

PREVALENCE OF SMOKING AND ITS DETERMINANTS AMONG MEDICAL
STUDENTS IN MOSUL CITY*¹Dr. Omar Ahmed Suleiman, ²Dr. Firas Husam Ali*¹M.B.Ch.B., Consultant Family Physician, ²M.B.Ch.B., F.I.C.M.S. (FM).

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*Corresponding Author: Dr. Omar Ahmed Suleiman

M.B.Ch.B.

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ABSTRACT

Background: Tobacco use remains a major global public health concern, particularly among young adults. Medical students are considered at higher risk of smoking due to academic and psychological pressures, and understanding the prevalence and determinants of smoking in this group is essential for prevention strategies, especially given their future role in counseling patients against tobacco use; however, data on this issue remain limited in Iraq. **Aim:** To assess the prevalence of smoking and identify its key determinants among medical students in Mosul City. **Methods:** A descriptive cross-sectional study was conducted among 486 medical students of both sexes and all academic stages at the College of Medicine, University of Mosul, and the Medical College, University of Nineveh, using a self-administered online questionnaire covering socio-demographic data, smoking behavior, and social and psychological factors; data were analyzed using SPSS version 25. **Results:** The overall prevalence of smoking was 31.3% and was markedly higher among males (41.5%) than females (13.4%) and among rural (43.2%) than urban (29.6%) residents. Prevalence varied by academic stage, from 27.7% (sixth stage) to 37.3% (fourth stage), and was strongly associated with having smoking family members (15.4% to 53.8%) and smoker friends (7.8% to 51.7%). Cigarettes were the most common type used (40.4%); most smokers initiated after age 18 (61.8%); and the majority were light smokers (1-10 cigarettes/day, 44.3%). Curiosity (69.1%) and the influence of smoker celebrities (27.1%) were the leading reported reasons for initiation. **Conclusion:** Smoking was relatively common among medical students, particularly among males, rural residents, and those with familial or peer exposure to tobacco. Targeted interventions addressing psychosocial and environmental determinants, alongside continued awareness efforts, are needed to reduce smoking prevalence in this population.

KEYWORDS: Smoking, prevalence, medical students, determinants, Mosul, Iraq.

1. INTRODUCTION

Tobacco use remains one of the leading preventable causes of morbidity and mortality worldwide, and smoking^[1] refers to the inhalation and exhalation of smoke produced by burning tobacco, most commonly in the form of cigarettes, cigars, waterpipes, or electronic cigarettes. Its prevalence continues to impose a substantial burden on public health globally.^[2]

Medical students represent a population of particular interest about tobacco use. Their academic workload, examination pressure, and early exposure to clinical stressors are believed to place them at higher risk of adopting smoking as a coping behavior, while their future role as physicians and health educators makes their own smoking behavior and attitudes especially

relevant to tobacco-control efforts, since physicians who smoke are less effective advocates for cessation and are perceived as less credible sources of health advice.^[3]

Despite the abundance of international literature describing smoking prevalence and its determinants among medical students, data from Iraq, and from Nineveh Governorate specifically, remain scarce. Reported prevalence figures vary considerably across neighboring Iraqi and regional settings, reflecting differences in culture, methodology, and the strength of local anti-smoking policies. This study, therefore, aimed to assess the prevalence of smoking and to identify its key socio-demographic, familial, and psychosocial determinants among medical students in Mosul City in order to inform locally relevant prevention strategies.

The specific objectives were to describe the socio-demographic characteristics of the sample; to determine the distribution of smoking status by sex, residence, and academic stage; to identify the predisposing factors and patterns of smoking behavior; to explore students' perceptions of the effects of smoking; and to identify the sources of awareness and encouragement to quit smoking available to this population.

1.5 AIM OF THE STUDY

The present study aims to determine the prevalence of smoking among medical students in Mosul City (University of Mosul, College of Medicine, and Medical College, University of Nineveh).

1.6 Specific Objectives

- To describe sociodemographic factors among medical students in Mosul City.
- To determine the distribution of smoking status by sex and residence area among the sampled students
- To determine the predisposing factors of smoking among this group.
- To know the point of view of medical students about smoking.
- To know the prevalence and number of smokers in each academic stage.
- To describe the smoking behavior (smoking status, age of initiation, type of smoking, and frequency) among medical students in Mosul city.
- To know the sources of awareness and encouragement to quit smoking among this group.

