Significant |
| | Non-smokers | 14.29 | 3.03 | | (p<0.05) | | |

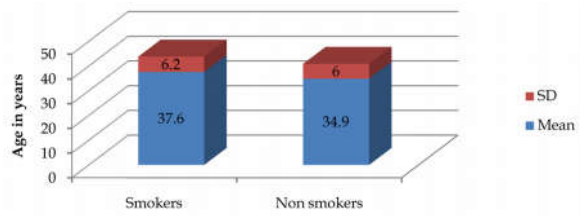


**Fig. 1:** Distribution of study population according to mean age

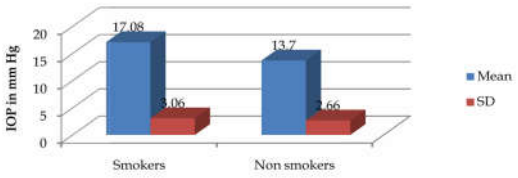


**Fig. 2:** IOP comparison of right eye between smokers and non smokers

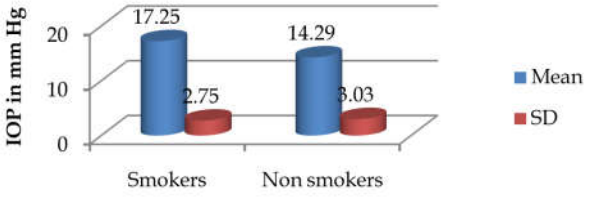


**Fig. 3:** IOP comparison of left eye between smokers and non smokers

Table 1 depicts the comparison of IOP in both smokers and control group. The mean difference in right eye smokers is 17.08±3.06, right eye non-smokers is 13.70 ± 2.66. The mean difference in left eye smokers is 17.25±2.75 , left eye non-smokers is 14.29± 3.03.Thus it was observed that the mean difference in IOP

changes amongst smokers was significantly increased in both right and left eye ($p<0.05$) when compared to non-smokers.

## Discussion

Previous studies show conflicting effects of cigarette smoking on IOP so we have taken up this study. In our study we found IOP of smokers to be significantly elevated ($p< 0.001$) compared with nonsmokers. Our studies were in accordance with findings of Afroz Afshan, C. [1] O. Timothy [2], Dhubhghaill. S.S [8].

Okaro observed an increase in intra ocular pressure due to cigarette smoking, was consistent with the report among smokers and non –smokers [9]. In a study by M. Roy. Wilson regarding the relationship between primary open angle Glaucoma and potential toxic exposures in people found that cigarette smoking was associated with Glaucoma [10].

On the other hand, Sami. L [11], Shephard [12], Klein et.al [13], reported no relationship between cigarette smoking, elevated intraocular pressure and Glaucoma. Sami conducted a study in which it was found that the 3 groups composed of smokers, exsmokers and non smokers had the same distribution of IOP, and had no relationship to the smoking habit [11]. Shephard. R.J et al, reported no relationship between cigarette smoking, elevated intraocular pressure and Glaucoma [12].

Nicotine is vasoconstrictor. This potentially slows down aqueous outflow from ant. Chamber drainage angle which leads to raised intra ocular pressure. and restricts blood flow to optic nerve.

It has been suggested that increased IOP was observed for the change in the mean values monocularly (that is, it was different for each of the two eyes, and binocularly for the two eyes) for the subjects.

This, therefore suggests a relationship between cigarette smoking and intra ocular pressure. The sudden increase in IOP of normotensive subjects after smoking cigarette showed that it could be an important risk factor in the occurence of glaucoma and ocular hypertension including other chronic ocular diseases such as cataract, macular degeneration (leading to severe visual impairment and blindness), retina ischaemia, anterior ischaemic optic neuropathy, gravis ophthalmopathy, and amblyopic strasbismus [14].

## Conclusion

We observed a significantly higher effect of cigarette smoking on intra-ocular pressure of left eye. This increase intra-ocular pressure of normotensive subjects after getting habituated to cigarette smoking showed that it could be an important risk factor in occurrence of glaucoma and ocular hypertension including other chronic ocular diseases such as cataract, macular degeneration, ambylopia.

It is concluded that acute and chronic cigarette smoking leads to systemic ailments and ocular diseases. Among many drugs, tobacco is also an agent causing increased ocular pressure. We conclude our study with observation that tobacco in the form of cigarette smoking affects the intra-ocular pressure. Further studies on larger samples with longer followup are needed to substantiate our findings before firm conclusion can be drawn that there is an increase in intra-ocular pressure

Measuring intraocular pressure by schiotz tonometer is simple technique which can be done at peripheral centres to detect high risk group for glaucoma.

