



A COMPARATIVE STUDY OF CARDIAC FUNCTIONS IN TOBACCO SMOKERS AND NON SMOKERS AMONG ADULT MALES IN AND AROUND SULLIA

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ABSTRACT

Background: Cigarette smoking is one of the common cause of Hypertension. Hence the present study is conducted to evaluate the effect of smoking on cardiac functions among healthy individuals as the previous studies done have conflicting results.

Objectives: To evaluate the cardiac functions among smokers and non smokers in Sullia

Methods: The present study was carried out on 100 apparently healthy male subjects included 50 smokers (study group) and 50 non – smokers (control group) in the age group of 18 to 30 years. Cardiac parameters were compared between smokers and non-smokers. Stastistical analyses was performed using student's t-test for 2 group comparisons.

Results: In this study the effect of smoking on cardiac parameters like Resting Heart Rate(RHR), Diastolic Blood Pressure(DBP) and on Mean Blood Pressure(MBP) is negligible except on Systolic Blood Pressure (SBP) in which there is statistically significant decrease in blood pressure in smokers compared to non smokers.

Conclusion: There was significant decrease in Systolic Blood Pressure (SBP) among smokers compared to non-smokers. In the present study Blood Pressure(BP) levels in smokers was rarely recorded during or immediately after smoking when acute rises in BP occur due to nicotine induced adrenergic drive, therefore BP levels of smokers tend to be systematically underestimated. The acute rise in BP may be followed by reduction due to body's homeostatic mechanism to maintain BP which may be attributed to rebound phenomenon and the adaptation process. Futher study has to be conducted between young and old age smokers with large sample size taking into consideration the time of sampling i.e taking the readings immediately after smoking.

Key Words: RHR, DBP, SBP, MBP

INTRODUCTION

Cigarette smoking constitutes one of the major cause of morbidity and mortality to mankind. According to WHO estimation, 194 million men and 45 million women use tobacco in smoke or smokeless form in India.¹ The WHO predicts that tobacco deaths in India may exceed 1.5 million annually by 2020.² Cessation of smoking reduces risk of diseases caused by it.³ Non optimal levels of blood pressure (BP) and smoking are the first and second most common causes of death in the world, and, together, these two risk factors account for more than 20% of the global burden of premature death.⁴ Smoking is the most

prevalent and most preventable risk factor for cardiovascular diseases. Smoking results in a twofold increase in the risk of coronary artery disease and is responsible for one-fifth of all cardiovascular deaths and increases the risk of heart failure threefold.⁵ The two most toxic constituents of cigarette smoke are nicotine and carbon monoxide; however, cigarette smoke contains about 2000 additional toxic components. Cigarette smoke exerts the most marked detrimental effects on the endothelial system and especially on the coronary endothelial system.⁶

Nicotine acts as an adrenergic agonist, mediating local and systemic catecholamine release and possibly the

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release of vasopressin.⁷ Thus smoking causes an acute increase in blood pressure (BP) and heart rate and has been found to be associated with malignant hypertension⁸ Paradoxically, several epidemiological studies have found that BP levels among cigarette smokers were the same as or lower than those of non-smokers.⁴

Active smokers can display BP values which vary widely according to a great number of individual, racial, life-style factors and also the time of sampling after smoking episode. While a smoker is actively smoking, transiently sympathetic responses, which acutely raise BP levels, usually occur due to kick induced by smoking. Reports emphasize that hypertension or hypotension can be associated with cigarette smoking in active smokers.⁹

In particular, increased BP¹⁰ and smoking¹¹ are major risk factors for cardiovascular diseases (CVD), including coronary heart disease (CHD) and stroke. Previous studies have indicated that smoking and increased BP interact to increase markers of cardiovascular risk, including levels of plasma fibrinogen¹² and carotid intima-media thickness.¹³ Hence, a combination of raised BP and smoking may have a synergistic impact on cardiovascular events, especially those caused by atherosclerosis and thrombosis.¹⁴ If such an interaction exists, multifactorial interventions aimed at both lowering BP and quitting smoking will contribute more to reducing CVD than expected and hence contribute to less mortality and morbidity. Hence the present study is conducted to emphasise the adverse effects of smoking on cardiac parameters and the need to quit smoking to save mankind.

