The Influence of Tobacco on Health-Related Parameters in Chronic and Acute Healthy Male Smokers

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ABSTRACT

Ingestion of tobacco is detrimental to overall health that could affect the normal function of several health parameters in the human body. While it has been generally documented that smoking is injurious to health, the influence of tobacco on certain health parameters with regards to the duration of smoking in individuals without any apparent health issues is yet to be fully investigated. The current study investigated the effect of smoking on health parameters of healthy male smokers. A total of 107 (37 ± 9.42) years were enlisted randomly from different locations in Malaysia and several health-related parameters were measured. A k-means cluster analysis was employed to classify the smokers into groups based on their smoking period while analysis of variance (ANOVA) was used to examine the differences in the health parameters status of the smokers. The k-means clustering analysis identified two distinct groups namely; chronic and acute smokers whilst the ANOVA indicated that the chronic smokers are older and characterised with a considerably higher diastolic blood pressure levels, total cholesterol, visceral fat, leptin as well as high and low-density lipoprotein. Moreover, chronic smokers are found to be highly dependent on nicotine $p < 0.05$. Nonetheless, no significant difference was found in basal metabolic rate systolic blood pressure, heart rate, nicotine level as well as calories intake amongst the smoking groups $p > 0.05$. The long-term smokers are predisposed to higher risks of cardiovascular-related problems, high fat accumulation as well as dependence on nicotine, among others.

Keywords: Chronic smokers, acute smokers, Health-related parameters, Tobacco, Health risks

1. INTRODUCTION

Tobacco smoking remains one of the most serious public health problems associated with substantial preventable morbidity worldwide. In the US alone, smoking tobacco has been listed as the leading cause of death and morbidity[1]. Hitherto, it is believed that there are more than 1.3 billion smokers worldwide and this amount is expected to be 1.6 billion by 2025 [2]. To date, there are more than 60,000 studies relating tobacco smoking to higher morbidity and mortality due to coronary disorders, as well as various causes of cancer and chronic disruptive diseases[3]. Considering the dangers of progressive loss in health arising from a myriad of human illnesses, the troubling rise in smoking expenditures and poor productivity remain a significant concern for tobacco smoking[4].

The risks involved from smoking cigarettes was determined to be linked to the length of smoking and the regular consumption of cigarettes. Although stopping

smoking could dramatically reduce health risk factors, smoking has been seen to rise gradually worldwide, with the adult population staying at 10-40 per cent in many countries[5]. To this end, various programs and media campaigns designed to encourage people to stop smoking have risen globally, but the number of smokers has not so far appeared to decrease[5]. Consequently, highlighting the influence of tobacco on health-related parameters in chronic and acute healthy male smokers is essential in providing data that could reflect the adverse effects of ingesting tobacco with respect to the duration of smoking.

In addition, it is worth noting that the majority of studies in this area used a self-reporting approach, such as the number of cigarettes smoked or packs in a day in order to assess the smoking status of a person. Likewise, the association between the health indicators consisting of Age, Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Heart rate, Basal metabolic rate (BMR), Visceral fat, Nicotine dependence, Total cholesterol, Triglyceride, High density lipoprotein cholesterol (HDLC), Low density lipoprotein cholesterol (LDLC), Leptin, Nicotine level as well as Calories amongst healthy male smokers is yet to be described. Hence the present study endeavor to investigate the association between the aforesaid parameters.

2. MATERIALS AND METHODS

The present study followed the steps to achieve the initial objective stated.

Participants

A sample of 107 health males Average age and standard deviation (37 ± 9.42) were selected to take part in this study. The participants were Malay and had no experience of serious illnesses, either on regular medications or on alcohol intake. It is worth noting that the subjects who were involved in weight loss or any smoking quitting programs were excluded from the present study. All the procedures and protocol in the present study were endorsed by the Research Ethics Committee (Human) of Universiti Sains Malaysia and was conducted in accordance with the Helsinki Declaration. Moreover, informed consent was retrieved from all the participants before the commencement of the study. Interview sessions were organized to obtain personal background information of the participants

3. EVALUATION OF THE HEALTH-RELATED PARAMETERS

All the participants were told to fast the night before the day of the measurement. Peripheral blood samples were collected and held briefly at room temperature in the morning of the day of measurement in order to clot prior to the serum separation process. Both systolic and diastolic blood pressures were measured from the right

arm of the participants when in sitting posture using automated optical blood pressure tests device HEM-780, Omron, Japan). The body fat percentage (BF), visceral fat (VF), and basal metabolic rate (BMR) were measured using a digital body composition analyzer (SC-330, Tanita, Japan) that applied the principles of bioelectrical impedance analysis (BIA). The lipid profile, leptin, as well as the nicotine level were measured in accordance with the standard protocol documented in the previous studies[6]. Conversely, the nicotine dependence was determined via the application of a questionnaire with respect to the procedure previously documented in the preceding investigation [7].

