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Original Article

Public Health Section

Prevalence and Perception of Smoking among Medical Students: A Cross-sectional Survey-based Study from a Sudanese University

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ABSTRACT

Introduction: Smoking among medical students is a public health concern, as these future healthcare providers play a crucial role in tobacco cessation.

Aim: To examine the prevalence and perception of smoking among medical students in Sudan, with a focus on the socio-demographic factors influencing smoking behaviour.

Materials and Methods: A cross-sectional study was conducted between June 2015 and July 2015 among medical students at Sudan International University located in Khartoum, Sudan. A total of 394 students were included in the study. Smoking behaviour and perceptions were analysed using a modified United Nations Office on Drugs and Crime (UNODC) survey, which included only the questions related to smoking. Statistical analysis was performed using descriptive statistics, and a Chi-square test was applied to identify associations, with a p-value of <0.05 considered statistically significant.

Results: Of the 394 participants, 27 (6.9%) were current smokers, with smoking rates significantly higher among males 26 (17.2%) compared to females 1 (0.4%). Smoking prevalence was also higher among older students, with 5 (16.1%) of those aged ≥25 and 16 (10.7%) of clinical-stage students being current smokers. Strong disapproval of heavy smoking was noted among 234 (59.4%) of the students, especially among females (169, 70.1%). Students living with non relatives reported higher smoking rates, with 5 (50%) being ever smokers and 3 (30%) currently smoking, compared to those living with parents or relatives. Additionally, students living alone were less likely (n=4, 20%) to disapprove heavy smoking compared to their counterparts, with disapproval rates ranging between 50% and 65% for different categories.

Conclusion: Smoking was more prevalent among males, older individuals and clinical-stage students, while perceptions of smoking vary by age and gender. These findings underline the need for targeted smoking prevention initiatives within medical schools that address gender- and age-related factors. Tailored interventions can better equip future healthcare providers in Sudan for effective tobacco cessation advocacy.

Keywords: Smoking, Medical students, Tobacco cessation, Occasional smokers

INTRODUCTION

Tobacco use remains a significant global public health concern, contributing to millions of deaths annually from smoking-related diseases such as cancer, cardiovascular diseases and respiratory illnesses. The World Health Organisation (WHO) estimates that tobacco kills more than 8 million people each year, with over 7 million of these deaths attributed to direct tobacco use and around 1.2 million due to non smokers being exposed to secondhand smoke [1]. Despite various tobacco control measures and public health campaigns, smoking remains a pervasive habit, particularly in low- and middle-income countries, where nearly 80% of the world's smokers reside. In the Middle East and North Africa (MENA) region, the prevalence of smoking remains high, particularly among men, who continue to exhibit significantly higher smoking rates compared to women [2,3].

Smoking among university students, especially those in medical fields, is of particular concern, as these individuals are future healthcare providers expected to play a critical role in tobacco cessation efforts. Studies from various countries in the region and beyond reveal that smoking remains relatively common among medical students, with prevalence rates ranging from 10 to 32% across countries such as Saudi Arabia, Lebanon, Egypt, Turkey and Jordan [2-6]. A study in Turkey found that 27.7% of medical students were current smokers [6], while in Jordan, smoking prevalence among medical students was around 28.6% [2]. Such figures are alarming given the medical training provided to these students and their assumed awareness of the health risks associated with smoking. Their smoking habits may not only reflect personal health choices but also influence future clinical practice and credibility in promoting tobacco cessation to patients. Additionally, smoking behaviour among medical students often mirrors societal trends.

Despite medical students' extensive knowledge of the harmful effects of smoking, many continue to smoke. This paradox highlights the importance of addressing not only knowledge gaps but also behavioural and cultural influences that perpetuate smoking. Understanding the specific patterns and risk factors associated with smoking among medical students is crucial for designing effective smoking prevention and cessation programs. Research has shown that the factors influencing smoking behaviour among medical students are varied. Age, gender, academic pressure, stress and peer influence are commonly cited as reasons for initiating and maintaining smoking habits [4].

