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Relationship of smoking with alteration in body physiology

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Abstract

Cigarette smoking has harmful effects on the physiology of the body. Higher exposure to smoking causes musculoskeletal disorders including depressed muscle protein synthesis, arterial stiffness, reduction in serum HDL level, cerebral aneurysm, weight loss and obesity. The present study was carried out in the different areas of Tehsil Mailsi and District Vehari through a survey in form of a questionnaire, and the blood samples were collected randomly. A total of 431 persons participated in the recent survey, with 51.28% being from rural areas and 48.49% hailing from cities. The sample population had 26.45% chain smokers, 45.48% light smokers, and 27.48% ex-smokers. As a result of their company, the majority of them begin to smoke as a fashion statement. It was determined that cigarette smoking has numerous consequences on human physiology, however, the level of CBC was observed as normal due to increased physical activity and natural food consumption. It was concluded that no significant values were explored.

Introduction

The cigarette was first introduced in the United States in the early nineteenth century. The tobacco was once only used in pipes and cigars. Cigarette smoking had grown highly common by the time of the revolution. The cigarette was subjected to Federal Tex in 1864 [1].

The consequences of smoking on bodily physiology have been reported, through coughing, smoking induces disc herniation, which can lead to pathological alterations in the intervertebral disc. These can alter the nutrition, pH, and mineral content of the food. A sickening habit was also observed in smokers. It has also been reported that there is a link between smoking and discomfort in various regions of the body, such as the neck [2], shoulder [3], and legs [4]. Nicotine is found in tobacco smoke. Nicotine is a psychostimulant that affects arousal in both the cortical and autonomic nervous systems. Vascular constriction, hypoxia, faulty fibrinolysis, and other damaging factors also harm the musculoskeletal tissues [5].

Specific carcinogens are transported by inhalation to the bronchoalveolar location to develop adenocarcinoma [6]. The tobacco stems that have been blended release a higher level of nitrosamines than tobacco leaves [7]. The nitrosamines incorporation into the lungs of an organism leads to causes adenocarcinoma [8]. The number of cigarettes smoked is directly proportional to the increase in serum HDL level. HDL is inversely proportional to the number of cigarettes smoked each day. Increased cigarette smoke exposure lowers the level of HDL and leads to cardiovascular disease. A lipid profile is a straightforward test that can be used to predict future cardiovascular morbidity and mortality in smokers. This could be related to nicotine, hydrogen cyanide, and carbon monoxide, which are all present in cigarettes [9, 10].

The main cause of the cardiovascular disease is increased exposure to cigarette smoke. It causes endothelial dysfunction, arterial stiffness, swelling, and lipid level changes. It produces an increase in blood pressure due to artery rigidity, which damages organ tissues and can be seen after only 5 minutes of smoking [11, 12]. Smoking may also impair physical function and raise the likelihood of sarcopenia [13, 14]. It lowers the rate of muscle renewal, resulting in lower muscle protein synthesis. The use of tobacco decreased bone mineral density [15] and raised the risk of osteoporotic fracture [16], influenza-like sickness [17], intestinal inflammation [18], aberrant follicular growth [19], and cerebral aneurysm formation [20]. Nowadays, researchers are trying to solve biological problems through interdisciplinary fields. Bioinformatics approaches are being used to solve complex biological problems with the help of computational power and mathematical theorems [21]. Effects of smoking and disturbance of biological mechanisms can be explore through bioinformatics approaches [22, 23]. The study was designed to explore the prevalence and effects of smoking in the areas of Tehsil Mailsi, District Vehari, Punjab, Pakistan.

