Between Puffs and Blood: Exploring Smoking's Influence on Haematological and Anthropometric Parameters in Young Smokers

Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1558
www.lmi.education/
LINK MEDICAL INTERFACE

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Keywords
Smoking effects, hematological parameters, BMI, young smokers, platelet count, complete blood count, SPSS analysis, waist-to-hip ratio.

Disclaimers

Authors' Contributions	All authors contributed equally to the study.
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Smoking is a major global cause of mortality, leading to various chronic diseases such as COPD and cancers. Despite the well-documented health risks, smoking remains prevalent, particularly among young adults.

Objective: This study aimed to evaluate the effects of smoking on haematological and anthropometric parameters in healthy young male smokers.

Methods: A cross-sectional study was conducted with 110 male participants (40 smokers and 70 non-smokers) aged 18-30 years. Smokers consumed 3-20 cigarettes per day for at least three years. Anthropometric measurements, including BMI and waist-to-hip ratio (WHR), were recorded. Blood samples were collected for complete blood count (CBC) analysis using a Spincell-3n haematological analyser. Statistical analysis was performed using SPSS version 25, with significance set at $p < 0.05$.

Results: Smokers had significantly higher BMI (21.99 ± 4.57, $p < 0.001$), WHR (0.86 ± 0.06, $p < 0.001$), and RBC count (4.49 ± 0.55, $p = 0.003$) compared to non-smokers. Platelet count was significantly lower in smokers (234,075 ± 234,075, $p = 0.0013$).

Conclusion: The study highlights the adverse effects of smoking on body composition and haematological parameters, particularly the reduction in platelet count, emphasizing the need for smoking cessation interventions.

INTRODUCTION

Smoking is one of the most prevalent preventable causes of morbidity and mortality worldwide, contributing to approximately 8 million deaths annually. Among these deaths, a significant number result from chronic diseases that are well-documented, such as chronic obstructive pulmonary disease (COPD), various cancers, and cardiovascular diseases (1, 2). Despite the established health risks associated with tobacco use, smoking remains common, particularly among young adults, driven by social factors like stress, peer influence, and a misguided perception of smoking as fashionable (3, 4). Globally, around 1.3 billion people use tobacco, with the majority residing in low- and middle-income countries, including Pakistan. In Pakistan, smoking prevalence is reported to be 13.4%, with urban areas showing a higher incidence (16.3%) compared to rural regions (11.7%), and men are disproportionately affected (5, 6, 7). This habit has been linked to severe health conditions beyond respiratory diseases, including various forms of cancer, cardiovascular diseases, and metabolic disorders (8, 9, 10).

Cigarette smoke contains over 7000 harmful compounds, including nicotine and tar, which have been linked to the development of multiple diseases. Pakistani cigarettes, notably, have some of the highest levels of these compounds in the world (11). Smoking increases carboxyhaemoglobin levels, impairs oxygen transport, and contributes to the development of cardiovascular complications such as ischemic stroke and coronary heart disease (12). In particular, the presence of carbon monoxide in cigarette smoke binds to haemoglobin, reducing oxygen-carrying capacity and leading to tissue hypoxia, which further stimulates the production of red blood cells (RBCs). As a result, smokers often exhibit elevated RBC counts, a condition that predisposes them to thrombosis and other circulatory issues. Furthermore, the toxic components of cigarette smoke can induce chronic inflammation, endothelial dysfunction, and hypercoagulability, further elevating the risk of cardiovascular events (13).

Given these established risks, understanding how smoking impacts haematological and anthropometric parameters is crucial for early detection of health deterioration in smokers. Prior studies have consistently demonstrated that smoking increases body mass index (BMI), waist-to-hip ratio (WHR), RBC count, and other blood parameters like haematocrit (HCT) and haemoglobin (Hb), reflecting both the physiological stress induced by smoking and the body's compensatory mechanisms (14, 15). However, few studies have examined the impact of smoking on platelet counts, which are essential for clot formation and wound healing. Moreover, while previous research has reported increased

haematological values among smokers, variations in results suggest that additional factors such as age, smoking duration, and lifestyle may play significant roles (16).

This study aims to explore the effects of smoking on haematological and anthropometric parameters in a young male population, focusing specifically on differences in BMI, WHR, and blood markers between smokers and non-smokers. Notably, this research seeks to address the gaps in understanding regarding the relationship between smoking and platelet count, contributing novel insights into how smoking influences haematological health in young adults. Given the reluctance of many young smokers in Pakistan to disclose their habit, particularly in a cultural context where smoking is discouraged, healthcare providers may benefit from using these objective markers to assess smoking-related health risks more accurately (17). By identifying these early indicators of harm, clinicians can offer targeted interventions to mitigate the long-term health impacts of smoking and promote cessation efforts.