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# Influence of Deep Breathing Exercise for A Short Duration on Heart Rate Variability in Healthy Young Individuals

**Sanjay G.*, R.H. Taklikar**, Anant A. Takalkar*****

**Abstract**

Previous studies have reported and documented the beneficial effects of deep breathing as a part of either short term or long term practice of pranayama. Few studies have shown increase in Heart rate variability (HRV) on performing non yogic deep breathing exercise for a long period. However our knowledge about the effects of few minutes of deep breathing exercise (DB) on HRV is lacking. In the present study we examined the effects of few minutes of deep breathing exercise (DB) on HRV. The study was conducted on a homogenous group of 17 male students. The students performed deep breathing exercises for 3 minutes at the rate of 6 breaths per minute; short term HRV indices were assessed before and after deep breathing exercise. The data analysis was carried out by using SPSS19.0 software. Results were expressed as mean & standard deviation. A P-value of < 0.001 was considered as highly significant. The mean LF, HF & LF/HF ratio before DB exercise was 46.07±11.03, 50.97±8.67 & 0.95±0.36. The mean LF, HF & LF/HF ratio after DB exercise was 36.68±11.76, 58.29±9.64 & 0.67±0.32.Mean differences in all parameters before and after DB exercise was found to be statistically significant. There was a significant decrease in the sympathetic tone (LF) & a significant increase in the parasympathetic tone (HF) after DB exercise. This shows that deep breathing for few minutes has a beneficial effect on heart.

**Keywords**: Deep Breathing Exercise; Heart Rate Variability.

## Introduction

The origin of Yoga as a religious tradition occurred in India few thousands of years ago. Yoga is the best lifestyle modification, which aims to attain the unity of mind, body and spirit through asanas (exercise), pranayama (breathing), and meditation [1].

Pranayama is the art of prolongation and control of breath helps in bringing conscious awareness to breathing and the reshaping of breathing habits and patterns [2]. According to the ancient yogic literature, certain breathing practices have been known to exhibit inhibitory as well as stimulating effects which induce calmness and arousal that alter the autonomic status and improve the psychological parameters. Fast breathing (Kapal-bhatipranayama) instantly modifies the autonomic status by increasing the sympathetic tone accompanied with a reduced parasympathetic tone [3,4] while slow deep breathing increases the parasympathetic tone and decreases sympathetic activity and breathing through a particular nostril and "Om" meditation alters the metabolic and autonomic activities [5,6,7]. Practice of slow deep breathing has also been used as a treatment modality for anxiety disorders as it attenuates cardiac autonomic responses in such patients [8].

Previous studies have reported and documented the beneficial effects of deep breathing as a part of either short term or long term practice of pranayama [9,10]. Few studies have shown variation in Heart rate variability (HRV) on performing non yogic deep breathing exercise for a long period [11,12]. However the knowledge about the effects of few minutes of deep breathing exercise (DB) on HRV is lacking. The present study was designed to find the effects of deep breathing exercise (DB) for duration of 3 minutes on HRV.

## Materials and Methods

The study was conducted in a homogenous group of 17 male first year students from Navodaya college

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of Physiotherapy, Raichur. The subjects were in the age group of 18 - 20 years. All the subjects were non-smokers, without any pre-existing disease and were not on any medications. Those already performing some form of yoga or breathing exercises were excluded from the study. Informed written consent was obtained after explaining the procedure and protocol.

## Methodology

The students were trained to perform slow deep breathing exercise for duration of 3 minutes at the rate of 6-8 breaths per minute by one of the investigators. All the students were asked to report to the Department at 8.30 am in the morning on empty stomach. Before starting the procedure the subject was given 15 min rest. Heart rate variability was recorded using instrument Power lab 8/30 series with dual bio amplifier, (Manufactured by AD instruments, Australia, with model no ML870). To quantify heart rate, the analogue ECG signal wasobtained using lead II to obtain a QRS complex of sufficient amplitude and stable base line. First ECG was recorded for a period of 5 minutes, with subject in supine, eyes closed and awake state. The subject was then advised to perform slow deep breathing exercise for a period of 3 minutes at a rate of 6-8 breaths per minute in sitting position. Second ECG was recorded immediately after the deep breathing exercise with the subject in supine, eyes closed and awake state. The data gathered was subjected to frequency domain analysis of HRV. The frequency domain parameters including Low frequency (LF) and High frequency (HF) power and LF/HF ratio were calculated for ECG acquired at every time point. Short term HRV indices were assessed before and after deep breathing exercise. The data analysis was carried out by using SPSS19.0 software. Results were expressed as mean & standard deviation. A P-value of < 0.001 was considered as highly significant.