Materials and Methods

Sampling

The present study was taken from the people of 20 different urban and rural areas of Tehsil Mailsi, District Vehari, Punjab. The information was collected by using a survey that included questions on chain-smoking, mild smoking, and non-smoking. . All the participants were updated about the research purpose and the consequences of smoking were elaborated. The consent of all the participants was obtained. The health conditions of all the selected participants were observed and severe patients were excluded. The occasional smokers were excluded from this study. Twenty different areas of Tehsil Mailsi were selected and the samples were collected randomly to avoid biases in this study. The age, career, education, marital status, smoking family history, smoking status, and age of initiation of all the participants were observed and questioned in this study.

Measuring system

Digital Blood Pressure Monitor CH-452 was used to assess the blood pressure of all the participants. It was also observed that the blood pressure is higher in smokers as compared to non-smokers. The three different readings with a break of 10 minutes each were collected for blood pressure. The blood was extracted from the selected participants including chain smokers, mild smokers, and non-smokers by utilizing the EDTA tubes. All the tubes were transferred to the THQ Hospital Laboratory, Mailsi in a controlled environment. Various basic tests including creatinine and CRP (c Reactive Protein) test were performed on the samples extracted from all the participants. The Count Blood Cells test (Hb, RBC Count, HCT, MCV, MCH, MCHC, TLC, Neutrophils,

Lymphocytes, Monocytes, Eosinophils, Basophils, and Platelets) of the extracted blood samples were tested from
Combined Military Hospital, Mailsi. All the participants were informed about all the blood tests and also informed all the participants that the blood collection and blood tests were only for research purposes. The results of the blood tests of all the collected samples were compared and observed for further analyses and conclusions. The damaged blood samples were excluded from the study.

Statistical Analyses

The statistical analyses were carried out by employing the statistical application of GraphPad Prism 9 and Minitab Statistical Software. Various appropriate tests including the T-Test and Chi-square test were applied to analyze the generated results. A control group was also utilized to study the collected samples from the blood of selected participants of smoking. A comparison between the control group and chain and mild smokers yielded a significant value.

Results

A questionnaire-based survey was conducted to investigate the effects of smoking on the physiology of the body. Various questions were prepared for extensive analyses and to study the effect of smoking on body physiology. In total, 430 participants were selected for this research purpose having different variety of age groups and professionals were involved. Most of the participants were selected from rural areas. The demographic form was utilized to understand the observed findings (**Table 1**). The proportion of the age of all the participants was calculated to understand the average age and to analyze the effect of smoking on the physiology of the body. It was observed that most of the smokers were married. Interestingly, it was observed that 61.72% of the participants were unemployed. Moreover, it was also observed that 97.68% percent of participants were undergraduates.

Table 1: Demographic characteristics (age, marital status, education, profession, and residence) of respondents

Participants characteristics	Overall (N=431)
Age	
Teenage	72 (16.71%)
Adults	255 (59.16%)
Old age	103 (23.90%)
Marital status	
Married	260 (60.32%)
Unmarried	170 (39.44%)
Education	
Undergraduate	421 (97.68%)
Postgraduate	9 (2.09%)
Residence	
Rural	221(51.28%)
Urban	209 (48.49%)
Profession	
Unemployed	266 (61.72%)
Self-employed	125 (29%)
Employed	39 (9.05%)

Among professions, 48% of participants were mild smokers and 34% percent were chain smokers. It was observed that the chain smokers were self-employed and addicted to cigarette smoking. Interestingly, it was observed that there was a large number of rural populations with no smoking habit. Only 23% of chain smokers were observed and analyzed during this study. The *p*-value was calculated by applying the Chi-square test to the data of all the participants and demographic information was analyzed (**Table 2**).

