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Original Research Article

Effect of cigarette smoking on sleep quality of non-obese male medical students of south Punjab

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ABSTRACT

Background: Cigarette smoking disrupts sleep patterns. Studies suggest a strong link between sleep quality and academic achievement. This study investigates the impact of smoking on sleep quality and academic performance, informing the importance of smoking cessation strategies.
Methods: A cross-sectional, questionnaire-based study was conducted among 100 medical students of Nishtar Medical University from June 2023 to March 2024, using a convenient sampling technique. Demographic and anthropometric details were obtained, and academic performance was recorded based on the percentage achieved in the recent professional examination. Sleep quality was assessed by a validated questionnaire; PSQI. SPSS version 27 was utilized for data analysis.
Results: Smokers demonstrated a significantly higher PSQI (median 7, IQR 2-13) than non-smokers (median 4, IQR 1-15), p= 0.02. Academic scores were slightly higher in non-smokers (median 73.5, IQR 59.35-81.85) than in smokers (median 69.85, IQR 51-78.5), p= 0.05. In Group 1 (nonsmokers) and Group 2 (smokers), there was a significant negative correlation between PSQI and academic performance (Rho = -0.357, p = 0.011), and (Rho = -0.314, p = 0.026) respectively. Cigarettes smoked per day were also significantly correlated with both PSQI (Rho = 0.331, p = 0.019) and academic performance (Rho = -0.539, p = 0.000).
Conclusions: Smokers had poor sleep quality and slightly lower academic scores than non-smokers. Poor sleep quality was strongly tied to lower academic achievement. Students should be informed about the link between cigarette smoking and poor sleep quality, and how that affects academic performance.

Keywords: Academic performance, Cigarette smoking, Medical student, Sleep quality

INTRODUCTION

Globally, tobacco dependence poses a significant threat to public health.[1] According to the World Health Organization, the prevalence of cigarette smoking in Pakistan will be 26.7% among men and 3.6% among women by 2025.[2] Cigarette Smoking is linked to various health risks, including cardiovascular disease, respiratory disease, cancer, and circadian rhythm disruption.[3,4] Sleep is a fundamental human necessity, and deprivation can result in severe cognitive, emotional, and physical consequences.[5] Compared to nonsmokers, smokers experience higher rates of sleep disturbances, characterized by shorter sleep duration, increased sleep latency, and daytime sleepiness.[6] Sleep deprivation is linked to an increased risk of developing debilitating conditions like depression, obesity, diabetes, and heart disease, creating a vicious cycle that impairs sleep and well-being.[7]

Cigarette smoking can affect sleep in various ways; Nicotine in cigarette smoke disrupts sleep by stimulating

nonselective nicotinic acetylcholine receptors (nAChRs), altering neurotransmitter release (acetylcholine, dopamine, serotonin), and regulating neuronal excitability, ultimately affecting sleep latency, duration, and quality. The release of noradrenaline and acetylcholine by nicotine inhibits GABAergic neurons in the ventrolateral preoptic area (VLPO), a key region regulating sleep onset. This inhibition reduces sleep promotion, leading to decreased sleep quality.[8,9] Meanwhile, nicotine's cholinergic effects enhance REM sleep, altering sleep patterns. Nicotine withdrawal symptoms can occur in smokers during sleep, as plasma levels drop. Meanwhile, smoking's adverse impact on airway function increases the risk of sleep-related breathing disorders, disrupting sleep continuity and architecture.[10] Research in animal models suggests nicotine exposure stimulates orexin neurons, regulating arousal and wakefulness,[11,12] potentially affecting humans similarly. Studies also reveal a positive correlation between sleep quality and academic achievement among college students, suggesting that poor sleep can hinder academic success.[13] The interplay between sleep quality and cigarette smoking has significant implications for academic performance. To date, studies exploring the effect of smoking on sleep quality among young adults are limited.[14] To address the knowledge gap in sleep-smoking research, this study examines the relationship between smoking and sleep quality, comparing sleep parameters in smokers and nonsmokers, with potential applications for novel smoking cessation strategies, and also focuses on the effect of smoking and sleep on academic performance.