Research on smoking behaviour among university students in Sudan, particularly among medical students, remains limited. Jarelnape AA et al., reported a smoking prevalence of 48.8% among medical students in Khartoum City [7]. In contrast, Abdelraouf MM et al., found a prevalence of 11.7% among both medical and non medical students in northern Sudan [8]. Abdo AA et al., documented an alarmingly high smoking rate of 95% among a small sample of medical students in the River Nile region [9]. Additionally, Elfaki BA, reported a smoking prevalence of 18.10% among medical students

at Alfajr College for Science and Technology in Khartoum [10]. Similarly, Elamin OE et al., found a smoking rate of 10% among medical students in Khartoum City [11]. The discrepancies in these statistics suggest the influence of small sample sizes, differences in eligibility criteria, or varying definitions of smokers. This highlights the necessity for further research to yield more accurate and reliable statistics.

Consequently, data was analysed on smoking behaviour collected previously as part of a survey on drug abuse, with the first part of this survey having been published and focusing on psychoactive substance use [12]. This study aimed to investigate the prevalence of smoking among medical students in Sudan, with a particular focus on the socio-demographic factors that influence smoking behaviour and how medical students perceive smoking and its associated harms.

MATERIALS AND METHODS

A cross-sectional study was conducted from June 2015 to July 2015 among medical students at Sudan International University located in Khartoum, Sudan. Ethical clearance was obtained from Sudan International University, Khartoum, Sudan (reference: SIU/FM dated 26 April 2015). Informed consent, detailing the study's purpose, voluntary participation and confidentiality assurances, was attached to the questionnaire.

Inclusion criteria: Students from all academic years within the Faculty of Medicine were invited to participate and were included in the study.

Exclusion criteria: Only students present during the designated lectures took part, as absent students could not be followed-up due to the anonymous nature of the data collection process. The study was planned to cover students in the medical school but engaged only those who were present at lectures on the days when the questionnaires were circulated. Since anonymity was maintained, it was not possible to contact the absentees afterwards, and they were therefore considered excluded from the survey.

Sample size calculation: A sample size of 384 was the minimum required, as estimated using the formula n=z2p(1-p)/e2 [13]. The calculation was made assuming a 95% confidence interval (z-score=1.96), a 5% margin of error, and an expected probability (p) of 0.5 among the population.

The sampling technique was convenience sampling, as the study enrolled those students who were available in the college at the time of data collection.

Study Procedure

For data collection, a two-part instrument was administered, comprising the following:

1. A socio-demographic questionnaire designed to collect details such as age, gender, marital status, place of origin, economic background, accommodation type and source of secondary education certificate.
2. Smoking-related information and perceptions were captured from the "United Nations Office on Drugs and Crime" student questionnaire, originally developed for surveys on drug use among students. This instrument has been utilised across various countries as part of the Global Assessment Programme on Drug Abuse (GAP) and was available in Arabic, as well as English, which was employed in this study [14,15].

For this specific analysis, only data related to smoking behaviour among the students were extracted from the respondents' answers to the questionnaire on drug use. The extracted responses represent a consistent part related to smoking behaviours and the students' views about smoking. No information from the smoking-related questions was omitted. Reliability, face and content validity were not affected, as the researchers used a published Arabic version of the survey, and no changes were made in how questions were phrased.

In this study, those who indicated smoking on any number of occasions were considered ever smokers, while those who smoked during the last 30 days were classified as current smokers. Responses provided for economic status were written in the questionnaire as "above average, average and below average," and each respondent was allowed to choose the perceived correct answer that represented their status.

Data Collection Procedure

The survey was conducted during lecture sessions and participants were provided with both a questionnaire and an envelope to ensure anonymity. The completed forms were collected immediately. Participants received clear instructions regarding the research objectives and the completion process. They were assured of complete confidentiality and participation was entirely voluntary. No identifying information was collected, and students were instructed to seal their responses in the envelopes before returning them.