2. MATERIALS AND METHODS

2.1 Study Design, Setting, and Period

A descriptive cross-sectional study was conducted among medical students of both sexes and from all academic stages at the College of Medicine, University of Mosul, and the Medical College, University of Nineveh. The study was carried out over six months, from 2 January 2025 to 29 June 2025.

2.2 Ethical Considerations

Administrative agreement was obtained from the Scientific Council of the Arab Board of Health Specializations in Family Medicine in Iraq; ethical approval was obtained from the Ethical Committee of Nineveh Health Directorate; and official permission was granted by the Deanships of the Colleges of Medicine at the Universities of Mosul and Nineveh. The study objectives and survey link were posted together on the official social media groups of each academic stage; participation was voluntary, and completion of the questionnaire was considered informed consent. Responses were anonymous and kept confidential, and no risks or negative effects on participants were anticipated.

2.3 Study Sample

The minimum required sample size was calculated using

the standard formula $N = Z^2 P(1-P)/d^2$, where Z is the standard normal statistic for a 95% confidence level (1.96), P is the estimated prevalence (assumed 15%), and d is the margin of error (5%). This yielded a minimum of 195 participants; after adjusting for design effect and potential non-response by doubling this figure, a target of 390, rounded to 400, was set. A total of 486 medical students were ultimately recruited using a convenience sampling approach across all academic stages and both sexes, exceeding the minimum requirement.

Inclusion criteria comprised all medical students who agreed to participate by completing the questionnaire through the link posted in their academic-stage social media groups. Students who declined to participate, could not access the questionnaire link, or answered it randomly or carelessly were excluded.

2.4 Data Collection Tool

Data were collected using a structured, self-administered electronic questionnaire distributed through Google Forms, adapted from previous studies with adjustments to fit the objectives of this study. The questionnaire comprised three sections: (1) socio-demographic data, including age, sex, academic stage, residence, parental education and occupation, family smoking status, home ownership, and number of families sharing the household; (2) smoking behavior, including smoking status (current, former, never), age of initiation, type of smoking (cigarette, shisha, e-cigarette, or polytobacco use, defined as concurrent use of two or more tobacco products), and frequency; and (3) social and psychological factors, including peer and family influence, perceptions about the personal and social effects of smoking, whether smokers had received advice from family or friends to quit, and whether students had attended lectures on the risks of smoking during their academic training.

2.5 Statistical Analysis

Data were processed using Microsoft Excel (2010) and analyzed with SPSS version 25. Descriptive statistics, including frequencies and simple percentages, were calculated for all study variables and are presented as tables and figures.

3. RESULTS

3.1 Socio-Demographic Characteristics

A total of 486 medical students participated in the study (Table 1). The majority were male (63.4%), and most were from urban areas (88.1%). Participants were distributed across all six academic stages, with the sixth stage having the highest proportion (18.5%). Most participants (90.5%) had both parents alive and reported married parents (89.9%); 91.6% lived in owned houses. Fathers most commonly held a university degree (51.4%) and were employed or retired (74.7%), while over half of mothers were housewives (54.3%).

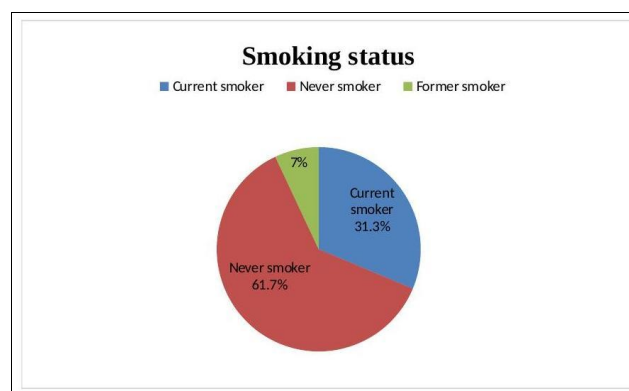
Table 1: Socio-demographic characteristics of the participants (n = 486).