3. DATA ANALYSIS

Cluster Analysis

A k-means clustering algorithm is applied to cluster the smokers in the current investigation. It is worth noting that k-means cluster analysis is basically a method of cluster analysis that iteratively tries to segregate a dataset into a separate k-predefined as well as non-overlapping subgroup known as clusters such that only one group is assigned to each datapoint. In this step, the algorithm aims to make inter-cluster data points as homogeneous as possible while maintaining clusters as heterogeneous as possible. In this analysis, the k-means clustering algorithm is applied to group the smokers based on the duration of smoking. The Euclidean distance was used a distance metric of apportioning the two clusters formed i.e. chronic and acute smokers (Chronic S.) and (Acute S.). Moreover, the analysis of variance (ANOVA) was used to examine the differences in the health parameters status of the smokers. All the statistical analysis was conducted using XLSTAT2014 add-in software for Windows as well as Orange Canvas Version 3.4 for Windows. All the inferences were considered significant and drawn at $p \leq 0.05$.

4. RESULTS

Table 1 tabulates the descriptive analysis of the samples under study. From the table, the number of the participants, the minimum, maximum observations, the mean as well as the standard deviations of all the variables investigated are shown.

Figure 1 projects the groups identified through the k-means analysis based on the duration of the participants' smoking. It could be seen from the figure that a clear separation is formed between the Acute S. and the Chronic S.

Table 1 Descript statistics of the study samples

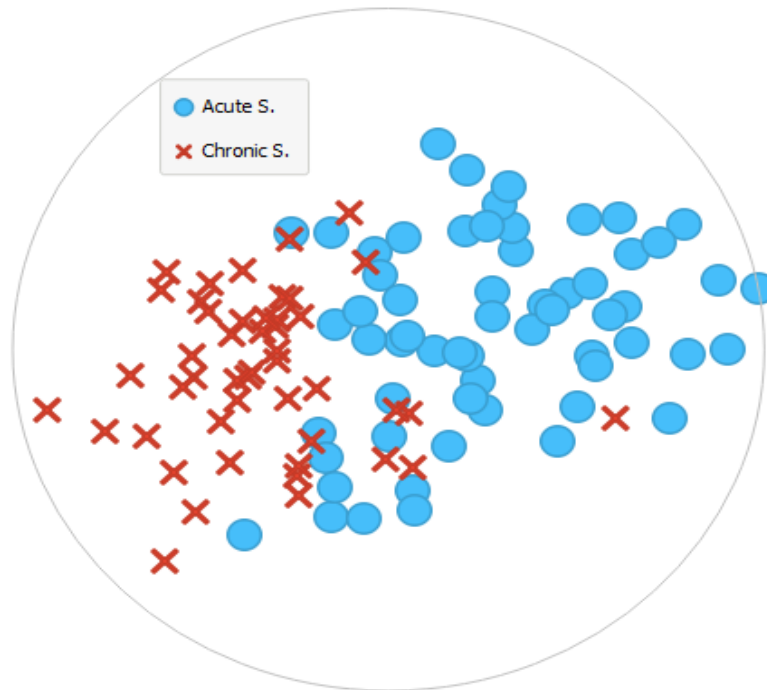| Health Parameters	N	Min	Max	Mean	SD
Age	107	20.00	55.00	37.00	9.423
SBP	107	96.00	171.00	125.56	14.337
DBP	107	55.00	125.00	77.52	11.228
Heart rate	107	48.00	103.00	72.37	10.463
BMR	107	1062.00	2137.00	1523.84	205.948
Visceral Fat	107	1.00	18.00	9.79	4.425
Nicotine Dependence	107	0.00	10.00	3.50	2.428
Total cholesterol	107	2.75	7.46	5.18	1.046
Triglyceride	107	0.38	5.31	1.61	0.879
HDLC	107	0.74	1.70	1.14	0.204
LDLC	107	1.31	5.02	3.31	0.786
Leptin	107	2510.21	12550.47	4285.50	1953.804
Nicotine level	107	0.05	51.75	6.81	8.349
Calorie	107	726.53	4451.46	2057.65	640.462