## Results

The mean LF, HF & LF/HF ratio before DB exercise was 46.07±11.03, 50.97±8.67 & 0.95±0.36. The mean LF, HF & LF/HF ratio after DB exercise was 36.68±11.76, 58.29±9.64 & 0.67±0.32.Mean differences in all parameters before and after DB exercise was found to be statistically significant. There was a significant decrease in the sympathetic tone (LF) & a significant increase in the parasympathetic tone (HF) after DB exercise.

**Table 1:** Different HRV indices before and after exercise (Paired t test)

| HRV indices | Exercise | N | Mean | Std. Deviation | t | DF | p | Inference |
|---|---|---|---|---|---|---|---|---|
| LF | Before | 17 | 46.07 | 11.03 | 15.942 | 16 | .0001 | Highly |
| | After | 17 | 36.68 | 11.76 | | | (<0.001) | significant |
| HF | Before | 17 | 50.97 | 8.67 | -12.978 | 16 | .0001 | Highly |
| | After | 17 | 58.29 | 9.64 | | | (<0.001) | significant |
| LF/HF | Before | 17 | .95 | .36 | 16.198 | 16 | .0001 | Highly |
| | After | 17 | .67 | .32 | | | (<0.001) | significant |

## Discussion

In the present study we saw a significant decrease in the sympathetic tone and a significant increase in the parasympathetic tone after performing slow deep breathing exercise for a short duration of 3 minutes. Slow deep breathing exercise generates inhibitory signals and hyperpolarizing current within neural and non-neural tissue by mechanically stretching tissues during breath inhalation and retention. It is likely that inhibitory impulses in cooperation with hyperpolarization current initiates the synchronization of neural elements in the central nervous system, peripheral nervous system, and surrounding tissues ultimately causing shifts in the autonomic balance towards parasympathetic dominance. Short-term effects of slow pranayamic breathing include decreased oxygen consumption [13], decreased heart rate, decreased blood pressure [14], and increased amplitude of theta waves [15]. Increase theta amplitude and delta waves during breath retention and slow breathing is indicative of a parasympathetic state. There are several chemical and non-chemical mechanisms that may account for some of the physiologic phenomena experienced by pranayama practitioners. No significant changes in arterial blood gases were noted after pranayama practice indicating a neural mechanism for pranayama's effect [16]. Breath holding, an essential

part of pranayama, is shown to induce theta waves [15]. A decrease in breathing frequency can increase synchronization of brain waves eliciting delta wave activity [17] indicating parasympathetic dominance.

## Conclusion

Our study confirms that simple deep breathing even for few minutes has a beneficial effect on heart.

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# Comparison of Effects of Acute Stress on Cardiovascular Parameters in Sedentary Workers and Athletes

**Sharad Jain**

**Abstract**

Stress is common and inevitable in present scenario. Ability to combat stress varies from person to person. The present study was conducted to compare the effects of acute stress on cardiovascular parameters in sedentary workers and athletes. One hundred asymptomatic healthy males, aged 17-25 years, participated voluntarily. Subjects were divided into 2 groups of 50 each comprising of sedentary workers (Group A) and athletes (Group B). Cold pressor test (CPT) was used to induce acute stress. In CPT, cold water of 8°C was used to induce experimental stress. In both the groups, blood pressure and heart rate were recorded in basal condition and post CPT-immediate, 1 minute and 5 minutes after removal of cold stimulus. Statistical analysis was done by one-way ANOVA and Tukey post-hoc tests using the (window) SPSS Statistics 17.0 version. Results showed that there was significant increase in cardiovascular parameters viz. blood pressure and heart rate in both the groups but these increments were more significant in sedentary workers in comparison to athletes. Recovery from the effects of cold stress was faster in group B (athletes). The results suggest that regular athletic activities and aerobic exercise reduces the effects of stress and also helps in faster recovery from the ill effects of stress.

**Keywords:** Acute Stress; Athletic Activity; Sedentary Life Style; Cold Pressor Test.

## Introduction

Today human life is full of stress and everybody has to face stress in daily life. Stress is unavoidable and usually stressor develops unexpectedly all of sudden. Ability to cope up stress varies from person to person. Few people cope up stress very easily and few people face multiple problems in combating stress and suffer from ill effects of stress like apprehension, anxiety, insomnia, depression, hypertension etc. Lifestyles have been changed in people belonging to middle & high economic status where sedentary life style is very common [1]. Lack of exercise, lack of outdoor activities, more adherences to computer, mobiles and TV games is responsible to make the person lazy and sedentary. Sedentary life style has proven to be associated with increased risk of development of hypertension, obesity and other cardiovascular diseases [2].

