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ORIGINAL ARTICLE

A STUDY OF EFFECT OF SMOKING ON BLOOD PRESSURE IN HEALTHY YOUNG ADULTS

Prashanth Babu G[1], Mallikarjuna V[2], Arun Kumar S[3], Prashanth K. S[4]

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ABSTRACT: BACKGROUND: Smoking now is identified as a major cause of respiratory diseases, heart related ailments, cancer and a wide variety of other health problems. It is well known that the acute effects of smoking produce an increase in systolic and diastolic blood pressure, tachycardia, vasoconstriction, increase in carotid artery occlusion, and sometimes instantaneous Myocardial infarction. The present study was undertaken to study the effects of smoking on blood pressure in young apparently healthy individuals. **OBJECTIVE:** To compare blood pressure values between smokers and non-smokers. **METHODOLOGY:** The study was conducted in the Department of Physiology, Vijayanagar Institute of Medical Sciences, Bellary, Karnataka. The study included 100 apparently healthy males, 50 smokers and 50 non-smokers, between ages 20-35 years. Demographic data, history of smoking habit (quantity and duration) and detailed medical history were obtained from the subjects. Heart rate and blood pressure were recorded. Results were compared from the two groups using statistical tools. **RESULTS:** There was statistically significant increase in heart rate, systolic blood pressure as well as diastolic blood pressure in smokers when compared to non-smokers. **CONCLUSION:** The study shows that systolic as well as diastolic blood pressures were elevated in the absence of any cardiac disease in smokers.

KEYWORDS: Smokers; Non-smokers; Heart rate, Systolic blood Pressure, Diastolic blood pressure.

INTRODUCTION: According to U.S. Surgeon General, "It is safe to say that smoking represents the most extensively documented cause of disease ever investigated in the history of biomedical research."[1]

Recent research has shown that the hazards of prolonged cigarette smoking are even greater than used to be supposed. Smoking now is justified as a major cause of respiratory diseases, heart related ailments, cancer and other wide variety of other health related problems. The total number of tobacco users in the world has been estimated at 1.2 billion, which is expected to rise to 1.6 billion during year 2020's. At present, tobacco use causes death of 3.5 to 4 million people globally and expected to increase about 10 million during year 2020's.[2]

In India, a nationwide survey showed 184 million used tobacco, of which 112 million smoked tobacco. It kills 8 lakh people every year according to Indian Council of Medical Research (ICMR) which amounts to 2200 people dying every day from tobacco related diseases. Also revealed that each patient suffering from tobacco related disease costs the country Rs.2.5 million through direct medicinal costs, absenteeism, for treatment & loss of income due to premature death.[3] In Karnataka too, tobacco use has reached a prevalence of 41% among men & 14.9% among women which is now escalating to higher levels.

Cigarette smoking, hypertension, and hyperlipidemia are three major risk factors for coronary artery disease. Smoking acts both independently and synergistically with these other risk

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factors. Smoking cessation reduced coronary artery disease mortality by 36% as compared to mortality in subjects who continued smoking.[4]

The nicotine in cigarette smoke transiently raises BP by 10-20 mm Hg with every single cigarette, thereby elevating the average daytime BP in habitual smokers.[5] Acutely the surge of nicotine causes a rise in both systolic and diastolic BP that may last for 15-30 mins[6] likely mediated by release of nor-epinephrine from adrenergic nerves. Even more prolonged elevations in BP follow use of smokeless tobacco.[7] This pressor effect must be at least partly responsible for the major increase in strokes[8] and coronary disease[9] among smokers as well as for their apparent resistance to antihypertensive therapy.[10]

Smoking habit typically begins at a young age, usually in the early teens and continues throughout life. This puts the younger population at considerable risk of all the ill effects of smoking. As it is a modifiable and preventable risk factor, it is worthwhile to study its effects and create awareness among young individuals who may be maximally benefited by quitting.

OBJECTIVE OF THE STUDY: To measure blood pressure values in a group of apparently healthy smokers and test whether they are significantly higher than those of non-smokers of same age group. Thus explore whether smoking is associated with elevated blood pressure in non-hypertensive young adults.

MATERIALS AND METHODS: The study was conducted at Clinical physiology laboratory of the Department of Physiology, VIMS, Bellary.

Source of Data: Cases were apparently healthy male smokers between ages 20-35 years, selected from among students and staff of the institute, and attendants of patients visiting outpatient departments at the hospital. Non-smoking male controls of the same age group were selected from the same pool. The nature and purpose of the study were described to the subjects and informed consent was obtained from those willing to participate in the study.

A pre-structured proforma was given to each subject to record personal details and pertinent medical history from both cases and controls. Details of smoking habit, that is duration and quantum of smoking, were obtained from cases. For each subject in the case group, number of pack years was calculated. One pack year = 20 cigarettes smoked per day for a duration of one year.

Physical examination included measurement of height in centimeters, weight in kilograms, recording resting pulse rate by palpating radial artery and blood pressure recording with a mercury sphygmomanometer. Clinical examination of cardiovascular and respiratory systems was done in detail.

Persons with diagnosed hypertension, history of cardiac, respiratory, renal and endocrine disorders, abuse of alcohol and other psychoactive substances, family history of hypertension and cardiac diseases, history of anxiety or depressive disorders, were excluded. The final study group consisted of 50 smokers and 50 non-smokers.