METHODS

This study was carried out from June 2023 to March 2024 within the premises of Nishtar Medical University and Hospital in Multan. The study design employed was a cross-sectional study utilizing convenient sampling for data collection, following the approval of the Institutional Review Board (IRB). The sample size was determined using the WHO sample size calculation software, resulting in a target of 100 participants.[15]

Inclusion criteria

Male medical students from the second year to the final year enrolled in MBBS or BDS were included in the study. Participants included were from 18 to 26 years old with body mass index (BMI) ranging from 18.5 to 24.9 and waist-to-hip ratio less than 0.9. Nonsmokers were those students who never smoked a cigarette in their life. Smoking status was defined as students who had smoked at least 100 cigarettes in their lifetime and had been smoking for the past 28 days.[16]

Exclusion criteria

Male students with a previous history of psychiatric ailment, already on psycho-psychiatric and/or recreational drugs, with a family history of psychiatric ailment, with a history of chronic diseases, morbidly obese male students, and those with a history of genetic obesity were excluded from the study. Students who had not smoked 100 cigarettes in their lifetime were also excluded.

Data collection was facilitated through a self-administered Performa, which included detailed biodata, written consent, and the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality with scores ranging from 0 to 21 points and scores greater than 5 as an indicator for sleep disturbance. PSQI assesses various aspects of sleep quality and a higher score indicates poor sleep quality.[16] Previous studies show that the PSQI has good internal consistency (Coefficient Alpha = 0.75) and reliability (r = 0.77).[15] Cigarette smoking characteristics were obtained from smokers by a self-administered questionnaire including questions related to cigarettes smoked per day, years of cigarette smoked, average daily number of cigarettes smoked, and age of smoking onset.[15,16]

In addition to anthropometric measurements and smoking status, academic performance was recorded based on the percentage achieved in the most recent professional examination. Participants were required to submit their completed proformas, which were meticulously reviewed to ensure that all sections were thoroughly addressed. The collected data were then input into SPSS Version 27 for comprehensive statistical analysis.

RESULTS

The anthropometric parameters of the study population, including age, height, weight, waist-to-hip ratio (WHR), and body mass index (BMI), are presented in Table 1. The Shapiro-Wilk test was used to assess the normality of the data, given the sample size of 50 per group. Of the 13 variables analyzed, 9 showed a p value <0.05, indicating a non-normal distribution. The median (IQR) age for Group 1 (non-smokers) was 21 years (18-26), while for Group 2 (smokers), it was 22 years (19-25). Median height for both groups was comparable: 1.71 m (1.62-1.90) in non-smokers and 1.72 m (1.60-1.85) in smokers. Similarly, the median weight for non-smokers was 60 kg (51.5-82), whereas smokers had a median weight of 65 kg (52-78). WHR and BMI were also comparable across both groups.

For the comparison of academic scores and Pittsburgh Sleep Quality Index (PSQI) scores between smokers and non-smokers, the Mann-Whitney U test was applied (Table 2). Smokers demonstrated a significantly higher PSQI (median 7, IQR 2-13) compared to non-smokers (median 4, IQR 1-15), with a p-value of 0.02. Academic scores were slightly higher in non-smokers (median 73.5, IQR 59.35-81.85) compared to smokers (median 69.85, IQR 51-78.5), with a p value approaching significance (p=0.05).

Table 1: Anthropometric parameters of the study population.

Parameters	Group 1 (non-smokers)	Group 2 (smokers)
	Median IQR	Median IQR
Age (years)	21 (18-26)	22 (19-25)
Height (m)	1.71 (1.62-1.90)	1.72 (1.60-1.85)
Weight (kgs)	60 (51.5-82)	65 (52-78)
WHR	0.87 (0.80-0.90)	0.85 (0.79-0.90)
BMI	20.9 (18.50-24.80)	22.15 (18.70-24.83)

Table 2: Comparison of academic scores and Pittsburgh Sleep Quality Index (PSQI) scores between smokers and non-smokers.

Parameters	Group I (Median IQR)	Group II (Median IQR)	P values
PSQI	4 (1-15)	7 (2-13)	0.02
Academic score	73.5 (59.35-81.85)	69.85 (51-78.5)	0.05

Spearman Correlations between academic performance and PSQI in both groups were evaluated (Table 3). In Group 1 and Group 2 there was a significant negative correlation between PSQI and academic performance (Rho = -0.357, p = 0.011), and (Rho = -0.314, p = 0.026) respectively indicating that poorer sleep quality was associated with lower academic scores.

Further analysis of smoking-related variables in Group 2 revealed significant correlations (Table 4). Smoking duration was positively correlated with PSQI (Rho = 0.301, p = 0.034) and negatively correlated with academic performance (Rho = -0.587, p=0.000). Similarly, smoking frequency showed a significant positive correlation with PSQI (Rho = 0.371, p = 0.008) and a negative correlation with academic performance (Rho = -0.515, p = 0.000). The number of cigarettes smoked per day was also significantly correlated with both PSQI (Rho = 0.331, p=0.019) and academic performance (Rho = -0.539, p=0.000).