Cold stress test is autonomic function test used for the assessment of autonomic functions especially sympathetic activity. Cold water of 8°C is used to induce experimental stress which leads to wide spread neurogenic stimulation of sympathetic nervous system via afferent pain and temperature receptors and leads to increase in blood pressure and heart rate [3,4]. Cold pressor test was first described by Leblank in fisherman [5]. Cold stress produces intense stimulation of sympathetic nervous system and almost complete withdrawal of parasympathetic activity [6].

Regular exercise and athletic activities have proven to increase resting vagal tone. Resting bradycardia in trained athletes has been reported and now well established fact [7-9]. Regular exercise has been reported to produce pharmacological benefits and effective like a drug [10]. Many adaptations develop in the body in response to regular exercise which might be helpful to combat environmental stresses, and trauma/sickness [11]. As exercise may possibly increase the capacity o a person to combat stress. Therefore, the present study was conducted to compare the effects of acute stress on cardiovascular parameters in sedentary workers and athletes.

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## Materials and Methods

The present study was conducted in the Department of Physiology, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India. One hundred asymptomatic healthy males, aged 17-25 years, participated voluntarily. Subjects were divided into 2 groups of 50 each comprising of sedentary workers (Group A) and athletes (Group B).

*Inclusion Criteria*

Subjects involved in athletic activities for more than 6 months were included. Subjects with sedentary life style with negligible exercise were included as control.

*Exclusion Criteria*

1. Smoking
2. Alcohol
3. Any acute or chronic illness
4. History of cardiovascular or pulmonary disease
5. Hypertension/prehypertension

Experiment procedures were in accordance with the Ethics Committee on human experimentation. The present study was carried out at ambient temperature with minimal external or internal sound disturbances in the room. Subjects reported to the laboratory 4 hours after breakfast. Cold water of 8°C was used to induce experimental stress in Cold pressor test (CPT). In both the groups, blood pressure and heart rate were recorded in right arm in basal condition. Then subject was asked to dip left hand in cold water of 8°C for 2 minutes. Blood pressure and heart rate were recorded immediately after removal of hand from cold water, after 1 minute and after 5 minutes. Statistical analysis was done by one-way ANOVA and Tukey post-hoc tests using the (window) SPSS Statistics 17.0 version.

## Result

Table 1 shows that, in group A (sedentary workers), systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) were significantly higher immediately after CPT ($p<0.01$) and after 1 minute in post CPT ($p<0.05$). There was no significant difference in parameters recorded in basal condition and 5 minutes after CPT ($p>0.05$).

Table 2 shows that, in group B (athletes) systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) were significantly higher immediately after CPT ($p<0.05$). There was no significant difference in parameters recorded in basal condition and 1 minute and 5 minutes after CPT ($p>0.05$).

Table 3 shows that SBP and DBP were significantly higher in group A than group B immediately after CPT and 1 minute after CPT ($p<0.05$) however there was no significant difference in SBP and DBP in both groups in basal and in 5 minutes after CPT ($p>0.05$).

Heart rate was significantly lower in group B (athletes) ($p<0.05$) in comparison to group A in basal and post CPT periods viz. immediate, after 1 minute & 5 minutes.

**Table 1:** Effects of acute stress on cardiovascular parameters in Group A (sedentary workers)

| Parameters | Basal | Post CPT- immediate | Post CPT- After 1 minute | Post CPT- After 5 minutes |
|---|---|---|---|---|
| Systolic blood pressure (SBP) mmHg | 122.6±5.2 | 160.5±8.4* | 140.6±7.3# | 121.9±4.2^ |
| Diastolic blood pressure (DBP) mmHg | 78.3±4.3 | 90.3±8.3* | 82.2±6.3# | 79.3±5.2^ |
| Heart Rate (HR) per minute | 74.7±5.2 | 94.1±8.2* | 86.6±7.3# | 74.2±4.8^ |

Data represented as Mean±SD. *$p<0.01$, #$p<0.05$, ^$p>0.05$
*Comparison between basal and post CPT- immediate.
# Comparison between basal and post CPT –after 1minute.
^ Comparison between basal and post CPT –after 5 minutes.