STATISTICAL ANALYSIS

The data were processed using the Statistical Package for the Social Sciences (SPSS) version 18.0, with descriptive statistics expressed as percentages. A Chi-square test was applied to examine the association between smoking and potential risk factors. A p-value of <0.05 was considered statistically significant.

RESULTS

Out of 420 students available at the time of data collection, 394 participated in this study, resulting in a response rate of 93.8%. The majority of them were female, comprising 241 (61.2%) of the sample. Most students were from urban areas, with 355 (90.1%) indicating this as their place of residence. Most students described their financial status as average (279, 70.8%), while 91 (23.1%) considered themselves above average. In terms of academic progression, 244 (61.9%) of the students were in the preclinical stage, while the remaining 150 (38.1%) were in the clinical stage [Table/Fig-1].

Socio-demographic factors		n (%)
Gender*	Males	151 (38.3)
	Females	241 (61.2)
Origin*	Urban	355 (90.1)
	Rural	36 (9.1)
Source of Secondary certificate*	Sudan	306 (77.7)
	Other Arab countries	68 (17.3)
	Foreign	17 (4.3)
Marital status	Single	374 (94.9)
	Married	17 (4.3)
	Divorced	2 (0.5)
	Widowed	1 (0.3)
Economic status*	Above average	91 (23.1)
	Average	279 (70.8)
	Below average	21 (5.3)
Academic stage	Preclinical	244 (61.9)
	Clinical	150 (38.1)
Father qualification	Post graduate	72 (18.3)
	University	176 (44.7)
	Secondary school	81 (20.6)
	Primary school or less	65 (16.5)

Mother qualification	Post graduate	26 (6.6)
	University	127 (32.2)
	Secondary school	153 (38.8)
	Primary school or less	88 (22.3)
With whom he lives	Parents	85 (21.6)
	2nd degree relative	150 (38.1)
	Other relative	60 (15.2)
	Alone	20 (5.1)
	Non relative	10 (2.5)
	Residential	69 (17.5)
Total		394 (100)

[Table/Fig-1]: Socio-demographic data of the participants.
*information missing for some students

The overall prevalence of smoking among the students indicated that 70 (17.8%) reported occasional smoking (ever smoked), and 27 (6.9%) were current smokers [Table/Fig-2]. Smoking was significantly more common among male students, with 58 (38.4%) of males reporting ever smoking, compared to only 12 (5%) of females, resulting in a p-value of <0.001. Similarly, current smoking rates were much higher in males, with 26 (17.2%) compared to females at 1 (0.4%), also with a p-value of <0.001. Older students exhibited higher rates of smoking, where those aged 25 years or older had the highest prevalence of occasional smoking at 11 (35.5%), with a p value of 0.001 and current smoking at 5 (16.1%), with a p-value of 0.003. Smoking rates were higher among students in the clinical stage compared to their counterparts in the preclinical stage, regarding ever smoking with a p-value of 0.023 and current smoking with a p-value of 0.019. Students living with non relatives had significantly higher smoking rates with 3 (30%) reporting current smoking, compared to those living with parents or relatives, resulting in a p-value of 0.010 [Table/Fig-2].

Regarding the perception of smoking, 234 (59.4%) students strongly disapproved smoking 10 or more cigarettes a day. A total of 169 (70.1%) female students expressed strong disapproval of smoking compared to 63 (41.7%) male students, which was statistically significant (p-value <0.001). Only 4 (20%) students living alone were less likely to disapprove heavy smoking compared to their counterparts (p-value=0.002). On the other hand, 214 (54.3%) students answered "impossible" to the question, "How difficult do you think it would be for you to get cigarettes?" A significantly higher proportion of females, 161 (66.8%), than males, 53 (35.1%), used "impossible" as a response to this question (p-value <0.001). Additionally, a higher proportion of younger students under the age of 20, 121 (67.2%), compared to older students over 25, where only 12 (38.7%) declared impossibility (p-value <0.001). Significantly, 146 (59.8%) students from the preclinical stage declared impossibility (p-value <0.001) [Table/Fig-3].