Table 2: Demographic characteristics of respondents in response to chain smokers, mild smokers and non-smokers

Participants characteristics	Chain smokers	Mild smokers	Non-smokers	X^2	*p*-value
Age					
Teenage	2 (2.7%)	30 (41.66%)	40 (55.55)		
Adults	63 (11.37%)	131 (51.37%)	61 (23.92%)		0.00
Old Age	49 (47.57%)	35 (33.98%)	19 (18.44%)	85.134	
Marital Status					
Married	95 (36.53%)	120 (45.38%)	45 (17.30%)		
Unmarried	19 (11.17%)	76 (44.70%)	75 (42.35%)	48.74	0.00
Education					
Undergraduate	111 (26.36%)	193 (45.84%)	117 (27.79%)		
Postgraduate	3 (33.33%)	3 (33.33%)	3 (33.33%)	0.561	0.75
Residence					
Rural	51 (23.07%)	91 (41.17%)	79 (35.74%)		
Urban	63 (30.14%)	105 (50.23%)	41 (19.61%)	13.972	0.001
Profession					
Unemployed	65 (24.43%)	114 (42.85%)	87 (32.70%)		
Self-employed	43 (34.4%)	60 (48%)	22 (17.6%)	13.740	0.008
Employed	6 (15.38%)	22 (56.41%)	11 (28.20%)		

Chain smokers had a greater impact on their health than non-smokers since they had a lower BMI. The smoking habit reduces protein synthesis, resulting in a loss of body mass. Mild and nonsmokers had a normal BMI due to their high level of physical activity. The proximal alterations were observed by applying the chi-square test (**Table 3**).

It was observed that the family members of the smokers were nonsmokers. The family history of the chain smokers was nonsmokers and also dislikes the smoking habit. It was observed that the chain smokers started the smoking habit due to unemployment, depression, and fashion (**Fig. 1**).

Table 3: Comparative analyses of physical health of smokers and non-smokers

Participants characteristics	Chain smokers	Mild smokers	Non- smokers	X^2	*p*-value
Physical Activity					
Yes	48 (28.91%)	84 (50.60%)	34 (20.48%)		
No	66 (25%)	112 (42.42%)	86 (32.57%)	7.426	0.024
BMI (Body Mass Index)					
Low	101 (49.75%)	86 (42.36%)	16 (7.88%)		
Normal	11 (4.95%)	108 (48.64%)	103 (46.39%)		
High	2 (40%)	2 (40%)	1 (20%)	138.048	0.00
Obesity					
Yes	10 (45.45%)	8 (36.36%)	4 (18.18%)		
No	104 (25.49%)	188 (46.07%)	116 (28.43%)	4.356	0.11
Abdominal Obesity					
Yes	25 (36.23%)	29 (42.02%)	25 (36.23%)		
No	89 (24.86%)	166 (46.36%)	103 (28.77%)	2.678	0.26