**Table 2:** Effects of acute stress on cardiovascular parameters in Group B (athletes)

| Parameters | Basal | Post CPT- Immediate | Post CPT- After 1 Minute | Post CPT- After 5 Minutes |
|---|---|---|---|---|
| Systolic blood pressure (SBP) mmHg | 121.3±7.2 | 143.3±11.8* | 124.2±8.2# | 120.3±8.3^ |
| Diastolic blood pressure (DBP) mmHg | 74.4±6.3 | 82.6±9.1* | 76.2±6.8# | 74.5±5.4^ |
| Heart Rate (HR) per minute | 61.2±5.6 | 86.3±10.3* | 64.2±6.1# | 61.6±5.2^ |

Data represented as Mean±SD. *$p<0.05$, #$p>0.05$, ^$p>0.05$
*Comparison between basal and post CPT immediate.
#Comparison between basal and post CPT –after 1minute.
^ Comparison between basal and post CPT –after 5 minutes.

**Table 3:** Comparison of effects of acute stress on cardiovascular parameters in sedentary workers and athletes

| Parameters | Group A (sedentary workers) | | | Group B (athletes) | | |
|---|---|---|---|---|---|---|
| | SBP | DBP | HR | SBP | DBP | HR |
| Basal | 122.6±5.2 | 78.3±4.3 | 74.7±5.2 | 121.3±7.2 | 74.4±6.3 | 61.2±5.6^ |
| Post CPT- immediate | 160.5±8.4 | 90.3±8.3 | 94.1±8.2 | 143.3±11.8* | 82.6±9.1# | 86.3±10.3^ |
| Post CPT- After 1 minute | 140.6±7.3 | 82.2±6.3 | 86.6±7.3 | 124.2±8.2* | 76.2±6.8# | 64.2±6.1^ |
| Post CPT- After 5 minutes | 121.9±4.2 | 79.3±5.2 | 74.2±4.8 | 120.3±8.3 | 74.5±5.4 | 61.6±5.2^ |

Data represented as Mean±SD. *p<0.05, #p<0.05, ^p<0.05
*Comparison of SBP in group A and group B.
#Comparison of DBP in group A and group B.
^Comparison of HR in group A and group B.

## Discussion

The present study shows significant difference in heart rate in basal condition in group A (sedentary workers) and group B (athletes) which indicates higher resting vagal tone in athletes. However no significant difference was observed in SBP and DBP in two groups, indicating that higher vagal tone in athletes is not sufficient enough to produce significant reduction in resting blood pressure. On exposure to cold stress, SBP, DBP and heart rate significantly increased in both groups, however this increase was more significant in group A (sedentary) in comparison to group B (athletes). In recovery phase, 1 minute after CPT, all parameters were significantly higher in group A (sedentary) ($p<0.05$) and insignificantly higher in group B (athletes) ($p>0.05$) indicating faster recovery in group B. However all cardiovascular parameters returned to basal value in 5 minutes after CPT. With these observations , it can be concluded that regular aerobic exercise and athletic activities increase the resting vagal tone and also increases the ability to cope up the stress in better way and leads to faster recovery from the ill effects of the stress.

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# Sympathetic Vascular Reactivity and Development of Pregnancy Induced Hypertension and Preeclampsia: A Hypothesis

**Amit Kant Singh*, Reena Rani Verma**, Shikha Seth***, Santosh Kumar Sant****, Anamika Singh*****

**Abstract**

*Introduction:* Pregnancy is a physiological condition associated with profound adaptive changes in the maternal hemodynamics and cardiovascular system. Autonomic nervous system plays a central role in this adaptation to the various needs of pregnancy. One of the well known complication, that occurs commonly during pregnancy is pregnancy induced hypertension (PIH)/ preeclampsia (PE). Impairment of autonomic functions has been suggested as one of the cause of pregnancy induced hypertension. As sympathetic vascular reactivity has been reported as one of the indicators of autonomic status to predict the development of hypertension. Therefore, this study was undertaken to assess sympathetic vascular reactivity in the first and second trimesters of pregnancy. *Materials and Methods:* The study was conducted in the Department of Physiology, Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah, in association with Department of Obstetrics and Gynaecology. The pregnant females in first and second trimesters reporting to the Out Patient Department (OPD) of Obstetrics and Gynaecology were included in the study. They were subjected to the Cold Pressor Test for the assessment of sympathetic vascular reactivity in sitting position by the method as described by Hines and Brown. *Results:* A total of 14 subjects were recruited in the study (7 subjects were in the first trimester and another 7 were in the second trimester). The 51.7 percent of the subjects during first trimester turned out to be the hyper- reactors while in second trimester this was true for the 71.4 percent of the subjects. *Conclusion:* As the subjects even in the first trimester showed increased blood pressure reactivity, thus it is hypothesised that assessment of sympathetic vascular reactivity reflected as blood pressure reactivity from early pregnancy may be a useful indicator for development of pregnancy induced hypertension and preeclampsia in later pregnancy.

