ORIGINAL ARTICLE

COMPARISON OF BLOOD PRESSURE AND HEART RATE AMONG ACTIVE AND PASSIVE CIGARETTE SMOKERS

Ayesha Qaiser[1], Fazlina Shaid[1], Henna Salman[1], Naila Hamid[1], Jibran Umar Ayub[2]

[1]Department of Physiology, Khyber Medical College, Peshawar - Pakistan

[2]Department of Gastroenterology, Kabir Medical College, Peshawar - Pakistan

ABSTRACT

Objectives: To compare the effects of passive and active cigarette smokers on blood pressure and heart rate.

Material and methods: It was a cross-sectional study based in the Physiology department of Khyber Medical College, Peshawar. It was conducted from January 2022 to June 2022. Using non-probability convenient sampling, MBBS students and college employees were divided into three groups. Each group had a sample size of 50. Group 1 comprised of passive smokers, group 2 consisted of active smokers and Group 3 of nonsmokers. Heart rate and blood pressure, including Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure, and Pulse Pressure, were measured. Data was analyzed using SPSS 26.

RESULTS: In Group-1, all smokers were males. In Group-2 (nonsmokers), 42 were males (32.6%) and 8 (34.8%) were females and in Group-3 (passive smokers), 37 were males (28.7%) and 15 were females (65.2%). Using the Anova test, the difference in the mean values of systolic blood pressure (SBP) among the three groups was found to be highly significant (0.001), while that of diastolic blood pressure (DBP) was non-significant (0.291). The mean values of Heart Rate (HR) among the three groups were also significant (0.049).

CONCLUSION: Smoking affects blood pressure and heart rate, as the systolic blood pressure and heart rate of smokers in our study were raised.

KEYWORDS: Hypertension, Power Lab, Smokers

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INTRODUCTION

Exposure to passive smoking is linked with an increase in cardiovascular deaths. It was found that getting exposed to passive smoking for a long time can result in hypertension.[1] Hypertension is a fatal condition that can cause myocardial ischemia, cerebrovascular accidents, congestive cardiac failure, and chronic kidney disease. In one of the studies, it was determined that passive smoking can cause silent hypertension in people who don't smoke.[1] Smoking is the major culprit that can cause non-communicable diseases.[2] Active smoking has detrimental effects on individuals consuming it. About 85% of passive smoking is due to a side stream of smoke, as a result of burning from cigarette tips.[3] However, the relationship of tobacco consumption with blood pressure (BP) is still ambiguous, especially in youngsters.[4] An international study was conducted on active and passive smokers among young adults which concluded that both smoking and being exposed to it are positively related to an increased cardiac metabolic consequence and therefore precautionary measures are of paramount importance.[5] A study conducted among healthcare staff concluded that tobacco consumption was most common among male doctors.[6] Most of the time exposure to secondhand smoke does occur at workplaces, colleges, and residences.[7] Less literature is found regarding the enhanced risk of MI due to passive smoking.[8] On the hand active smoking is responsible for ischemic heart diseases and stroke as well.[9] Internationally findings are implicated in glucose intolerance as well.[10] Most of the research has medical students as their participants followed by medical doctors.[11] The prevalence in them is from 32.7 to 37%.[12] Park et. al. came to an interesting conclusion that SHS was found to cause hypertension in females only.[13] Nevertheless, passive smoking is absolutely dangerous and about 6 million people die from it each year globally.[14] Little is known in the literature about the relationship between exposure to passive smoking and high blood pressure in lifetime nonsmokers. Therefore, this study can be very useful which will enable the health authorities to make solid decisions and formulate constructive health guidelines, policies, and

Correspondence
Dr. Fazlina Shaid
Assistant Professor
Department of Physiology, Khyber Medical College,
Peshawar - Pakistan
Cell: +92-332-9296405
Email: fazlina.shaid@kmc.edu.pk
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interventions to prevent smoking and its complications.[15] The rationale of our study is to observe the effects of active and passive smoking on cardiovascular health in students and staff of undergraduate medical college as very little work has been done on this issue. Also, very little comparative research has been done between active and passive smoking in our setup. The objective of the study was to compare the effects of passive and active cigarette smokers on blood pressure and heart rate.

MATERIAL AND METHODS

This comparative cross-sectional study was performed in Physiology Laboratory at Khyber medical college Peshawar from Jan.2022 to Jun 2022. Ethical approval was taken from the institution's research and ethical review board. Subjects included both staff and students of the college, comprising both genders. The study sample was calculated as 50 in each group using WHO software (open Epi tool) via Diastolic blood pressure in male smokers and non-smokers as 82.55+-11.26 mmHg and 80.44+-10.95mmHg (Mean +- SE) respectively keeping confidence interval as 95% and power as 90%.[15] Sampling was done through a non-probability convenient technique. Three groups were taken, where Group 1 comprised active smokers, group 2 were passive smokers and Group 3 nonsmokers based on the number of cigarettes smoked per day and smoking habits asked in the questionnaire. Group 3 had 52 subjects. Blood pressure, including systolic blood pressure, diastolic blood pressure, mean arterial pressure and pulse pressure was measured in all eligible participants. Healthy staff and students of Khyber medical college were enrolled. People not taking any medications which affect the heart rate and blood pressure were also included. Those with known hypertension and heart disease, chronic kidney disease, diabetes mellitus, or thyroid diseases were excluded. Study details were explained to the participants who met the inclusion criteria. Written informed consent was obtained. The participants underwent clinical assessment which included history (questionnaire), and clinical examination. Clinical examination included BMI, height, and weight. BP (systolic, diastolic, mean arterial pressure, pulse pressure) and heart rate were checked using Bio Pac student power lab. The Biopac Student Lab system is an integrated life science teaching solution that includes hardware, software, and curriculum materials that students use in undergraduate laboratories to record data from their bodies, animals, or tissue preparations.[16] After the data collection, analysis was done using SPSS v. 26. Quantitative data was presented as mean and standard deviation. Categorical data was presented as frequency and percentages. A One-way ANOVA test was applied to check the difference in the mean values of blood pressure and heart rate in all three groups.