Table 3: Spearman correlations between academic performance and PSQI in both groups.

Parameters	Academic performance-1	Parameters	Academic performance-2
PSQI-1	Rho= -0.357 P = 0.011	PSQI-2	Rho = -0.314 P = 0.026

Table 4: Analysis of smoking-related variables in Group 2.

		PSQI-2	Group-II academics
Smoking duration*	Correlation coefficient	0.301	-0.587
	P value	0.034	0.000
Smoking frequency	Correlation coefficient	0.371	-0.515
	P value	0.008	0.000
Cigarette/day	Correlation coefficient	0.331	-0.539
	P value	0.019	0.000

*Smoking Duration is in years

DISCUSSION

This study aimed to investigate the impact of cigarette smoking on sleep quality and its effects on academic performance among medical students. The findings of our study reveal that smokers reported significantly poorer sleep quality [Median IQR = 7 (2-13)] as compared to non-smokers [Median IQR = 4 (1-15)] with a p-value of 0.02 measured by the PSQI. Additionally, academic performance in nonsmokers [Median IQR = 73.5 (59.35-81.85)] comes out to be significantly high as compared to that of smokers [Median IQR = 69.85 (51-78.5)] with a p value of 0.04. Notably, there are significant negative correlations between sleep quality and academic performance in both groups; Group I (Rho= -0.357 p=0.011) and Group II (Rho = -0.314, P=0.026). Furthermore, within the smokers' group, various smoking-related factors, including smoking duration and frequency, correlate negatively with academic performance while positively correlating with sleep quality.

The higher PSQI scores in smokers indicate that smoking adversely affects sleep quality. Nicotine disrupts sleep by acting as a stimulant, reducing total sleep time, increasing sleep latency, and decreasing REM sleep, which is critical for cognitive and emotional regulation. Additionally, nicotine withdrawal during sleep leads to frequent awakenings and poorer sleep quality, further impairing overall rest and recovery.[5-7,14] This is in harmony with previous studies that have identified a strong link between smoking and sleep disturbances. For example, research conducted in Israel[14] found that smokers have a higher risk ratio for sleep-related issues. Similar findings in the U.S. indicate increased insomnia and reduced sleep duration associated with smoking.[17] Moreover, studies in China have linked smoking to obstructive sleep apnea, further corroborating our findings.[4]

Like sleep quality, lower academic scores in Group 2 indicate that smoking also negatively affects academic performance. Nicotine and tobacco use, impair academic performance by disrupting cognitive function, memory, and attention through alterations in neurotransmitter systems and long-term desensitization of nicotinic receptors.[18] Additionally, nicotine-induced sleep disturbances, increased anxiety, and withdrawal symptoms further degrade focus, learning ability, and overall academic outcomes. Our findings give credence to previous research that has studied the linkage between nicotine effects on academic performance.[19]

Smoking has detrimental effects on sleep quality and academic performance among medical students.[5-7,14,18-20] By elucidating these relationships, the research underscores the importance of promoting healthier lifestyle choices, which can lead to improved academic success and overall well-being. Future research should explore the underlying mechanisms connecting smoking, sleep, and cognitive function to develop comprehensive intervention strategies.

As there is only limited data available on the effect of smoking on sleep quality, our findings also highlight the critical need for educational institutions to implement smoking cessation programs and promote healthy sleep habits among students.[14,21] By addressing these issues, universities can foster an environment that supports both physical and mental health, ultimately enhancing academic performance.

CONCLUSION

Smokers exhibited significantly poorer sleep quality and lower academic scores compared to non-smokers. Notably, a strong negative correlation was found between sleep quality and academic performance, suggesting that poorer sleep quality is associated with lower academic achievement. Furthermore, smoking duration, frequency, and number of cigarettes smoked per day were positively correlated with sleep disturbances and negatively correlated with academic performance. These findings highlight the importance of addressing smoking habits and sleep quality to optimize academic performance and overall well-being among medical students, mentioning the need for integrated smoking cessation programs and sleep hygiene education in medical schools.