**Keywords:** Pregnancy; Autonomic Functions; Sympathetic Vascular Reactivity; Pregnancy Induced Hypertension; Preeclampsia.

## Introduction

Pregnancy is a physiological condition associated with profound adaptive changes in the maternal hemodynamics and cardiovascular system. Autonomic nervous system plays a central role in this adaptation to the various needs of pregnancy [1].

One of the well known complication, that occurs commonly during pregnancy is pregnancy induced hypertension (PIH)/ preeclampsia (PE) affecting 5% to 8% of all pregnancies. It is one of the most common cause of maternal and neonatal morbidity & mortality [2,4].

PIH is defined as a syndrome that arises in pregnancy and is diagnosed by presence of hypertension (blood pressure of 140/90 mmHg or more for the first time in pregnancy, on two separate occasions) first detected after 20 weeks of gestation [2-4].

PE is defined as PIH with proteinuria of at least 0.3g per 24 hours in a previously normotensive and non-proteinuric patient [5]. It develops in the second half of pregnancy and resolves shortly after delivery [1].

Impairment of autonomic functions has been suggested as one of the cause of pregnancy induced hypertension. There have been reports of greater resting sympathetic output in cases of pregnancy induced hypertension as compared to normal pregnancy [1].

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The central sympathetic output has also been found to be increased to a much greater extent in women with pregnancy induced hypertension as compared to normal pregnant women [5]. In some studies, increased sympathetic activity as well as decreased vagal tone has been found to be associated with pregnancy induced hypertension/preeclampsia [6,7].

Although it usually becomes apparent only in the third trimester of pregnancy, evidences are available that underlying pathophysiological abnormalities appear early in the pregnancy [8].

There have been attempts for early prediction of pregnancy induced hypertension (PIH)/ preeclampsia (PE) by using a variety of biological, biochemical and biophysical markers. But early prediction is still insufficient in clinical practice [9,10].

As sympathetic vascular reactivity has been reported as one of the indicators of autonomic status to predict the development of hypertension. Therefore, this study was undertaken to assess sympathetic vascular reactivity in the first and second trimesters of pregnancy.

## Materials and Methods

The study was conducted in the Department of Physiology, Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah, in association with Department of Obstetrics and Gynaecology after clearance from institutional ethical committee. The pregnant females in first and second trimesters reporting to the Out Patient Department (OPD) of Obstetrics and Gynaecology were included in the study.

After explaining the procedure of CPT to the subjects, the informed written consent to participate in study was taken from each subject. A detailed history was taken to rule out any chronic illness.

The subjects were requested to sit in peace for 10 minutes. After 10 minutes of rest they were subjected to the Cold Pressor Test for the assessment of sympathetic vascular reactivity in sitting position by the method as described by Hines and Brown [11]. The subject were seated comfortably and baseline BP was recorded by auscultatory method using mercurial sphygmomanometer. Then the subject was asked to immerse one hand up to the wrist in ice cold water (4-5 degree Celsius) for one minute. The blood pressure (BP) was recorded after one minute with immersed hand. After the recording with immersed hand the subject was requested to take out the hand from cold water and further BP was measured after one minute. The change in the systolic blood pressure (ΔSBP) and diastolic blood pressure (ΔDBP) was calculated by subtracting pre-test reading from the reading obtained during hand immersion state. The subjects having ΔSBP < 14 mmHg and ΔDBP < 10mmHg were labelled as normo-reactors and ΔSBP ≥14mmHg and ΔDBP ≥ 10mmHg were labelled as hyper-reactors. There results are expressed as the percentages.

## Results

A total of 14 subjects were recruited in the study (7 subjects were in the first trimester and another 7 were in the second trimester). The results are summarised in the Table 1.

The 51.7 percent of the subjects during first trimester turned out to be the hyper- reactors while in second trimester this was true for the 71.4 percent of the subjects.