MATERIAL AND METHODS

The study employed a cross-sectional design using a non-random purposive sampling technique to assess the haematological and anthropometric parameters of smokers and non-smokers. Ethical approval for the research was obtained from the Board of Advanced Studies and Research at the University of Sindh, Jamshoro, and the Department of Pulmonology at Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, granted permission for conducting the sampling on its premises. All participants provided written informed consent, and the study adhered to the ethical principles outlined in the Declaration of Helsinki. Participants were briefed on the study objectives, and their anonymity was guaranteed through the use of an anonymized questionnaire. The questionnaire included questions on smoking habits, lifestyle, and general health to exclude subjects with pre-existing chronic or acute diseases.

The study involved 110 male subjects between the ages of 18 and 30, divided into two groups: 40 smokers and 70 non-smokers. Smokers were defined as individuals who had been consuming 3 to 20 cigarettes per day for at least three years. Anthropometric data, including weight, height, waist circumference, and hip circumference, were collected using standard measurement techniques. Body mass index (BMI) was calculated by dividing weight in kilograms by height in meters squared. The waist-to-hip ratio (WHR) was obtained by dividing the waist circumference (measured below the lowest rib) by the hip circumference (measured around the widest region of the hips).

Venous blood samples were drawn from all participants for haematological analysis. Up to 3 mL of venous blood was collected using sterile equipment, including a 21-gauge 5cc syringe, 23-gauge 3cc syringe, tourniquet, alcohol pads, cotton, and purple-capped EDTA tubes. The samples were collected during the daytime hours and transported to the laboratory for analysis within 8 hours. Complete blood count (CBC) was performed using a Spincell-3n haematological analyser, which measured parameters such as red blood cell (RBC) count, haemoglobin (Hb), haematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), total leucocyte count (TLC), and platelet count. Normal ranges for these parameters were referenced from established guidelines (13).

Data analysis was conducted using SPSS version 25. Descriptive statistics were presented as mean ± standard deviation for all measured variables. An unpaired t-test was used to compare the anthropometric and haematological parameters between smokers and non-smokers, with a p-value of less than 0.05 considered statistically significant. The results were interpreted based on these statistical tests to identify any significant differences between the two groups. The study aimed to contribute novel findings, particularly regarding the negative correlation of platelet count with smoking, which had been underexplored in previous research.

RESULTS

The study evaluated 110 male subjects, including 40 smokers and 70 non-smokers, aged 18 to 30 years. The mean age in both groups was 22.5 years. The analysis focused on differences in anthropometric measurements, such as BMI and WHR, and haematological parameters, including RBC count and platelet levels. The results demonstrated statistically significant differences in certain parameters between smokers and non-smokers.

The anthropometric data showed that smokers had significantly higher BMI and WHR compared to non-smokers. The mean BMI for smokers was 21.99 ± 4.57, while for non-smokers, it was 18.19 ± 1.73 ($p < 0.001$). Similarly, the mean WHR for smokers was 0.86 ± 0.06, significantly higher than the mean WHR of non-smokers, which was 0.81 ± 0.06 ($p < 0.001$). These findings indicate that smoking is associated with an increase in body composition indices, particularly in terms of adiposity around the waist.

Significant differences were observed in RBC counts and platelet levels between the two groups. Smokers had a higher RBC count (4.49 ± 0.55) compared to non-smokers (4.18 ± 0.45), with a p-value of 0.003, indicating a statistically significant increase in RBC count among smokers. The following tables summarize the results:

Table 1: Comparison of Anthropometric Parameters Between Smokers and Non-Smokers

Parameter	Group	Mean ± Std. Deviation	P-Value
BMI	Smokers	21.99 ± 4.57	< 0.001*
	Non-smokers	18.19 ± 1.73	
WHR	Smokers	0.86 ± 0.06	< 0.001*
	Non-smokers	0.81 ± 0.06	

Interestingly, platelet counts were significantly lower in smokers, with a mean platelet count of 234,075 ± 234,075 in smokers compared to 271,700 ± 271,700 in non-smokers (p = 0.0013). Other haematological parameters, including Hb, MCV, MCH, MCHC, and TLC, did not show significant differences between the groups.

Table 2: Comparison of Haematological Parameters Between Smokers and Non-Smokers

Parameter	Group	Mean ± Std. Deviation	P-Value
RBC count	Smokers	4.49 ± 0.55	0.003*
	Non-smokers	4.18 ± 0.45	
Hb	Smokers	13.56 ± 1.02	NS
	Non-smokers	13.36 ± 0.90	
MCV	Smokers	85.39 ± 6.05	NS
	Non-smokers	84.49 ± 5.40	
MCH	Smokers	28.98 ± 2.15	NS
	Non-smokers	28.43 ± 4.11	
MCHC	Smokers	33.30 ± 1.97	NS
	Non-smokers	33.53 ± 1.67	
TLC	Smokers	6698.5 ± 1866.1	NS
	Non-smokers	7040.0 ± 1666.8	
Platelets	Smokers	234,075 ± 234,075	0.0013*
	Non-smokers	271,700 ± 271,700	

NS=p>0.05

The results of the unpaired t-test indicate significant differences in BMI, WHR, RBC count, and platelet count between smokers and non-smokers, highlighting the adverse impact of smoking on body composition and blood health. However, other haematological parameters, such as haemoglobin levels and mean corpuscular values, did not show significant variation between the two groups.