Significantly, 119 (49.4%) females stated that people risk harming themselves greatly if they smoke occasionally, compared to males at 57 (37.7%), with a p-value of 0.001. A total of 219 (90.9%) females responded that if they smoked one or more packs of cigarettes per day, the chances of people risking harm to themselves were great, resulting in a p-value of 0.005. Significantly, only 4 (20%) students living alone—and fewer than those living with someone—declared that people risk harming themselves greatly if they smoke occasionally. Only 12 (60%) students living alone responded that if they smoked one or more packs of cigarettes per day, the chances of harming themselves were great, with a p-value of <0.001 [Table/Fig-4].

Socio-demographic factors		Ever smoked (smoked previously at any time)			Current smoking (smoked during last 30 days)		
		Yes N (%)	No N (%)	p-value	Yes N (%)	No N (%)	p-value
All students		70 (17.8)	324 (82.2)	-	27 (6.9)	367 (93.1)	-
Gender	Male	58 (38.4)	93 (61.6)	<0.001*	26 (17.2)	125 (82.8)	<0.001*
	Female	12 (5.0)	229 (95.0)		1 (0.4)	240 (99.6)	
Age (years)	≤20	22 (12.2)	158 (87.8)	0.001*	9 (5.0)	171 (95.0)	0.003*
	21-25	23 (27.7)	60 (72.3)		11 (13.3)	72 (86.7)	
	>25	11 (35.5)	20 (64.5)		5 (16.1)	26 (83.9)	
	Not mentioned	14 (14)	86 (86)		2 (2)	98 (98)	
Origin	Urban	61 (17.2)	294 (82.8)	0.244	23 (6.5)	332 (93.5)	0.296
	Rural	9 (25.0)	27 (75.0)		4 (11.1)	32 (88.9)	
Source of Secondary certificate	Sudan	57 (18.6)	249 (81.4)	0.114	20 (6.5)	286 (93.5)	0.145
	Other Arab countries	7 (10.3)	61 (89.7)		3 (4.4)	65 (95.6)	
	Foreign	5 (29.4)	12 (70.6)		3 (17.6)	14 (82.4)	
Marital status	Single	67 (17.9)	307 (82.1)	0.038*	25 (6.7)	349 (93.3)	0.189
	Married	1 (5.9)	16 (94.1)		1 (5.9)	16 (94.1)	
	Divorced/ widowed	2 (66.7)	1 (33.3)		1 (33.3)	2 (66.7)	
Economic status	Above average	15 (16.5)	76 (83.5)	0.508	6 (6.6)	85 (93.4)	0.886
	Average	53 (19.0)	226 (81.0)		19 (6.8)	260 (93.2)	
	Below average	2 (9.5)	19 (90.5)		2 (9.5)	19 (90.5)	
Academic stage	Preclinical	35 (14.3)	209 (85.7)	0.023*	11 (4.5)	233 (95.5)	0.019*
	Clinical	35 (23.3)	115 (76.7)		16 (10.7)	134 (89.3)	
With whom he lives	Parents	15 (17.6)	70 (82.4)	0.092	4 (4.7)	81 (95.3)	0.010*
	2nd degree relative	29 (19.3)	121 (80.7)		8 (5.3)	142 (94.7)	
	other relative	7 (11.7)	53 (88.3)		4 (6.7)	56 (93.3)	
	Alone	4 (20.0)	16 (80.0)		4 (20.0)	16 (80.0)	
	Non relative	5 (50.0)	5 (50.0)		3 (30.0)	7 (70.0)	
	Residential	10 (14.5)	59 (85.5)		4 (5.8)	65 (94.2)	

[Table/Fig-2]: Prevalence of smoking according to different socio-demographic factors.
*chi-square test, p-value<0.05.