Characteristic		No.	%
Sex	Male	308	63.4
	Female	178	36.6
Age (years)	18	26	5.3
	19	53	10.9
	20	79	16.3
	21	82	16.9
	22	66	13.6
	23	58	11.9
	24	59	12.1
	25	38	7.8
	≥26	24	4.9
Residence	Urban	428	88.1
	Rural	58	11.9
Academic stage	1st	78	16.0
	2nd	73	15.0
	3rd	87	17.9
	4th	83	17.1
	5th	75	15.4
	6th	90	18.5
Parental status	Both alive	440	90.5
	One/both are deceased	46	9.5
Parents' marital status	Married	437	89.9
	Widowed	44	9.1
	Divorced	5	1.0
Home ownership	Owned	445	91.6
	Rented	41	8.4
Families/ household	One	350	72.0
	More than one	136	28.0
Father's occupation	Employed/retired	363	74.7
	Unemployed	123	25.3
Mother's occupation	Employed/retired	222	45.7
	Housewife	264	54.3
Father's education	Primary	34	7.0
	Secondary	70	14.4
	University	250	51.4
	Higher education	132	27.2
Mother's education	Primary	108	22.2
	Secondary	115	23.7
	University	185	38.1
	Higher education	78	16.0

3.2 Prevalence of Smoking

Among the 486 participants, 31.3% (n = 152) were current smokers, 7.0% (n = 34) were former smokers, and 61.7% (n = 300) had never smoked (Figure 1).

Smoking status differed markedly by sex: among males (n = 308), 41.5% were current smokers versus 13.5% of females (n = 178) (Figure 2).

**Figure 1: Prevalence of smoking among the total sample.**

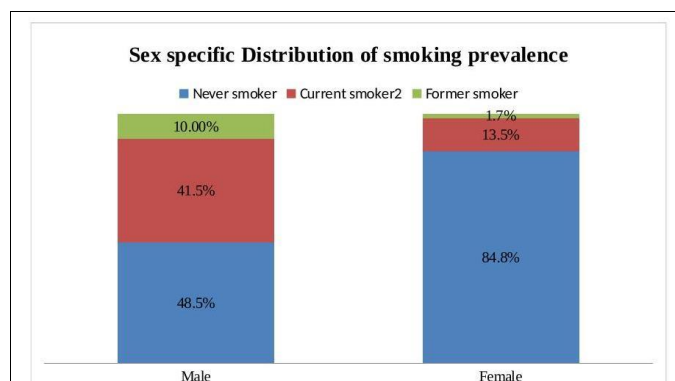


Figure 2: Distribution of smoking status by sex.

Smoking prevalence varied across academic stages (Table 2), rising from 28.2% in the first stage to a peak

of 37.3% in the fourth stage, then declining to its lowest point, 27.7%, in the sixth stage.

Table 2: Prevalence of smoking by academic stage.

Stage	Cur. (F/M)	Ex (F/M)	Never (F/M)	Tot.	Prev. %
1st	22 (6/16)	6 (0/6)	50 (28/22)	78	28.2
2nd	24 (3/21)	5 (0/5)	44 (20/24)	73	32.8
3rd	23 (3/20)	6 (1/5)	58 (25/33)	87	29.4
4th	31 (3/28)	5 (1/4)	47 (28/19)	83	37.3
5th	27 (5/22)	2 (0/2)	46 (21/25)	75	36.0
6th	25 (4/21)	10 (1/9)	55 (29/26)	90	27.7

Prevalence was higher among rural students (43.2%) than urban students (29.6%) (Figure 3). Family smoking exposure showed a strong dose-related association with student smoking (Table 3): prevalence was highest

among students with more than one smoking family member (53.8%), followed by those with a smoking father (47.8%) or brother (44.3%), compared with only 15.4% among students with no smoker in the family.

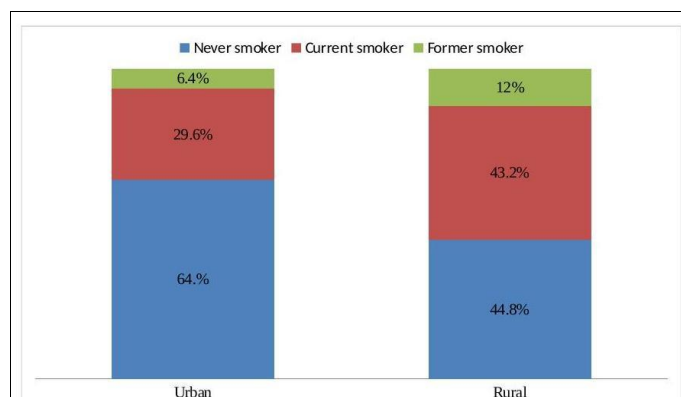


Figure 3: Prevalence of smoking according to residence.