**Table 1:**

| Trimester | Age (years) | Resting Blood Pressure (mm Hg) | | Blood pressure after 1 min of immersion of hand in cold water (4-5° C) (mm Hg) | | Change in blood pressure (mm Hg) | | Hyper-reactors (percent) | Normo-reactors (percent) |
|---|---|---|---|---|---|---|---|---|---|
| | | Systolic | Diastolic | Systolic | Diastolic | Systolic | Diastolic | | |
| I (n= 7) | 34.6 ± 4.2 | 109.7± 5.3 | 72.5± 2.2 | 126.0±10.3 | 85.7±4.2 | 16.2±6.4 | 13.1±4.4 | 57.1 | 42.9 |
| II (n= 7) | 35.2 ± 3.7 | 106.3±3.2 | 71.6±1.5 | 123.3±5.7 | 83.0±2.0 | 17±3.2 | 11.3±2.7 | 71.4 | 28.6 |

## Discussion

As observed in the study the resting blood pressure in both trimesters were within normal range and there is increase in both systolic and diastolic blood pressure in the subjects during cold pressor test, which is in accordance to the study carried out by Woisetschlager C et al [9] who evaluated 123 pregnant women between 16th to 20th week of gestation for increased vascular activity detected prior to clinical

manifestation of preeclampsia. and concluded that during the cold pressor test systolic as well as diastolic blood pressure increased significantly and was more pronounced in women developing preeclampsia as compared with healthy pregnant women.

## Conclusion

The study carried out by Woisetschlager C et al included the subjects between 16$^{th}$ to 20$^{th}$ week of gestation but preliminary data of our study reveals that the subjects even in the first trimester showed increased blood pressure reactivity, thus it is hypothesised that assessment of sympathetic vascular reactivity reflected as blood pressure reactivity from early pregnancy may be a useful indicator for development of pregnancy induced hypertension and preeclampsia in later pregnancy and further studies are needed in this regard.

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Original Research Paper

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# Outcome of Height and BMI on Nerve Conduction Velocity in Patients Attending Index Medical College, Indore: A Cross-Sectional Study

**Shrikrishna Nagorao Bamne**

## Abstract

*Background and Aim:* Electrical conduction of motor and sensory nerves of the human body is evaluated by Nerve Conduction Velocity, which is a part of electro-diagnostic procedures, which help in set up the type and character of the nerve and commonly used to evaluate function of nerve. Present study was performed with an aim to know the effect of Height and BMI on median motor nerve conduction velocity. *Materials and Methods:* A Descriptive Cross–Sectional was conducted in the Department of Physiology, Index Medical college Hospital and Research Centre, Indore. The study group included 55 female medical students with age 18 to 23 years in secretory phase of menstrual phase. Nerve conduction velocity was calculated by recording evoked electromyogram (EMG) by stimulating median nerve at elbow and at wrist with the help of EMG electrodes and isolated stimulator by using Power lab 8/30 series with dual Bioamplifier. Statistical analysis was done by using Karl Pearson Correlation coefficient. *Results:* There is quite negative correlation effect with height on motor nerve conduction velocity with "r" value -0.26, and results was found to be not statistically significant. There is slender negative correlation effect of BMI on conduction velocity with "r" value -0.17 which was also non-significant. *Conclusion:* Through escalating height and BMI, nerve conduction velocity is diminishes which was found to be not significant statistically. The above two biological factors be required to be taken into contemplation as understanding nerve conduction studies.

**Keywords:** BMI; Correlation; Height; Indore; Nerve Conduction Velocity.

## Introduction

Electrical conduction of motor and sensory nerves of the human body is evaluated by Nerve Conduction Velocity, which is a part of electro-diagnostic procedures, which help in set up the type and character of the nerve and commonly used to evaluate function of nerve. Nerve conduction velocity is exaggerated by many physiological and technical variables. Physiological variables such as age, height, gender, upper limb versus lower limb, temperature affects conduction velocity. Diameter and myelination of the nerve fibers also affect nerve conduction velocity [1].

Nerve conduction studies (NCS) are carry out to identify the disorders of the peripheral nervous system [2,3]. These facilitate the clinicians to differentiate the two major groups of peripheral diseases: demyelination and axonal degeneration [4]. These also assist in localizing the site of the lesions [5,6].

Height and low body mass index (BMI) have been reported as peril factor for ulnar neuropathy at elbow and high BMI as risk factor for carpel tunnel syndrome [7]. BMI was also found to have negative association with sensory nerve action potential amplitude [8]. In evaluation of diabetic peripheral neuropathy, BMI is very significant factor to be taken into deliberation [9]. Thus, sway of BMI on nerve conduction study is vital for considering research.

Many studies have been done previously to evaluate the influence of the anthropometric factors such as age, height and body mass index on the nerve velocities [10-12]. Peroneal and sural NCV connected inversely with height and with predictable axonal length, while median motor and sensory NCV failed to show any significant relationship to height [13]. So Present research was carried out with an aim to

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know the outcome of height and body mass index (BMI) on median motor nerve conduction velocity.