The subjects were asked to visit the Clinical physiology laboratory of the Department of Physiology, in the morning hours between 9 AM to 12 noon. Each subject was allowed to rest in supine posture for 15 minutes before recording was done. After the period of rest, pulse rate was recorded in beats per minute by palpating Radial artery for one minute. Systolic and Diastolic blood pressure were measured using mercury sphygmomanometer, from the left upper arm, with the

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subject in supine position. For each subject BP measurement was done twice at an interval of 15 minutes. The averages of values obtained from the two trials were documented as SBP and DBP of that subject, in mm of mercury units. Data obtained from cases and controls were analyzed using statistical tests.

The data was compiled in Microsoft excel and analyzed using SPSS (Statistical Package for Social Sciences) version15. Level of significance was fixed at $p < 0.05$.

RESULTS: Mean age of study subjects was 27.94 +/- 4.25 years. Mean age of smokers: 28.06 +/- 4.01 years and mean age of non-smokers: 27.82 +/- 4.52 years. The two groups were age matched (p value- 0.97).

Parameter	Smokers (N – 50) Mean +/- SD	Non-smokers (N- 50) Mean +/- SD	P value*
Weight (Kg)	54.50 +/- 4.13	55.84 +/- 5.81	0.084
Height (m)	1.62 +/- 0.056	1.63 +/- 0.051	0.056
BMI	20.58 +/- 1.03	20.89 +/- 1.46	0.072

Table 1: Comparison of anthropometric measurements between smokers and non-smokers

* student't' test

Cases and controls were matched in terms of height, weight and BMI.

Measurements	Smokers (N – 50) Mean +/- SD	Non-smokers (N- 50) Mean +/- SD	P value*
Pulse rate (beats/min)	87.20 +/- 5.66	78.36 +/- 4.22	**0.000**
Systolic BP (mm of Hg)	121.56 +/- 2.47	118.68 +/- 3.01	**0.000**
Diastolic BP (mm of Hg)	80.60 +/- 1.29	79.32 +/- 2.04	**0.000**

Table 2: Comparison of BP and Pulse rate between smokers and non-smokers

* student't' test

It is evident from the above table that resting pulse rate, Systolic BP and Diastolic BP were all significantly higher in smokers compared to non-smokers ($p < 0.05$).

Parameters	1 – 3 pack yrs.	4 – 6 yrs.	7 – 9 yrs.	P value*
Pulse	88	88	86.71	0.74
Systolic BP	123.33	121.54	121.23	0.16
Diastolic BP	81.33	80.77	80.39	0.22

Table 3: Comparison of vitals among smokers based on pack years

* ANOVA test (above values are mean values)

When study parameters were compared among smokers based on pack years (1-3 pack years, 4-6 pack years and 7-9 pack years), there was no statistically significant difference.

DISCUSSION: In this case control study, the principal finding was that resting pulse rate, systolic and diastolic blood pressures were significantly higher in young healthy smokers compared to non-smokers of similar age profile.

The findings are in agreement with other works such as those of Ramon C. Hermida et al,[11] Zahi Khoury et al,[12] Venkatesh G and Swamy RM[13], Osman Karakaya et al[14] who found smokers had significantly higher resting heart rate compared to non-smokers. Ramon C. Hermida et al[11] found statistically significant increased diastolic pressure in smokers while Zahi Khoury et al, [12] Benowitz NL et al[15] and S B Sharma et al[16] found increased systolic as well as diastolic blood pressure in smokers.

In the present study, significant association between number of pack years and Heart Rate and BP could not be shown. But it can be safely stated that even in smokers with least number of pack years, the study parameters were higher than in non-smokers.

High resting heart rate is an indicator of high sympathetic tone.[17] The increase in heart rate could be due to stimulation of sympathetic ganglia and discharge of catecholamines from adrenal medulla.[13]

Nicotine present in cigarette smoke stimulates the production of catecholamines from adrenal medulla which causes constriction of peripheral blood vessels which leads to increase in blood pressure. Smoking increases sympathetic outflow to the heart and some other vascular beds in humans.[18, 19, 20] It has also been suggested that a smoking-associated impairment of the baroreflex ability to counteract peripheral adrenergic stimulation participates in the sympatho-excitatory effects of smoking in humans.[21, 22]

A persistently high sympathetic tone predisposes to cardiovascular morbidity. This may be contributory to higher prevalence of cardiovascular disorders ranging from hypertension to sudden myocardial infarction seen in smokers compared to non-smokers.

CONCLUSIONS: Smoking causes significant elevation of heart rate and blood pressure in young adults.

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AUTHORS:

1. Prashanth Babu G.
2. Mallikarjuna V.
3. Arun Kumar S.
4. Prashanth K. S.

PARTICULARS OF CONTRIBUTORS:

1. Principal Investigator, Department of Physiology, VIMS, Bellary.
2. Associate Professor, Department of Physiology, VIMS, Bellary.
3. Professor, Department of Physiology, VIMS, Bellary.
4. Assistant Professor, Department of Physiology, BMCRI.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Mallikarjuna V,
Associate Professor,
Department of Physiology,
VIMS, Bellary – 583104.
E-mail: mercury003@gmail.com

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