Socio-demographic factors		Do you disapprove of people smoking 10 or more cigarettes a day					How difficult do you think it would be for you to get cigarettes						
		Don't disapprove	Dis-approve	Strongly disapprove	Don't know	p-value	Impossible	Very difficult	Difficult	Easy	Very easy	Don't know	p-value
All students		26 (6.6%)	114 (28.9%)	234 (59.4%)	20 (5.1%)	-	214 (54.3%)	44 (11.2%)	34 (8.6%)	31 (7.9%)	35 (8.9%)	36 (9.1%)	-
Gender	Male	16 (10.6%)	58 (38.4%)	63 (41.7%)	14 (9.3%)	<0.001*	53 (35.1%)	18 (11.9%)	17 (11.3%)	17 (11.3%)	27 (17.9%)	19 (12.6%)	<0.001*
	Female	10 (4.1%)	56 (23.2%)	169 (70.1%)	6 (2.5%)		161 (66.8%)	26 (10.8%)	16 (6.6%)	14 (5.8%)	7 (2.9%)	17 (7.1%)	
Age (years)	<20	9 (5.0%)	47 (26.1%)	116 (64.4%)	8 (4.4%)	0.105	121 (67.2%)	13 (7.2%)	7 (3.9%)	15 (8.3%)	8 (4.4%)	16 (8.9%)	<0.001*
	20-24	5 (6.0%)	22 (26.5%)	50 (60.2%)	6 (7.2%)		34 (41%)	10 (12%)	12 (14.5%)	5 (6%)	14 (16.9%)	8 (9.6%)	
	≥25	5 (16.1%)	14 (45.2%)	12 (38.7%)	0		12 (38.7%)	5 (16.1%)	3 (9.7%)	3 (9.7%)	6 (19.4%)	2 (6.5%)	
	Not mentioned	7 (7%)	31 (31%)	56 (56%)	6 (6%)		47 (47%)	16 (16%)	12 (12%)	8 (8%)	7 (7%)	10 (10%)	
Marital status	Single	24 (6.4%)	104 (27.8%)	226 (60.4%)	20 (5.3%)	0.104	204 (54.5%)	41 (11%)	32 (8.6%)	30 (8%)	33 (8.8%)	34 (9.1%)	0.918
	Married	2 (11.8%)	7 (41.2%)	8 (47.1%)	0		8 (47.1%)	3 (17.6%)	2 (11.8%)	1 (5.9%)	2 (11.8%)	1 (5.9%)	
	Divorced or widowed	0	3 (100.0%)	0	0		2 (66.7%)	0	0	0	0	1 (33.3%)	
Academic stage	Preclinical	14 (5.7%)	68 (27.9%)	149 (61.1%)	13 (5.3%)	0.716	146 (59.8%)	21 (8.6%)	18 (7.4%)	21 (8.6%)	11 (4.5%)	27 (11.1%)	<0.001*
	Clinical	12 (8.0%)	46 (30.7%)	85 (56.7%)	7 (4.7%)		68 (45.3%)	23 (15.3%)	16 (10.7%)	10 (6.7%)	24 (16%)	9 (6%)	
With whom he lives	Parents	6 (7.1%)	23 (27.1%)	52 (61.2%)	4 (4.7%)	0.002*	49 (57.6%)	10 (11.8%)	9 (10.6%)	6 (7.1%)	6 (7.1%)	5 (5.9%)	0.322
	2nd degree relative	13 (8.7%)	40 (26.7%)	94 (62.7%)	3 (2.0%)		88 (57.8%)	15 (10%)	9 (6%)	13 (8.7%)	16 (10.7%)	9 (6%)	
	Other relative	3 (5.0%)	14 (23.3%)	39 (65.0%)	4 (6.7%)		34 (56.7%)	4 (6.7%)	7 (11.7%)	4 (6.7%)	4 (6.7%)	7 (11.7%)	
	Alone	4 (20.0%)	9 (45.0%)	4 (20.0%)	3 (15.0%)		6 (30%)	3 (15%)	2 (10%)	2 (10%)	2 (10%)	5 (25%)	
	Non relative	0	4 (40.0%)	5 (50.0%)	1 (10.0%)		5 (50%)	0	2 (20%)	1 (10%)	2 (20%)	0	
	Residential	0	24 (34.8%)	40 (58.0%)	5 (7.2%)		32 (46.4%)	12 (17.4%)	5 (7.2%)	5 (7.2%)	5 (7.2%)	10 (14.5%)	

[Table/Fig-3]: Perception of smoking and difficulty of getting cigarettes by different socio-demographic factors.
*chi-square test, p-value<0.05.