Figure 1 Classification of the smoking group using k-means analysis

Table 2 Analysis of variance of the smoking group

Health Parameters	Smoking Class				
	Chronic S.		Acute S.		
	M	SD	M	SD	Sig
Age	41.72	8.20	33.30	8.68	0.000*
SBP	126.55	14.00	124.78	14.67	0.527
DBP	80.48	11.45	75.20	10.57	0.015*
Heart rate	74.34	10.64	70.83	10.14	0.085
BMR	1561.83	210.08	1494.08	199.35	0.091
Visceral Fat	11.49	3.20	8.47	4.81	0.000*
Nicotine Dependence	4.57	2.16	2.67	2.30	0.000*
Total cholesterol	5.84	0.76	4.66	0.94	0.000*
Triglyceride	1.82	0.73	1.45	0.95	0.026*
HDLC	1.22	0.19	1.07	0.19	0.000*
LDLC	3.79	0.59	2.93	0.71	0.000*
Leptin	3821.43	1422.55	4649.02	2230.38	0.028*
Nicotine level	5.31	5.81	7.99	9.78	0.100
Calorie	2140.62	667.65	1992.65	616.15	0.237

* $P < 0.05$

Table 2 reveals the analysis of variance of the classified smoking group based on the health-related parameters examined. It could be observed from the table that the chronic smokers are older and distinguished by a considerably higher diastolic blood pressure levels, total cholesterol, visceral fat, leptin as well as high and low-density lipoprotein. Moreover, chronic smokers are found to be highly dependent on nicotine $p < 0.05$. However, no significant difference was found in basal metabolic rate systolic blood pressure, heart rate, nicotine level as well as calories intake amongst the smoking groups $p > 0.05$. It is therefore, tempting to postulate from the current findings that the long-term smokers are predisposed to higher risks of cardiovascular-related problems, high fat accumulation as well as dependence on nicotine, among others.

5. DISCUSSION

In the current research, blood pressure, abdominal fat, HDLC, LDLC, and nicotine dependency were shown to be associated with smoking behaviors that may be related to cardiovascular disease. This illustrated that cigarettes smokers are likely to develop cardiovascular disease. Consistent evidence has been found supporting the claim that the consumption of nicotine increases the risks of blood pressure elevation which could give rise to development of hypotension[8], [9]. The pattern of rising

morbidity and mortality rates as a result of the circulatory system-related issue indicates that these diseases are becoming a major public health concern. It has also been reported in the previous research that coronary problems are related to the quantity of cigarettes smoked and the length of smoking habits [10], [11]. In an even more recent study, nicotine dependency was found to be positively associated with central fat distribution and negatively linked to peripheral fat distribution among Chinese male adults. The study also showed that older and heavy smokers are particularly at risk regardless of body mass index, which may essentially explain the impact of long exposure to tobacco smoking[12].

The attributes as well as classifying characteristics of both the Chronic S and the Acute S are shown in table 2. It was observed that smoking period, diastolic blood pressure, visceral fat, leptin total cholesterol, nicotine dependence, and high as well as low density lipoprotein cholesterol are higher in chronic smokers as opposed to the acute smokers. It could then be presumed that the long-term impact of smoking is primarily ascribed to a higher risk of cardiovascular disease, as noted earlier. In this vein, earlier data have shown that long-term smoking practices predispose individuals to a rise in arterial wall stiffness that may be detrimental to the artery and as such, to the risk of plaque breakup[13]. Likewise, the nicotine dependence in the chronic smokers reflected that smoking is sustained by conditioning. Habitual smokers are seen to equate smoking with specific circumstances, such as after

a meal, with a cup of coffee or with friends who also smoke[14]. Consequently, the connection between smoking and the circumstances alluded to the above may become powerful cues for the desire to continue a daily smoking habit, and this explains why regular smokers are struggling to quit for good.

6. CONCLUSION

Individuals are likely to smoke as a result of the addiction to nicotine. While it is shown that nicotine is not especially dangerous, cigarette smoke additives may be responsible for much of the damage associated with smoking. Despite many efforts to raise awareness of the risk of consuming cigarettes, it is noted that about 1 billion adults worldwide have been involved in smoking, and only around 5 per cent have been able to effectively stop for 6 months or longer. The main explanation appears to be that cigarettes quickly deliver nicotine to the brain in a way that is comfortable and friendly. It is worth reiterating that constant exposure to cigarette smoke has a detrimental impact on health and well-being, as well as an undue financial burden on people. The findings from the present investigation demonstrated that long-term smoking is attributed to a higher risks of cardiovascular-related problems, high fat accumulation as well as dependence on nicotine, which could predispose the smokers to a myriad health related problems that could affect their wellbeing in the long run. It is therefore recommended that the cost of smoking should be raised through taxes in order to curtail the smoking perversity. More programs should be initiated in the form of continued social advertising campaigns to serve as a means for the health practitioners regularly advise and engage smokers to stop smoking and make pharmacological and humanitarian assistance available for stopping.

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