MATERIALS AND METHODS

The study protocol was approved by the institutional ethical committee in KVG Medical College, Sullia. The present study was carried out on 100 apparently healthy male subjects which included 50 smokers (study group) and 50 non-smokers (control group) in the age group of 18 to 30 years after obtaining informed and written consent. Smokers having minimum history of smoking tobacco for more than two year duration and still smoking at least five or more cigarettes per day was included in the present study. Age below 18 years and above 30 years, History of cardiovascular diseases, History of chronic drug intake, History of infection, Alcoholics were excluded from study. Examination proforma used for recording the clinical examination findings was designed and validated. Resting pulse rate of the subjects was recorded in sitting posture. Blood pressure of the subjects was recorded in sitting posture by using Mercury sphygmomanometer and Littman stethoscope by auscultatory method. The equipment was checked and calibrated for its accuracy as per the recommendations by British hypertension society. Systolic blood pressure and Diastolic

blood pressure was recorded. Mean blood pressure was calculated as $1/3$ Systolic blood pressure + $2/3$ Diastolic blood pressure. Average of three recordings was taken. The results were given as Mean \pm Standard Deviation and range values. Comparisons were performed using students t-test for 2 group comparisons using SPSS software 19 version. The p value of less than 0.05 was considered as statistical significant.

RESULTS AND ANALYSIS

For this cross sectional study 50 healthy smokers and 50 healthy controls in the age group of 18-30 years were selected. Fifty male smoking subjects and also fifty male non-smoking subjects were analyzed for the results. The results obtained were expressed as Mean \pm SD, statistical technique like student t-test for two group comparisons and ANOVA (F test) for multiple group comparisons were used for analyzing data.

On analyzing the physical characteristics of the 50 non-smoking subjects the mean age (in yrs) is 20.08 ± 3.2 ; the mean height (in m) is 1.71 ± 0.06 ; the mean weight (kg) is 67.34 ± 10.7 & mean BMI is 22.78 ± 2.83 (Table 1). On analyzing the physical characteristics of the 50 smoking subjects, the mean age (in yrs) is 24.40 ± 2.1 ; the mean height (in m) is 1.73 ± 0.05 ; the mean weight (kg) is 66.50 ± 11.2 and the mean BMI is 22.17 ± 3.37 .

Resting heart rate

In Non-smokers mean resting heart rate was 80.96 ± 4.41 and 81.84 ± 3.04 in smokers. There was slight increase in resting heart rate in Smokers compared to Non-smokers but not statistically significant.

Systolic Blood Pressure

In Non-smokers mean Systolic Blood Pressure was 117.36 ± 4.34 and 115.60 ± 3.65 in smokers. There was statistically significant decrease in Systolic Blood Pressure in Smokers compared to Non-smokers.

Diastolic Blood Pressure

In Non-smokers mean Diastolic Blood Pressure were 77.56 ± 3.66 and 76.96 ± 3.38 in smokers. There was slight decrease in Diastolic Blood Pressure in Smokers compared to Non-smokers but not statistically significant.

Mean Blood Pressure

In Non-smokers Mean Blood Pressure was 90.82 ± 3.27 and 89.83 ± 2.86 in smokers. There was slight decrease in Mean Blood Pressure in Smokers compared to Non-smokers but not statistically significant.

DISCUSSION

Tobacco smoking is the major preventable cause of death in many parts of the world. Tobacco related lung diseases and cardiovascular diseases cause a significant proportion of total deaths and chronic disability. In this study, a group of youngsters in the age group of 18 – 30 years with 2 and more years of smoking were selected basically to highlight the cardiac risks during the transient phase of smoking. Transient or middle phase of smoking where in an individual is exposed to smoking bout for a period of 2 to 5 years. In young age, any abnormalities may be corrected or if he quits smoking, the rest of his life, quality of health may be better and can be prevented from the long term adverse health effects.

Resting heart rate: In smokers resting heart rate was slightly increased but not significant and similar findings were also found by Roberto et al¹⁵ and Minami et al.¹⁶ Heart rate measured by ambulatory monitoring is higher throughout the day when smokers are smoking compared with when not smoking.¹⁷ The extent of elevation of heart rate is independent of the blood level of nicotine absorbed from the cigarettes. The elevated heart rate is presumed to reflect persistent sympathetic nervous stimulation, which may be an important mechanism by which nicotine can contribute to cardiovascular disease and nicotine may also play a role in producing endothelial dysfunction, lipid abnormalities, and insulin resistance in smokers. Cigarette smoking acutely increases plasma levels of nor epinephrine and epinephrine and enhances 24-hour urinary excretion of these catecholamines.¹⁸ Cigarette smoking increases heart rate both acutely (up to 20 beats per minute) as well as throughout the day with regular dosing (average increase 7 beats per minute as measured during ambulatory monitoring).