Table 3: Prevalence of smoking according to the presence of smoker family members.

Family smoking status	Tot.	Never	Former	Current	Prev. %
Father smoker	67	33 (49.2%)	2 (3%)	32 (47.8%)	47.8
Brother smoker	88	36 (40.9%)	13 (14.8%)	39 (44.3%)	44.3
>1 family member smokes	78	27 (34.6%)	9 (11.5%)	42 (53.8%)	53.8
No smokers in the family.	253	204 (80.6%)	10 (4%)	39 (15.4%)	15.4
Total	486	300	34	152	31.3

A similar gradient was observed for peer influence (Table 4): prevalence rose from 7.8% among students

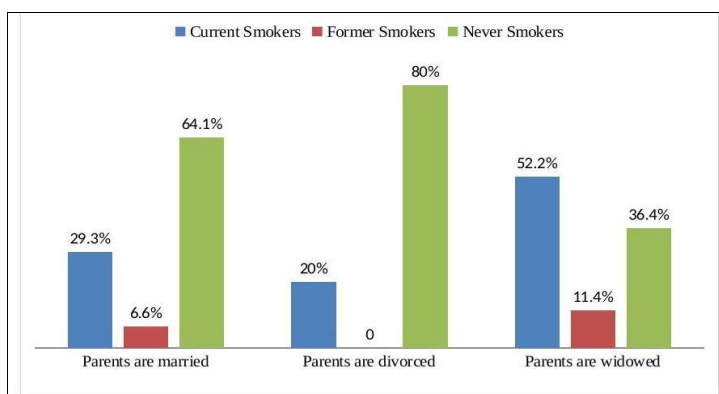
with no smoker friends to 25.9% with one smoker friend and 51.7% with more than one smoker friend.

Table 4: Prevalence of smoking according to the presence of smoker friends.

Friends' smoking status	Tot.	Never	Former	Current	Prev.%
No smoker friends	192	173	4	15	7.8
One smoker friend	58	39	4	15	25.9
>1 smoker friend	236	88	26	122	51.7
Total	486	300	34	152	31.3

With respect to parents' marital status (Figure 4), current-smoking prevalence was highest among students whose parents were widowed (52.2%) and lowest among those

with divorced parents (20.0%), while the latter group also had the highest proportion of never-smokers (80.0%).

**Figure 4: Distribution of smoking status by parents' marital status.**

Smoking prevalence increased progressively with parental loss (Table 5): 29.1% among students with both parents alive, 50.0% with one deceased parent, and 100%

(2/2) with both parents deceased, although this last subgroup was very small.

Table 5: Distribution of smoking status by parents' vital status (n = 486).

Parents' vital status	Tot.	Never	Former	Current	Prev.%
Both alive	440	283	29	128	29.1
One deceased	44	17	5	22	50.0
Both deceased	2	0	0	2	100.0
Total	486	300	34	152	31.3

Housing characteristics were also associated with smoking (Table 6): prevalence was higher among students in rented houses (36.6%) than in owned houses

(30.8%) and among those sharing a household with more than one family (45.6%) compared with a single family (25.7%).

Table 6: Distribution of smoking status by house ownership and number of families sharing the household.

Variable	Category	Never	Former	Current	Tot.
House ownership	Owned	280 (62.9%)	28 (6.3%)	137 (30.8%)	445
	Rented	20 (48.8%)	6 (14.6%)	15 (36.6%)	41
Families in the house	One	244 (69.7%)	16 (4.6%)	90 (25.7%)	350
	>One	56 (41.2%)	18 (13.2%)	62 (45.6%)	136

Parental education and occupation followed an inverse pattern with student smoking (Table 7): prevalence was highest among students whose fathers (41.1%) or mothers (43.5%) had only primary education and lowest among those with university-educated fathers (29.2%) or

mothers (23.2%). Prevalence was similarly higher when fathers were unemployed (43.0% versus 27.2% for employed/retired fathers), or mothers were housewives (34.8% versus 27.0% for employed/retired mothers).