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REFERENCES

1. Yu X, Wang M, Cen J, Ye M, Li S, Wang Y, et al. Advice for smokers in smoking cessation clinic: a review. Afr Health Sci. 2023;23(2):374-9.
2. World Health Organization. WHO global report on trends in prevalence of tobacco use 2000-2025. 3rd ed. Geneva: World Health Organization; 2019. Available at: https://iris.who.int/handle/10665/330221. Accessed 01 October 2024.
3. Truong MK, Berger M, Haba-Rubio J, Siclari F, Marques-Vidal P, Heinzer R. Impact of smoking on sleep macro and microstructure. Sleep Med. 2021;84:86-92.
4. Zeng X, Ren Y, Wu K, Yang Q, Zhang S, Wang D, et al. Association between smoking behavior and obstructive sleep apnea: a systematic review and meta-analysis. Nicotine Tob Res. 2023;25(3):364-71.
5. Underner M, Paquereau J, Meurice JC. Cigarette smoking and sleep disturbance. Rev Mal Respir. 2006;23(3 Suppl):6S67-66S77.
6. Jaehne A, Unbehaun T, Feige B, Lutz UC, Batra A, Riemann D. How smoking affects sleep: A polysomnographical analysis. Sleep Med. 2012;13(10):1286-92.
7. Schleupner RM, Kühnel J, Melchers KG, Richter SS. Be prepared: Does psychological reattachment buffer the effect of a bad night's sleep on day-specific work engagement and proactivity? J Occup Organ Psychol. 2023;96(2):287-307.
8. Terry AV, Jones K, Bertrand D. Nicotinic acetylcholine receptors in neurological and psychiatric diseases. Pharmacol Res. 2023;191:106764.
9. Zakiniaeiz Y, Liu H, Gao H, Najafzadeh S, Ropchan J, Nabulsi N, et al. Nicotine patch alters patterns of cigarette smoking-induced dopamine release: patterns relate to biomarkers associated with treatment response. Nicotine Tob Res. 2022;24(10):1597-606.
10. Palagini L, Hertenstein E, Riemann D, Nissen C. Sleep, insomnia and mental health. J Sleep Res. 2022;31(4):e13628.
11. Wang C, Wang Q, Ji B, Pan Y, Xu C, Cheng B, et al. The orexin/receptor system: molecular mechanism and therapeutic potential for neurological diseases. Front Mol Neurosci. 2018;11:220.
12. Mullington JM, Cunningham TJ, Haack M, Yang H. Causes and consequences of chronic sleep deficiency and the role of orexin. In: Steiner MA, Yanagisawa M, Clozel M, editors. Frontiers of Neurology and Neuroscience. S. Karger AG; 2021:128-38.
13. BaHammam AS, Alaseem AM, Alzakri AA, Almeneessier AS, Sharif MM. The relationship between sleep and wake habits and academic performance in medical students: a cross-sectional study. BMC Med Educ. 2012;12(1):61.
14. Cohen A, Ben Abu N, Haimov I. The interplay between tobacco dependence and sleep quality among young adults. Behav Sleep Med. 2020;18(2):163-76.

15. Liu Y, Li H, Li G, Kang Y, Shi J, Kong T, et al. Active smoking, sleep quality and cerebrospinal fluid biomarkers of neuroinflammation. Brain Behav Immun. 2020;89:623-7.
16. Liao Y, Xie L, Chen X, Kelly BC, Qi C, Pan C, et al. Sleep quality in cigarette smokers and nonsmokers: findings from the general population in central China. BMC Public Health. 2019;19(1):808.
17. Nuñez A, Rhee JU, Haynes P, Chakravorty S, Patterson F, Killgore WDS, et al. Smoke at night and sleep worse? The associations between cigarette smoking with insomnia severity and sleep duration. Sleep Health. 2021;7(2):177-82.
18. Riaz T, Murtaza G, Arif A, Mahmood S, Sultana R, Al-Hussain F, et al. Nicotine smoking is associated with impaired cognitive performance in Pakistani young people. Peer J. 2021;9:e11470.
19. Alqahtani JS, Aldhahir AM, Alanazi Z, Alsulami EZ, Alsulaimani MA, Alqarni AA, et al. Impact of smoking status and nicotine dependence on academic performance of health sciences students. Subst Abuse Rehabil. 2023;14:13-24.
20. Hershner S. Sleep and academic performance: measuring the impact of sleep. Curr Opin Behav Sci. 2020;33:51-6.
21. Purani H, Friedrichsen S, Allen AM. Sleep quality in cigarette smokers: Associations with smoking-related outcomes and exercise. Addict Behav. 2019;90:716.

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