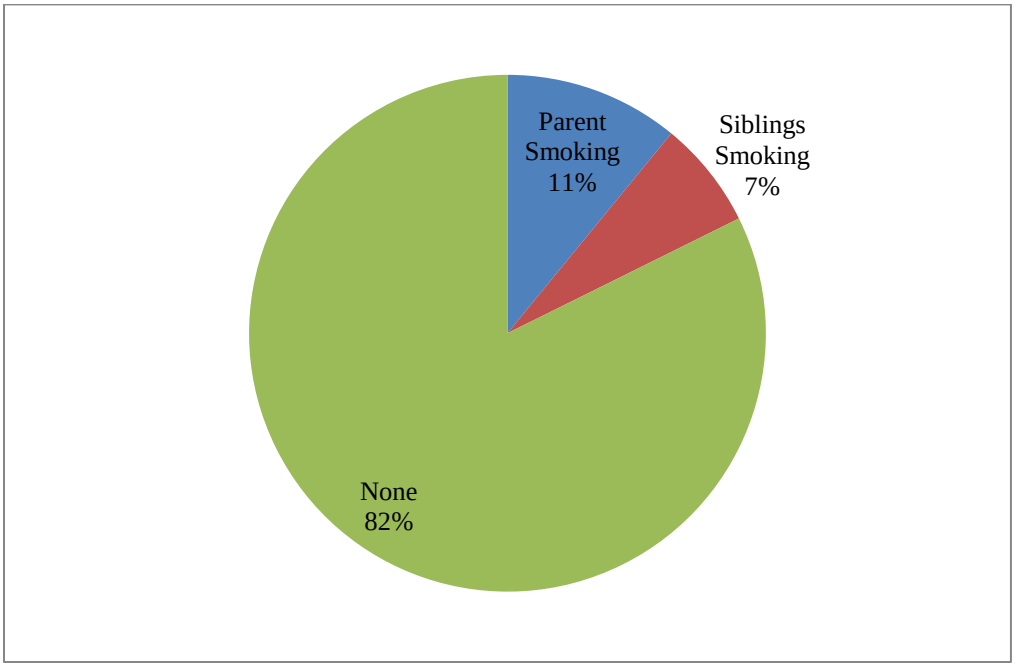

Fig. 1: Family history graph of the participants

The obtained data regarding chain smokers, mild smokers, and non-smokers were analyzed and it was observed that the participants have depression. It was also observed that only 26% of the participants were chain smokers, 46% of respondents were mild smokers and the remaining were trying to quit the habit of smoking (**Fig. 2**).

The hematology of the participants was analyzed, and *p*-value was calculated by applying T-test (**Table 4**). It was observed that minimal significant values were obtained by applying a statistical test to the control group and experiment group. However, the results were significant to control the consequences of smoking.

Discussion

The smokers were found to have musculoskeletal problems. Smokers had more discomfort in various

Table 4: Measurement of different Parameters in blood samples

Parameter	Control	Chain	Mild	*P*- value
Hb (g/dl)	14.70±1.34	14.56±1.07	13.14±1.91	0.29
RBC Count (M/mm3)	5.22±0.56	5.48±0.57	4.68±0.75	0.23
HCT (%)	42.40±4.45	43.80±2.23	39.20±5.64	0.34
MCV (f1)	81.60±4.08	80.00±6.63	84.20±5.56	0.66
MCH (pg)	27.40±1.36	26.20±2.93	27.80±2.32	0.60
MCHC (%)	34.00±0.63	32.60±1.50	32.60±0.80	0.13
TLC (Cmm)	5.24±1.68	6.88±3.02	6.96±5.09	0.74
Neutrophis (%)	49.20±3.66	50.20±12.53	55.00±6.13	0.58
Lymphocytes (%)	105.60±129.81	39.00±7.38	36.80±8.45	0.37
Monocytes (%)	6.20±1.33	7.80±6.34	5.00±1.55	0.59
Eosinophils (%)	4.80±1.94	3.00±1.10	3.20±1.47	0.23
Platelets (/mm3)	200.60±35.30	244.20±46.88	233.20±50.41	0.38
Creatine (mg/dl)	0.80±0.15	0.98±0.12	1.06±0.26	0.17