Socio-demographic factors		Smoke cigarettes occasionally (ever smokers)					Smoke one or more packs of cigarettes per day					
		No risk	Slight risk	Moderate	Great	Don't know	p-value	No risk	Slight risk	Moderate	Great	Don't know	p-value
All students		22 (5.6%)	72 (18.3%)	104 (26.4%)	177 (18.3%)	19 (4.8%)	-	5 (1.3%)	12 (3%)	24 (6.1%)	336 (85.3%)	17 (4.3%)	-
Gender	Male	14 (9.3%)	36 (23.8%)	33 (21.9%)	57 (37.7%)	11 (7.3%)	0.001*	3 (2%)	7 (4.6%)	14 (9.3%)	116 (76.8%)	11 (7.3%)	0.005*
	Female	8 (3.3%)	35 (14.5%)	71 (29.5%)	119 (49.4%)	8 (3.3%)		2 (0.8%)	4 (1.7%)	10 (4.1%)	219 (90.9%)	6 (2.5%)	
Age (years)	<20	11 (6.1%)	27 (15.0%)	50 (27.8%)	86 (47.8%)	6 (3.3%)	0.166	1 (0.6%)	3 (1.7%)	8 (4.4%)	163 (90.6%)	5 (2.8%)	0.032*
	20-24	1 (1.2%)	18 (21.7%)	24 (28.9%)	36 (43.4%)	4 (4.8%)		1 (1.2%)	0	7 (8.4%)	73 (88%)	2 (2.4%)	
	≥25	3 (9.7%)	11 (35.5%)	4 (12.9%)	11 (35.5%)	2 (6.5%)		1 (3.2%)	2 (6.5%)	2 (6.5%)	25 (80.6%)	1 (3.2%)	
	Not mentioned	7 (7%)	16 (16%)	26 (26%)	44 (44%)	7 (7%)		2 (2%)	7 (7%)	7 (7%)	75 (75%)	9 (9%)	
Marital status	Single	18 (4.8%)	68 (18.2%)	103 (27.5%)	167 (44.7%)	18 (4.8%)	0.094	5 (1.3%)	9 (2.4%)	23 (6.1%)	321 (85.8%)	16 (4.3%)	0.064
	Married	3 (17.6%)	3 (17.6%)	1 (5.9%)	9 (52.9%)	1 (5.9%)		0	2 (11.8%)	1 (5.9%)	13 (76.5%)	1 (5.9%)	
	Divorced or widowed	1 (3.3%)	1 (3.3%)	0	1 (3.3%)	0		0	1 (33.3%)	0	2 (66.7%)	0	
Academic stage	Preclinical	13 (5.3%)	45 (18.4%)	73 (29.9%)	102 (41.8%)	11 (4.5%)	0.329	4 (1.6%)	8 (3.3%)	12 (4.9%)	210 (86.1%)	10 (4.1%)	0.668
	Clinical	9 (6.0%)	27 (18.0%)	31 (20.7%)	75 (50%)	8 (5.3%)		1 (0.7%)	4 (2.7%)	12 (8%)	126 (84%)	7 (4.7%)	

With whom he lives	Parents	5 (5.9%)	12 (14.1%)	15 (17.6%)	48 (56.5%)	5 (5.9%)	0.014*	2 (2.4%)	3 (3.5%)	3 (3.5%)	74 (87.1%)	3 (3.5%)	<0.001*
	2nd degree relative	9 (6%)	30 (20%)	46 (30.7%)	60 (40%)	5 (3.3%)		2 (1.3%)	6 (4%)	9 (6%)	129 (86%)	4 (2.7%)	
	Other relative	3 (5%)	10 (16.7%)	20 (33.3%)	26 (43.3%)	1 (1.7%)		1 (1.7%)	0	7 (11.7%)	52 (86.7%)	0	
	Alone	4 (20%)	5 (25%)	3 (15%)	4 (20%)	4 (20%)		0	3 (15%)	0	12 (60%)	5 (25%)	
	Non relative	0	2 (20%)	3 (30%)	5 (50%)	0		0	0	0	10 (100%)	0	
	Residential	1 (1.4%)	13 (18.8%)	17 (24.6%)	34 (49.3)	4 (5.8%)		0	0	5 (7.2%)	59 (85.5%)	5 (7.2%)	

