

Original Research Article

Effect of Blood Pressure on Spirometer Variables in Undergraduate Students of a Medical College in North-East India

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ABSTRACT

Background: Medicos must be physically fit before serving patients. Blood pressure and Spirometer variables are essential markers of health status of an individual. . Our study aims at determining the effect of Blood Pressure on Pulmonary parameters of medical students to identify the Risk Groups who are prone to develop Hypertension and to provide recommendations.

Material and methods: Students were classified on the basis of BP (viz. Normotensive, Hypertensive). Spirometric variables viz. FVC, FEV1, PEFR of the students were recorded and compared between the hypotensives, normotensives and hypertensive students. The response frequencies and descriptive statistics like mean and standard deviations were calculated. In case of more than two variables, P values were calculated using ANOVA test by Interactive statistics software. The P value <0.05 was considered as significant.

Results: Comparison of spirometric variables showed that FVC, FEV1, PEFR values decreased as we go from hypotensives, to normotensives to hypertensives.

Conclusion: This study found decreasing trend of pulmonary functions with increase in blood pressure. We recommended for changing life style that includes reduced consumption of fat rich diets, fast foods, salt restriction, performing regular physical exercises, yoga, meditation, sticking to a routine time table for sports, study and sleeping hours so as to tackle the burden of noncommunicable diseases among the new-generation physicians.

Keywords: Medical Students, Blood pressure, Hypertension, Spirometer

INTRODUCTION

Hypertension is an independent predictor of cardiovascular disease It affects nearly a quarter of the adult population worldwide. ¹ Such studies were done among young students in other parts of the world.² Hypertension is an independent predictor of cardiovascular disease India has alarming trend of hypertension especially among the urban population due to economic development and changing lifestyle factors .³

Also, Pulmonary function is a long-term predictor for overall survival rates. ^{4,5} Among different pulmonary function tests, Forced vital capacity (FVC), Forced Expiratory Volume in 1st second (FEV1), Peak Expiratory Flow Rate (PEFR), are important tests.

Thus, pulmonary function tests play a significant role in the assessment, diagnosis, quantification of the pulmonary ventilator disorders.⁶ Spirometry is invaluable as a screening test of general respiratory health.

In the present study an attempt has been made to assess pulmonary parameters (Forced Vital Capacity, Forced Expiratory Volume in 1st second, Peak Expiration Flow Rate), and Blood pressure (BP) of medical students and to find the relationship of their pulmonary parameters with Blood Pressure.

MATERIAL AND METHODS

The present study was done in Dept. of Physiology, Jorhat Medical College. It was a institution based cross-sectional observational study. Study population included undergraduate medicos of Jorhat Medical College. Simple random sampling was used. Simple random sampling was used. Sample size was calculated as 164 by EpiTools Software. Among them, 160 students volunteers of age 18-25 years who were non-smokers and gave consent for the study were included. Ethical Clearance was seeked from Institutional Ethical Committee (H), Jorhat Medical College, Jorhat.

Measurement Of Blood Pressure (BP): -

Blood pressure was recorded by palpatory method and then confirmed by auscultatory method. Blood pressure (BP) was recorded on 3 separate days from 10 am onwards in Physiology Clinical Lab. Students were advised to come for Blood pressure measurement on the dates with required prerequisites like avoiding caffeinated drinks, heavy meal prior to BP recording on the given dates. Mean of the 3 readings were taken for each student and students whose mean BP came in Hypertension range were advised to consult in Medicine OPD for treatment and follow-up. Hypertension was classified as per American Heart Association 2017 Guidelines.⁷

Procedure Of Digital Spirometry

Digital Spirometer used was Helios 401 Medspiror machine. The noseclip was placed and the subject took a big deep breath of air and exhale air forcefully into tube followed by an equally forceful blow-in. This completed one forceful inspiration and expiration. The FVC, FEV, PEFR values were recorded and a print of the 1 recorded data was taken out and saved for further analysis.

Statistical Analysis

Mean and standard deviations were calculated using MS Excel. P values were calculated by ANOVA test through Interactive statistics software. P value <0.05 was considered as significant

RESULTS

Distribution of blood Pressure profile among 160 participants showed that, 119 students (74.38%) were normotensive, 33 students (20.62%) were hypertensive and 8 students (5%) were hypotensive. (Fig 1)

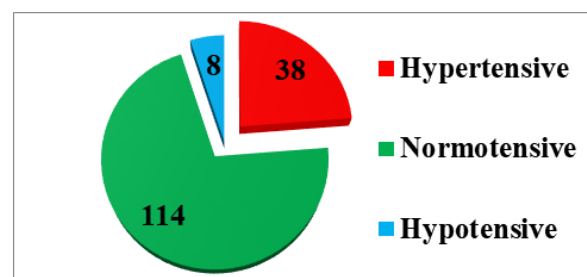


Figure-1: Distribution of normotensives, hypertensives and hypotensives among the participants.