DISCUSSION

The present study demonstrated that smoking has a significant impact on both anthropometric and haematological parameters, specifically BMI, WHR, RBC count, and platelet levels in young adult male smokers. These findings align with previous research indicating that smoking alters body composition and blood profiles, contributing to a higher risk of metabolic and cardiovascular diseases. The observed increase in BMI and WHR among smokers suggests that cigarette use is associated with changes in body fat distribution, particularly around the waist, which is a known risk factor for cardiovascular and metabolic disorders. Similar studies have reported elevated WHR and BMI in smokers, linking smoking to increased visceral adiposity rather than general body fat (17, 18). However, some previous studies have shown contradictory findings, where smoking was associated with a decrease in overall BMI but an increase in WHR, indicating the complexity of the relationship between smoking and body composition (14, 15). This suggests that while smoking may suppress appetite and reduce weight gain in some individuals, it still promotes the accumulation of fat in specific areas, particularly the abdomen.

The significant increase in RBC count among smokers in this study is consistent with earlier research, which found that long-term exposure to cigarette smoke increases the production of red blood cells as a compensatory mechanism to counteract hypoxia caused by elevated carboxyhaemoglobin levels (26). Smoking has been shown to raise carbon monoxide levels in the blood, leading to reduced oxygen-carrying capacity and subsequent erythropoietin release, which stimulates the production of RBCs (28). The lack of a significant rise in haematocrit and haemoglobin levels, despite an increase in RBC count, may be attributed to the relatively young age of the study population and their shorter smoking history, as prolonged exposure to smoking is often required to observe significant changes in these parameters (27). This discrepancy may also reflect individual variability in response to smoking or the intensity of smoking habits, with some studies reporting stronger associations between smoking and haematological changes in heavier smokers (29).

One of the novel findings of this study was the significant reduction in platelet count among smokers, contrasting with prior research that mostly reported an increase in platelet numbers (30, 31). Thrombocytopaenia observed in this study could be explained by the potential for smoking-induced endothelial damage, which may cause platelets to adhere to damaged vessel walls, thus reducing circulating platelet levels. Additionally, smoking might accelerate the destruction of platelets or interfere with their production. Despite this reduction, smoking still makes platelets more prone to aggregation, which increases the risk of thrombotic events and cardiovascular complications (32). More research is needed to explore the exact mechanisms through which smoking affects platelet levels and function, particularly in younger populations where the long-term impact of smoking on haematological health remains underexplored.

Although the study contributes valuable insights, it is not without limitations. The relatively small sample size and the focus on young adult males limit the generalizability of the findings to broader populations, including females and older adults. Furthermore, the cross-sectional design prevents the establishment of causal relationships, and there was a reliance on self-reported smoking habits, which may introduce reporting bias, especially in a cultural context where smoking is stigmatized. Another limitation was the inability to account for other lifestyle factors, such as physical activity and diet, which could have influenced the

anthropometric and haematological parameters. Moreover, the study did not assess the intensity or duration of smoking beyond the basic categorization of smoking habits, which may have affected the outcomes.

Future research should aim to address these limitations by including larger, more diverse populations and employing longitudinal designs to better understand the causal effects of smoking on haematological and anthropometric measures. Additionally, investigating the biochemical pathways involved in smoking-related platelet reduction would further clarify the mechanisms behind the novel findings of this study. Clinicians should be aware of the potential haematological changes caused by smoking, especially in younger populations, and consider these factors when assessing the health risks of their patients. Given the significant health impacts highlighted by this study, smoking cessation programs should be strongly promoted, and more aggressive public health campaigns should be directed toward younger adults to mitigate the long-term risks of smoking on both haematological and cardiovascular health.

CONCLUSION

In conclusion, this study highlighted the detrimental effects of smoking on haematological and anthropometric parameters, particularly the significant increase in BMI, WHR, and RBC count, along with a novel finding of reduced platelet levels among young smokers. These alterations contribute to a higher risk of obesity, cardiovascular diseases, and metabolic disorders in smokers, even at a young age. The findings underscore the importance of early detection of smoking-related health risks and emphasize the need for targeted interventions, including smoking cessation programs. In terms of healthcare implications, clinicians should consider these biomarkers as potential indicators of smoking habits, which can help improve patient care and long-term health outcomes through timely interventions.

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