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Clinical assessment of resting heart rate in smoker and nonsmoker healthy individuals

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ABSTRACT

Introduction: Smoking affects cardiovascular system by different mechanisms. Smoking related diseases are the biggest killers in the world today. Cardiac output is increased by nicotine which is present in smoke by increasing both heart rate and myocardial contractility.

Aims and Objective: Our aim was to compare and assess resting heart rate in smoker and nonsmoker healthy males. Our objective was to study the effect of smoking on resting heart rate.

Materials and Methods: We included total 60 male subjects in the age group 25 – 65 years comprising of 30 smokers as case group and 30 nonsmoker healthy males as control group for present study and these were relatives of patients, sweepers, peons and paramedical staff of P.D.U. Govt. Medical College. Pulse Oximeter was used to measure resting heart rate immediately after over night sleep. Heart rate was recorded in a condition of physical and mental rest.

Results and Discussion: Data was tabulated and analysed. By using Z test, P value was found which was statistically significant (<0.05). Resting heart rate is important parameter to measure the effect of smoking on cardiovascular system. Smoking related products are dangerous to health and causes many health related diseases.

Conclusion: From our study, we conclude that the resting heart rate of apparently healthy smokers is significantly higher than nonsmokers of same group.

1. Introduction

Now a days, smoking is one of the biggest cause of death and illness in many countries. As per the report of World Health Organization (WHO), tobacco smoking killed 100 million people worldwide in 20^{th} century and WHO warned that it could kill one billion people around the world in 21^{st} century. Tobacco smoking related death would increase to about 10 million a year by early 2030.[1] Statistically, cigarette smoking shortens the user's life by 11 minutes. About half of cigarette smokers die due to smoking related diseases. Pregnant women who smoke have also been shown to cause birth defects including mental and physical disabilities and infant death syndrome.[2] Smoking affects both cardiovascular and respiratory system. Smoking increase risk of all type of cardiovascular diseases including coronary artery disease, ischemic stroke, abdominal aortic aneurysm. Nicotine is a chemical which is present in smoke. Cardiac output is increased by nicotine by increasing both heart rate and myocardial contractility.[3] The tachycardial effect and pressor effect of cigarette smoking are related to increase in plasma catecholamines.[4] Smoking has both long term and short term effect on body. Only one cigarette smoking can have immediate health effects;[5] including temporary increasing blood pressure, heart rate, constriction of blood

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vessels and binding of carbon monoxide to haemoglobin in blood stream. This reduces amount of oxygen delivered to tissues. Both active and passive tobacco smokers have been shown to negatively affect cardiovascular health.[6] Smokers may have increased cardiovascular risk due to autonomic alterations. Risk depends on number of cigarette smoked and number of year of smoking.[6,7] Resting heart rate is one of the most important parameter for assessment of cardiovascular functions. The present study was organized to compare and assess resting heart rate in smokers as compared to nonsmoker subjects.

2. Aims and Objective

Our aim was to compare and assess resting heart rate in smoker and nonsmoker healthy males. Our objective was to study the effect of smoking on resting heart rate.

3. Materials and Methods

A total 60 healthy male subjects in the age group 25-65 years comprising 30 smokers as case group and 30 nonsmokers as control group were considered for present study which includes sweepers, peons, medical and paramedical staff of P.D.U. Govt. Medical College and Hospital. Informed consent was obtained after proper counselling of subjects. Pulse Oximeter was used to measure basal heart rate immediately after over night sleep and subjects did not have any kind of stress at that time. Heart rate was recorded in the condition of physical and mental rest to exclude the effect of sympathetic stimulation and other physiological factors.

3.1. Inclusion criteria

Case group was selected subjects with history of smoking for more than 5 years. While control group was selected subjects who have never smoked in life and not having any kind of addictions.

3.2. Exclusion criteria

We excluded the subjects having history of diabetes mellitus, hypertension, coronary artery disease and neurological disorders and any other systemic illnesses in past and present in both case and control study group.

4. Results and Discussion

In present study we noted higher resting heart rate in smokers as compare to nonsmokers. There is a direct relation between resting heart rate and smoking severity. Data was analysed. Z test was applied and by using this test P value was found < 0.05 (Significant).

In our study, findings indicate that smokers have significantly higher resting heart rate than nonsmokers. These results are similar with previously published data.[8,9]

Table 1: Resting heart rate in smokers and nonsmokers in present study

Resting heart rate (BEATS / MIN.)	MEAN	Standard Deviation (SD)	P Value
Nonsmokers	69	4.5	<0.05 (Significant)
Smokers	83	6.0	<0.05 (Significant)

Smoking affect the autonomic function[10] and selective alterations in cardiac autonomic control.[11,12] Smoking increases circulating level of catecholemines at peripharal sympathetic sites,[13] increases sympathetic outflow[14,15] and create a long term reduction in vagal drive.[16] This sympathetic prevalence, seen in heavy smokers, is also related with impaired baroreflex function[15] leading to marked increase in resting heart rate. There are many form of smoking like Biddis, Cigar, Chilim, Cigarette, Hukkas etc. In urban area, filtered cigarette smoking is common while in rural area, biddis are more common form of smoking. In present study we selected the subjects who smoke Biddis and Cigarettes. All form of tobacco are dangerous to health and not safe at any level of exposure.[17] Smokeless tobacco users are highly addictive and they have increased risk of damaging health. This smokeless tobacco contain many carcinogens and therefore its use increases the risk of many cancers. Second-hand smoke is also harmful that fills enclosed spaces when people burn tobacco products like cigarettes, bidis.[17] Heated tobacco products(HTPs) such as iQOS, Ploom, Glo and PAX are same as all other tobacco products but inherently toxic and have many carcinogens. HTPs generate aerosols containing nicotine and toxic chemicals upon heating of tobacco and these aerosols are inhaled by users during smoking.[18] There are so many carcinogens in cigarette smoke. Smoke contains some carcinogenic pyrolytic products which bind to DNA and cause various genetic mutations. Acrolein is pyrolytic product that is present in smoke which gives smoke an acrid smell and irritating lacromatory effect and this product is contributor to its carcinogenicity. Farmars who grow tobacco have also exposed to number of health risks such as Green Tobacco Sickness.[17] In present days, E-Cigarettes are in use which are devices that heat a liquid to generate aerosol which is inhaled by user, these may or may not contain nicotine but the main constitute of liquid are propylene glycol, with or without glycerol and flavouring agents and the important thing is, these e-cigarettes do not contain tobacco but dangerous to health.[19] Jean Claude Tardif noted that resting heart rate is really a strong predictor of mortality in patient with coronary artery disease.[20] Experimental data have demonstrated that decrease in heart rate can slow down the progression of atherosclerosis in animal model.[21] A study done by KA Parkins et al.

regarding the drastic effect of nicotine on resting metabolic rate(RMR), these results confirm that uptake of nicotine, isolated from tobacco smoke, significantly rise the resting metabolic rate in humans.[22]

5. Conclusion

This study proves that smoking increases person resting heart tare. Resting heart rate is easily measurable parameter with prognostic indications. Sympathetic overactivity which lead to cardiovascular disease development in smokers.

6. Source of Funding

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7. Conflict of Interest

The authors declare no conflict of interest.

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