There is slight decrease in systolic, Diastolic and mean blood pressure among smokers in this present study. Similar findings were also found by Manfred et al,¹⁹ Koichi et al,²⁰ Okubo et al,²¹ Yasushi et al²² and Hongmei et al.²³

The rebound phenomenon and the adaptation process were suggested as reasons smokers showed lower blood pressure than non-smokers.²⁴ we cannot disregard the possibility that our results were affected by these factors. However, it has been suggested that after the first few puffs of smoke, blood pressure increases abruptly and only returns to presmoking levels after 1–2 hours.²⁵ Thus it was pointed out that unless smokers had refrained from smoking on the day of examination, it was unlikely that lower blood pressure in smokers was due to withdrawal.²⁶ Therefore, the rebound phenomenon and the adaptation process cannot explain the mechanism of the effect of smoking on blood pressure completely.

Among cardiovascular parameters, blood pressure (BP) is adversely influenced by tobacco smoke with a high

rate by a mechanism yet under discussion. In addition, it is not clear if smoking exposure causes a rise or reduction of blood pressure and, otherwise, also if the occurrence of hypertension in smokers is a consequence of the greatest number of hypertensive people independently from smoking, or smoking actively contributes to changes in BP²⁷

Initially, a vasoconstriction mechanism mediated by nicotine causes acute but transient increase in systolic BP. This phase is followed by a decrease in BP as a consequence of depressant effects played chronically by nicotine. Simultaneously, carbon monoxide is acting directly on the arterial wall causing, in the long run, structurally irreversible alterations. At this time, there is a change in BP that increases again, and often constantly, its levels.²⁸ Such a hypothesis explains BP changes following chronic exposure. On the contrary, acute exposure to passive smoking determines a transient increase in systolic BP due to a combined effect of nicotine that acts by endothelial dysfunction and sympathetic stimulation, and carbon monoxide which exerts its toxic effects directly. Active smokers can display BP values which vary widely according to a great number of individual, racial, and lifestyle factors. Moreover, changes in BP have been documented in the same smoker while he is smoking a cigarette or not.

CONCLUSION

In this study the effect of smoking on cardiac parameters like RHR, DBP and MBP is negligible except on SBP in which there is statistically significant decrease in smokers. In this study the age group selected was 18-30 years, may be in younger people there is no much effect on cardiac parameters by smoking due to short duration of exposure and better disease combating activity. The rebound phenomenon and the adaptation process were suggested as reasons smokers showed lower blood pressure than non-smokers. Further study has to be conducted between young and old age smokers with large sample size.

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Table 1: Physical Characteristics of Subjects

Groups	N	Age (Yrs)		Height (meters)		Weight (Kgs)		BMI	
		Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD
Non-smokers	50	18 - 29	20.08 ± 3.2	1.55 -1.83	1.71 ± 0.06	51 - 110	67.34 ± 10.7	18.04 - 33.95	22.78 ± 2.83
smokers	50	21 - 29	24.40 ± 2.1	1.57-1.80	1.73 ± 0.05	52 - 98	66.50 ± 11.2	17.35 - 31.28	22.17 ± 3.37

Table 2: Comparison of RHR, SBP, DBP and MBP Between Non-Smokers and Smokers

Groups	N	RHR		SBP		DBP		MBP	
		Range	Mean ± SD	Range	Mean ± SD	Range	Mean ±SD	Range	Mean ± SD
Non-smokers	50	72-88	80.96±4.41	110-126	117.36±4.34	70-86	77.56 ±3.66	83.3-98.66	90.82 ± 3.27
Smokers	50	76-86	81.84±3.04	110-124	115.60±3.65	70-84	76.96 ±3.38	83.3-96.0	89.83 ± 2.86
Significance	t	1.266		2.101		0.734		1.472	
	p	>0.050, NS		<0.050, S		>0.050, NS		>0.050, NS	