[Table/Fig-4]: How much do you think people risk harming themselves (physically or in other ways), if they do the following? (by different socio-demographic factors). *chi-square test, p-value<0.05.

DISCUSSION

The present study's findings highlight significant gender differences in smoking behaviour among medical students, consistent with trends observed across the MENA region. The overall prevalence of current smoking in this study was 6.9%, which appears to be lower than in most other local and regional studies [3,5,7, 9-10]. However, the prevalence rates at National Ribat University [11] and Dongola University [8] were comparable to the present study, ranging from 6.6 to 14.4% by classes for Ribat University and at 11.7% for Dongola University. Additionally, a large study on substance abuse among medical and non medical university students in Egypt reported an overall prevalence rate of 8.9% for cigarette smoking [16]. Studies from Saudi Arabia reported smoking rates among medical students ranging from 4.7% to 17.6% [17-19]. Research on tobacco use in Sudan has pointed out that Tumbak is popular among rural populations and those with limited financial resources [20]. This alternative form of nicotine consumption should be included in future assessments to provide a more comprehensive picture of tobacco use among students. The availability of Tumbak might explain why cigarette smoking rates in present study, and in some studies from Sudan, are lower than in other countries in the region. The same reason may account for the lower rates of cigarette smoking in some parts of neighbouring countries. For example, shisha and hookah and other forms of tobacco use are commonly available in some Middle Eastern countries as well as some Asian counties. A study conducted among dental college students in India found an overall prevalence of hookah smoking at 59.1% (45.7% among males and 13.4% among females) [21].

The gender disparities observed in the present study illustrate how smoking behaviours often align with gender norms and societal expectations, similar to what has been reported elsewhere [3,16]. This gender disparity is not limited to the MENA region. Bodur S et al., conducted a study in Turkey that found while 27.7% of male medical students reported smoking, only 4.1% of female students did so [6]. A similar pattern was observed in Iran, where 19% of male medical students were smokers compared to only 4% of females, suggesting that gender norms and cultural expectations in conservative societies play a role in shaping smoking behaviour among students [22]. Overall, the stigma associated with female smoking in many conservative societies likely contributes to the significantly lower rates of reported smoking among women, as observed in this study and others. The consistent gender disparity across diverse contexts emphasises the importance of cultural attitudes and social norms in shaping smoking behaviour, which may be critical in understanding and addressing smoking behaviours among university students.

The influence of age and academic stage on smoking behaviour was also evident in the present study, as older students and those in the clinical stage reported higher smoking rates. These findings align with similar trends observed in Lebanon and Jordan, where smoking prevalence has been shown to increase with age and stage of education [2,4]. For instance, a study in Saudi Arabia also found that smoking rates were significantly higher among older medical students compared to younger ones, likely due to the increased academic pressures and clinical responsibilities that students face in the advanced stages of their education [3].

This trend may also be partially explained by the greater autonomy and exposure to social environments that normalise smoking behaviour as students progress in their studies. Similar results were reported in Iran, where smoking rates among medical students increased with each academic year, suggesting that the added pressures and exposure to clinical settings may contribute to increased smoking behaviour [22]. Furthermore, a longer duration of time in university likely exposes students to more peer influence, as shown in studies from Greece, where upper-year students were more inclined to smoke than their junior counterparts [23].