Table 7: Distribution of smoking status by father's and mother's occupation and educational level.

Variable	Category	Never	Former	Current	Tot.
Father's education	Primary	17	3	14 (41.1%)	34
	Secondary	39	7	24 (34.2%)	70
	University	159	18	73 (29.2%)	250

	Higher educ.	85	6	41 (31.0%)	132
Mother's education	Primary	—	—	47 (43.5%)	108
	Secondary	—	—	— (≈)	115
	University	—	—	43 (23.2%)	185
Father's occupation	Employed/ret.	—	—	(27.2%)	363
	Unemployed	—	—	(43.0%)	123
Mother's occupation	Employed/ret.	148	14	60 (27.0%)	222
	Housewife	152	20	92 (34.8%)	264

3.3 Patterns of Smoking Behavior

Among 181 current and former smokers who reported their type of smoking, cigarette smoking was most

common (40.4%), followed by polytobacco use (34.8%), shisha or hookah (13.8%), and e-cigarettes (11.0%) (Figure 5).

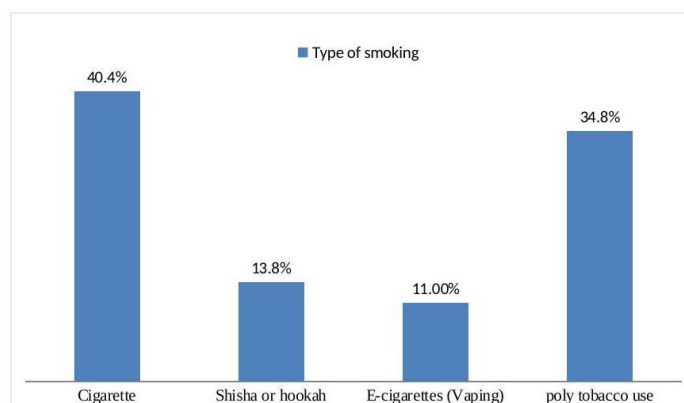


Figure 5: Type of smoking in the study sample.

Among 178 smokers reporting age of initiation, most (61.8%) began smoking after age 18, 36.0% began between 12 and 18 years, and only 2.2% began before age 12 (Figure 6). Among 131 cigarette smokers, 44.3%

smoked 1-10 cigarettes/day, 39.7% smoked 11-20/day, and 16.0% smoked more than 20/day (Figure 7), indicating a predominance of light-to-moderate smokers.

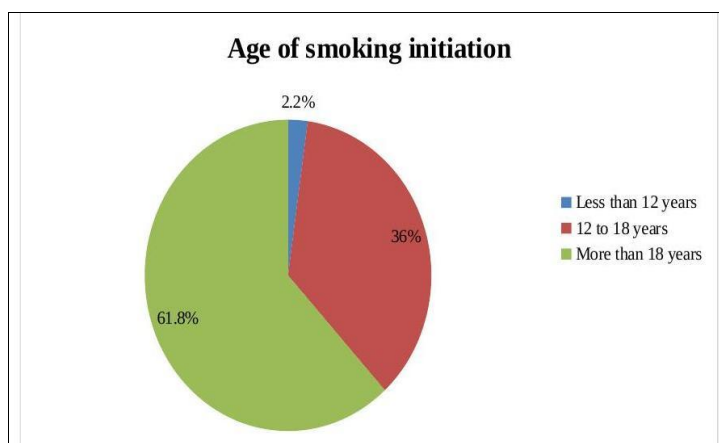


Figure 6: Age of smoking initiation in the study sample.

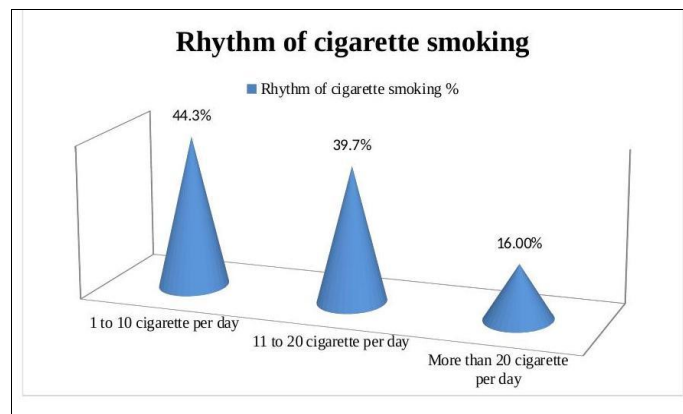


Figure 7: Daily cigarette consumption in the study sample.