## Material and Methods

A Descriptive Cross – Sectional was conducted in the Department of Physiology, Index Medical college Hospital and Research Centre, Indore. Ethical clearance was obtained from the institutional ethics board and written informed consent was taken from all the participants. The study group included 55 female medical students with age 18 to 23 years in secretory phase of menstrual phase. Subject with history of fever, neurological abnormalities, any limb deformities and history of systemic diseases were excluded. Body Mass Index (BMI) was calculated as the ratio of weight and square of Height in meters, using Quetelet Index.

Nerve conduction velocity was measured by recording evoked electromyogram (EMG) by stimulating median nerve at elbow and at wrist with the assist of EMG electrodes and isolated stimulator by utilizing Power lab 8/30 series with dual Bioamplifier.

After elucidation the process, the subjects were made to lie down on the couch. Setting with instrument was done. The EMG electrodes were placed on the abductor pollicis brevis muscle. Active electrode was positioned on muscle bulk & reference electrode was placed on tendon. The course of right median nerve was traced. The EMG was recorded by stimulating median nerve using isolated stimulator at wrist first and elbow at latter. The distance between two points of stimulation was calculated. The latent period was noted from recording. Disparity in the latent period for two stimulation was calculated.

*Statistical Analysis*

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. The variables were assessed for normality using the Kolmogorov-Smirnov test. Descriptive statistics were calculated. Statistical analysis was done by using Karl Pearson Correlation Coefficient.

## Results

A Descriptive Cross – Sectional was conducted in 55 female medical students with age group 18 to 23 years in secretory phase of menstrual phase at the Department of Physiology, Index Medical college Hospital and Research Centre, Indore. The mean height of the individuals is 1.7±0.5 meter and BMI is 20.34±1.44 kg/m2. Median Motor Nerve conduction velocity in right hand is 57.98±2.43 meter/second.

There is quite negative correlation effect with height on motor nerve conduction velocity with "r" value -0.26, and results was found to be not statistically significant. There is slender negative correlation effect of BMI on conduction velocity with "r" value -0.17 which was also non-significant.

**Table 1:** Descriptive analysis of various parameters of the study Participents

| Parameters | Mean | SD |
|---|---|---|
| Age | 19.65 | 0.43 |
| Height (Meters) | 1.7 | 0.5 |
| BMI (kg/m$^2$) | 20.34 | 1.44 |
| Nerve conduction velocity (meter/sec) | 57.98 | 2.43 |

**Table 2:** Corelation of Nerve Conduction Velocity with height and BMI among study participants

| Parameters | R value | P value |
|---|---|---|
| Height (Meters) | -0.26 | 0.65 |
| BMI (kg/m$^2$) | -0.17 | 0.09 |

Statistically significance at pd"0.05
Test applied: Karl Pearson correlation Co-efficient

## Discussion

The study was conducted to know the effect of height and BMI on nerve conduction velocity in right hand in 55 women during their secretory phase of menstrual cycle. Median motor nerve conduction velocity was calculated. There is reasonably negative correlation effect with height on motor nerve conduction velocity which is not significant. A

negative correlation between distal fiber diameter and height may preeminent clarify decreased conduction velocity. Distal axonal tapering in the nerves elucidates the effect. Still Campbell proposed that a decrease in diameter happens unexpectedly at a specified space from the cell body [15]. In mature rabbit nerves, Williams found that peripheral motor axon diameter was about half that of ventral spinal nerve root fibers and, regardless of an enhance in myelin sheath thickness, there was an in general decrease in total fiber diameter [16]. Height-related dawdling of nerve conduction velocity was pragmatic in this study [17]. Clinical acknowledgment of this height outcome is significant, or else an individual with gently slowed peripheral nerve conduction velocity solely related to large build may be tagged as abnormal.

Even with BMI, similar consequence has been observed. There is minor negative correlation effect of BMI on conduction velocity which is not noteworthy which might be owing to thicker subcutaneous tissue in the person with elevated BMI. As the adipose tissue in epineurium may be connected to some extent to amount of body Fat, it is rational that the amount of such fat may influence the nerve conduction. Our observations are in harmony with Awang MS et al who showed slowing of conduction velocity (CV) with rising BMI in median motor nerve [18].

Despite the fact that the height and BMI influences the median motor nerve conduction velocity, results found in the current study were not statistically significant. These two factors should be measured while diagnosing pathological conditions, or else normal folks may be diagnosed as abnormal and they will be on pointless medication.

## Conclusion

Through escalating height and BMI, nerve conduction velocity is diminishes which was found to be not significant statistically. So this incident should be measured for proportional studies and diagnosing pathological conditions. The above two biological factors be required to be taken into contemplation as understanding nerve conduction studies.

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