Another factor influencing older students is the broader social acceptance and availability of smoking opportunities as students transition from the preclinical, highly structured environments into clinical, more autonomous settings. In many countries, students in clinical stages often report increased interactions with peers or professionals who may smoke, thus normalising smoking behaviour [24].

In the present study, 59.4% of students strongly disapproved smoking 10 or more cigarettes a day, with disapproval rates being higher among females (70.1%) compared to males (41.7%). Research from Egypt and Lebanon similarly highlights the need for gender- and age-specific smoking prevention strategies to combat tobacco use in university settings [4,16].

In this study, students living with non relatives reported notably higher smoking rates, with 50% being ever smokers and 30% current smokers. In the same context, research from Greece found that university students living away from their families had significantly higher odds of smoking, attributed to increased social exposure and peer influence in more autonomous settings [23].

Living arrangements may affect smoking behaviour through increased peer influence and social pressures in environments where smoking is normalised. In a study conducted in Lebanon, university students living independently, especially with peers who smoke, were more likely to take up smoking, highlighting the role of social networks in smoking initiation and maintenance [4]. Furthermore, a study from the United States on college students showed that those living in shared accommodations with smokers reported higher smoking rates, suggesting that smoking behaviours may be reinforced by proximity to smoking peers [25].

Economic status, however, appeared to have minimal influence on smoking behaviour in the present study, with similar smoking rates across different economic backgrounds. This finding was consistent with research from high-income countries, where socio-economic status does not strongly influence smoking among

university students, possibly due to the relative affordability of tobacco products for students in these settings [24]. However, the influence of economic status on smoking may vary globally. In some lower-income regions, the affordability and accessibility of tobacco can limit smoking prevalence among lower socio-economic groups [22]. This difference highlights the need for contextualised studies to understand smoking behaviours in diverse socio-economic environments and living situations.

Raising awareness about smoking-related health risks is an important intervention to combat tobacco use, particularly among healthcare providers and medical students. According to Pezzuto A et al., quitting smoking is beneficial for improving symptoms, respiratory function, and metabolic parameters in the short-term [26]. Taylor DH et al., estimated that quitting at the age of 35 years increases life expectancy by 6.9 to 8.5 years for men and 6.1 to 7.7 years for women [27]. According to Jha P et al., adults who quit smoking at ages 25 to 34 years, 35 to 44 years, or 45 to 54 years gained about 10, 9, and 6 years of life, respectively, compared to those who continued to smoke [28].

The strength of the present study lies in its sample size, which, although not very large, is larger than four of the five previously reported studies [7,9-11]. Most of the other studies have been conducted in government universities, while this study was performed in a private university, potentially providing a different perspective on the issue. Additionally, the response rate among the students was high.

Limitation(s)

Among the identified limitations of this study was the absence of age information for 100 students. Given that age represents an important demographic variable, this data was retained. The missing information resulted from a subset of respondents who left certain questions unanswered, which is a common limitation associated with paper-based surveys compared to their online counterparts. For instance, two students did not respond to the gender question, three did not answer the urban/rural question, three skipped the inquiry regarding the source of their secondary certificate, and another three did not provide information concerning their economic status. The respondents who failed to complete these questions were not the same individuals; thus, their data was not excluded, as exclusion is typically applied when a substantial amount of information is missing for a specific respondent.

Furthermore, study observed significant missing data related to two questions: age and the query, “Do you disapprove of people smoking ten or more cigarettes a day?” To mitigate this issue, authors established a category labeled “not mentioned” and reanalysed the data. This approach yielded different results, with some previously significant observations becoming non significant following the adjustment. Regarding the second question, authors assumed that those who did not respond were simply unaware of the information requested.

CONCLUSION(S)

The study emphasises the importance of culturally tailoured interventions within medical schools to address gender- and age-specific factors associated with smoking. Given that medical students are future healthcare providers, equipping them with effective tobacco cessation skills and promoting a non smoking culture is essential for their role in public health. Additionally, the findings highlight the need for further research on alternative forms of nicotine use, such as Tumbak, as well as for a broader exploration of smoking behaviours across diverse socio-economic and living contexts within the Sudanese population.

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