RESULTS

Our findings revealed Group 1 included 50 (32.9%) active smokers, group 2 included 50 (32.9%) non-smokers and Group 3 included 52 (34.2%) passive smokers, based on smoking habits given in the questionnaire (Table-1).Table 2 shows the means and standard deviations of different parameters examined in all three groups, including age, height, weight, BMI, SBP, DBP, and heart rate. An ANOVA test was applied to check the difference in the mean values of blood pressure and heart rate in all three groups (Table 3). We can easily see in Table 3 that the difference in the mean values of systolic blood pressure (SBP) among the three groups is highly significant (0.001), The post-doc Tukey test showed that a significant difference ($P<0.05$) existed between each pair of groups.

Table 1: Demographic characteristics of the participants

	Frequency	Percent%	Gender (Male)	Percent %	Gender (Female)	Percent%
Smoker	50	32.9	50	38.3	0	0
Non-smoker	50	32.9	42	32.6	8	34.8
Passive smoker	52	34.2	37	34.8	15	65.2
Total	152	100.0	129	100	23	100

Table 2: Comparison of Health Parameters Among Smokers, Non-smokers, and Passive Smokers

No	Parameters	Smoker		Non-smoker		Passive Smoker	
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1.	Age	27.40	7.605	20.80	2.942	22.02	5.472
2.	Height	1.6748	.07492	1.6898	.07517	1.6987	.09569
3.	Weight	65.460	6.1052	63.420	11.7423	61.558	14.0188
4.	BMI	23.9998	3.04616	21.8466	3.94006	20.7552	3.48483
5.	Systolic BP	124.400	10.6426	118.260	12.9785	115.058	13.0149
6.	Diastolic BP	80.520	6.6586	79.040	8.9282	77.904	9.2995
7.	Heart Rate	78.100	7.7440	77.720	8.1817	81.077	6.5435

Table 3: Analysis of Variance (ANOVA) Results for Blood Pressure and Heart Rate Measurements Among Different Groups

	df	Mean Square	F	Sig.
Systolic BP Between Groups	2	1144.198	7.597	.001
Diastolic BP Between Groups	2	87.590	1.244	.291
MAP Between Groups	2	114.595	1.287	.280
Heart Rate Between Groups	2	173.361	3.074	.049

DISCUSSION

We performed this study to observe the effects of active and passive smoking on cardiovascular health in healthcare professionals. In group 1, all the smokers were males. In group 2, 42 were males (32.6%) and 8 (34.8%) were females and in group 3, 37 were males (28.7%) and 15 were females (65.2%). The mean SBP in group 1 was 124.4± 10.6 mmHg, in group 2 was 118.26 ± 12.978 mmHg and in group 3 was 115.06 ± 13.01 mmHg (Mean ± SE). Mean DBP in smokers was 80.52 ± 6.66 mmHg (Mean ± SE), in nonsmokers, 79.04 ± 8.92 mmHg and in passive smokers, 77.904 ± 9.2995 mmHg. The mean heart rate in the smokers was 78.1 ± 7.74 (Mean ± SE), in the nonsmokers it was 77.720 ± 8.1817 and in the passive smokers, it was 81.077± 6.5435. The difference in the mean values of systolic blood pressure (SBP) among the three groups is highly significant (0.001), while that of diastolic blood pressure (DBP) is non-significant (0.291).

Multiple researches have been conducted to study the association between cigarette smoking and BP. According to some, there is zero relationship between smoking and BP.[17] While some studies suggested lower BP among cigarette smokers, than nonsmokers.[18] On the other hand some studies suggested that smoking increases BP.[19] Our study also shows a significant rise in SBP in the smoker group.

Papathanasiou et al conducted a cross-sectional study in Greece, which showed a rise in both systolic and diastolic blood pressure in smokers. According to the findings of their study, blood pressure was directly associated with male gender and increased body mass index. Our study showed a rise in systolic blood pressure, and no difference in diastolic blood pressure among the three groups.[20]

While many researches have shown that heart rate is acutely increased in smokers, our study didn't show much change in heart rate in general and also among the three groups.[21]

Unlike studies done in the West, our smoker group exclusively comprised males, and the SBP was found to be raised in male smokers.[22]

A study done by Yarlioglues in 2010 revealed a marked increase in blood pressure and heart rate of healthy females as a result of the acute effects of passive smoking, and these injurious effects remained positive even after a long time passed after exposure. Heart rate and SBP increased and then lowered at the same time interval, whereas DBP varied at different time intervals. In our study, we saw no significant difference in systolic or diastolic blood pressure or heart rate among the passive smoker group or the non-smoker group.[23]

However, as is generally advised, strict measures to prevent passive smoking should be prioritized not only in public places but also in private homes because females are mainly exposed to cigarette smoke at home due to the smoking habits of their husbands. Children must be especially protected from exposure to cigarette smoke both at home and outside.[9]

CONCLUSION

Smoking affects blood pressure, especially systolic blood pressure and heart rate. The systolic blood pressure in our smoker group was significantly higher than passive smokers and non-smokers.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

Qaiser A: Concept, Design,

Shaid F: Acquisition and critical review

Salman H: Analysis and interpretation of data

Hamid N: Data collection

Ayub JU: Bibliography and proofreading

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.