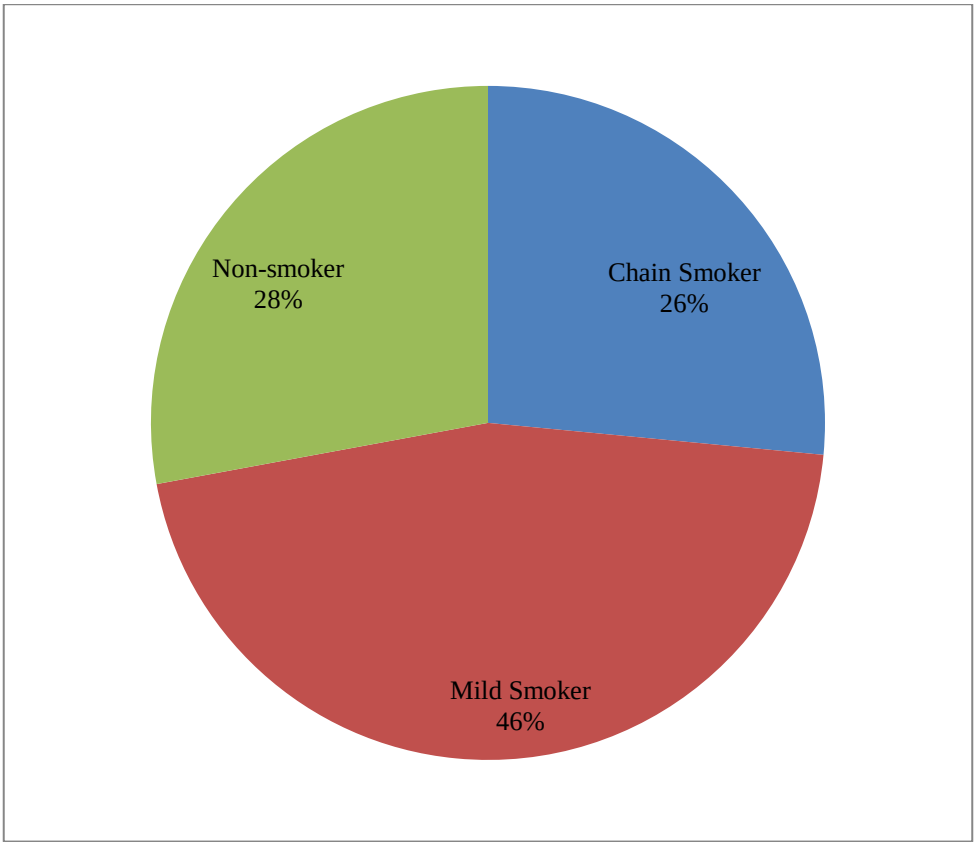

Fig. 2: The smoking status of the participants

parts of the body, such as the head, neck, shoulder, and joints, than non-smokers. The obtained results were reconciled with Palmer, Syddall [24]. Cigarette smoke changes the nutritive components, pH, or mineral content of the body, resulting in a variety of symptoms such as disc herniation, headache, shoulder discomfort, and leg joint pin. Nicotine, continine, and other harmful compounds in cigarette smoke deplete bone minerals and cause joint pain. Musculoskeletal aches (in the back, upper and lower limbs, and other body regions) were found among smokers and ex-smokers [4]. Smokers showed a higher prevalence of chronic pain than non-smokers.

Due to the change in diagnosis and categorization that can resemble genuine changes in disease occurrence, cancer histology can be difficult to detect and study [25]. It has been discovered that cigarette smoke can develop lung cancer by altering the histology of the disease. The observed results were reconciled [26]. It was stated that smoking was the leading cause of mortality among smokers, but that ex-smokers had a lower rate of lung cancer [27].

Platelet and endothelial function, arterial stiffness, stroke, oxidative stress, inflammation, heart rate variability, energy metabolism, and increased infarction size are all signs that the cardiovascular system is extremely vulnerable to the toxins in secondhand smokers. The biggest cause of asthma and lung infection is secondhand smoking. Indirect cigarette smoke exposure affects more people than direct cigarette smoke exposure [29].

Smokers are more likely than non-smokers to experience depression symptoms. Many smokers say that smoking improves their mood during the poll. Smoking has been linked to the alleviation of several psychiatric diseases. It is portrayed by smokers as a form of self-medication for depression [33].

The recent research was largely conducted in rural areas, where people were mostly engaged in a lot of physical exercises. Smokers worked hard in the fields from morning to evening, eating natural foods such as milk, buttermilk, vegetables, and so on, and have fewer effects from smoking. The CBC levels in the blood of the participants were maintained by hard labor and natural nourishment.

Conclusion

Smoking causes adverse effects on the body physiology in smokers than in non-smokers and ex-smokers. Interestingly, it was observed that smokers have normal CBC due to high physical activity and natural food consumption. The obtained results were reconciled with previous findings with proximal changes. However, due to variances in the study regions, they differ.

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Conflict of interest

The authors declare no conflict of interest.

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