Table-1: Mean spirometric values among the study participants

Parameters	Mean ± Sd
FVC (Liters)	2.68±0.78
FEV ₁ (Litres)	2.29±0.81
PEFR(Litres/s)	5.40±1.63

The mean FVC and FEV₁ of 160 students were 2.68±0.78 Liters and 2.29±0.81 Litres respectively and mean PEFR was 5.40±1.63 Liters/sec.) (Table 1)

Comparison of spirometric variables between hypotensives, normotensives and hypertensive students showed that FVC, decreased from 2.68±0.77 litres in normotensives to 2.66±0.80 Liters in hypertensives. FVC was 2.59±0.73 litres in hypotensive students. FEV₁ decreased from

Parameters (Mean±SD)	Hypotensives (n=8)	Normotensives (n=119)	Hypertensives (n=33)	P value
FVC (Liters)	2.59±0.73	2.68±0.77	2.66±0.80	0.9464
FEV ₁ (Liters)	2.42±1.01	2.36±0.76	2.07±0.88	0.1696
PEFR(Liters/s)	5.47±1.04	5.40±1.58	5.39±1.75	0.9918

Table-2: Comparison of Spirometric Variables between Hypotensives(n=8), Normotensive (n=119) and Hypertensive students (n=33)

2.42±1.01 liters in hypotensives to 2.36±0.76 liters in normotensive and 2.07±0.88 liters in hypertensive students. PEFR also decreased from 5.47±1.04 liters/s in hypotensives to 5.40±1.58 (Liters/s) in normotensives and 5.39±1.75 (liters/s) in hypertensive students although they were not statistically significant by Anova test (p value>0.05) (Table 2)

DISCUSSION

In the present study, the mean FVC and FEV₁ of 160 students were 2.68±0.78 liters and 2.29±0.81 litres respectively and mean PEFR was 5.40±1.63 liters/sec.) The reduction in mean FVC and FEV₁ values was also reported in previous studies conducted through digital Spirometer.⁸This could possibly be due to the students being less accustomed with the digital spirometer maneuver for calculation of the dynamic lung functions like FVC, FEV₁, PEFR as compared to the manual spirometer test, taught in Physiology practical classes for calculation of the static lung functions (lung volumes and lung capacities).

Distribution of blood pressure profile among 160 participants showed that, 119 students (74.38%) were normotensive, 33 students (20.62%) were

hypertensive and 8 students (5%) were hypotensive. More than half of the students had BP in the normal range. This was similar to a study done by Chenji et al.⁹

The higher prevalence of hypertension among the undergraduate medical students in our study could be due to several factors, such as food habits, lifestyle changes, academic stress, cultural differences, moving away from home, and residing in hostels etc. We also found that FVC, PEFR, FEV₁ were all reduced in hypertensives compared to normotensives, though not significant.

Our study findings were symmetrical with the findings of Swati Shah, Mohiuddin Shaikh et al where the mean values of all the PFT parameters were statistically significantly lesser in the hypertensive patients.¹⁰ The Framingham Study also found inverse relationship between FVC and cardiovascular diseases and mortality.¹¹

Studies by Engstorm et al showed that the incidence of cardiovascular disease and mortality associated with hypertension is increased, in patients with compromised lung function.¹² Study by Schnabel has

shown that there was decrease in FVC and FEV1 in patients of hypertension.¹³

In our study, we did not get any significant association between FVC, FEV1 and mean blood pressure though both the parameters were reduced in hypertensives. This may be due to smaller sample size in our study.

Studies by Selby et al have found significant association between FVC and hypertension FVC has been suggested by Selby et al as one of the markers of in pathways leading to hypertension.¹⁴ Similar results were obtained from other studies.¹⁵

Many studies have shown that not only hypertension is a risk factor for reduced lung function, but compromised pulmonary function tests increases the risk of development of hypertension.¹⁶ Wu Y et al have reported weaker associations between FVC, FEV1 and incidence of hypertension.¹⁷

High blood pressure has detrimental effects on the lung function. One possible hypothesis is that chronic hypertension causes left ventricular dysfunction that increases left atrial pressure. This might lead to an increase in pulmonary artery pressure resulting into an increase in interstitial edema causing a decrease in FEV1 and FVC values.¹⁸

Recent study also found that early diagnosis and management of impaired spirometric values, even the reversal of normal lung function, can reduce the adverse effects of hypertension.¹⁹

Regular practice of physical activity, as denoted by a physically active lifestyle, inhibited impaired pulmonary function with Systemic arterial Hypertension in older adults.²⁰

CONCLUSIONS

In the present study, we found deterioration of pulmonary functions with increase in blood pressure. We recommended for reduced consumption of fat rich diets, fast foods, salt restriction, doing physical exercises regularly, yoga, meditation, a routine time for sports, study and proper sleeping hours.

ACKNOWLEDGEMENT

I am grateful to my HOD & the student volunteers and everyone from my department. This is a part of my thesis work and I am grateful to everyone for allowing me to carry out this research work

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Source of support: Nil

Conflict of interest: None declared

How to cite: Sen A, Baruah G. Effect of Blood Pressure on Spirometer Variables in Undergraduate Students of a Medical College in North-East India. *GAIMS J Med Sci* 2026;6(2):87-91

<https://doi.org/10.5281/zenodo.21466537>