3.4 Perceived Effects of Smoking

Most participants did not perceive smoking as enhancing sociability (81.1%), self-confidence (79.4%), or

attractiveness (75.7%). Positive perceptions were reported by a minority, most often regarding attractiveness (24.3%) (Table 8).

Table 8: Perceived effects of smoking on personal traits, by smoking status (n = 486).

Variable	Status	Current	Former	Never	Total n(%)
Increase self-confidence	Yes	57	12	31	100 (20.6)
	No	95	22	269	386 (79.4)
Increase attractiveness	Yes	71	12	35	118 (24.3)
	No	81	22	265	368 (75.7)
Make more social	Yes	49	13	30	92 (18.9)
	No	103	21	270	394 (81.1)

3.5 Reasons for Smoking Initiation

Among 181 current/former smokers, 69.1% reported curiosity as the main reason for starting smoking (Figure

8), while 27.1% reported being influenced by a smoker celebrity (Figure 9).

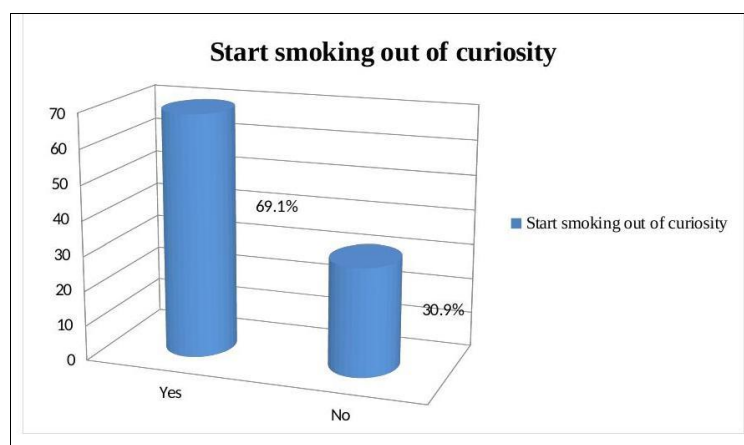


Figure 8: Influence of curiosity on smoking initiation.

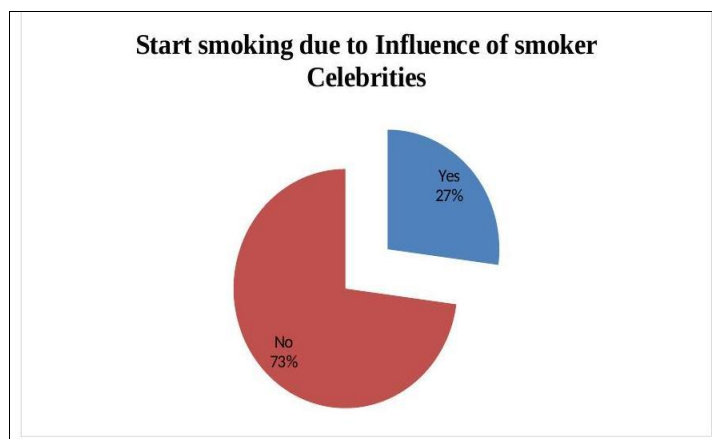


Figure 9: Influence of smoker celebrities on smoking initiation.

3.6 Awareness and Encouragement to Quit

Among 181 current and former smokers, 90.1% had

received advice from family to quit, and 72.3% had received advice from friends (Table 9).

Table 9: Family and friends' advice to quit smoking (current smokers and former smokers before quitting).

Source of advice	Status	n (%)
From family	Yes	163 (90.1)
	No	18 (9.9)
From friends	Yes	131 (72.3)
	No	50 (27.7)

Overall, 78.0% of the 486 students ($n = 379$) reported having attended lectures at their medical college on the

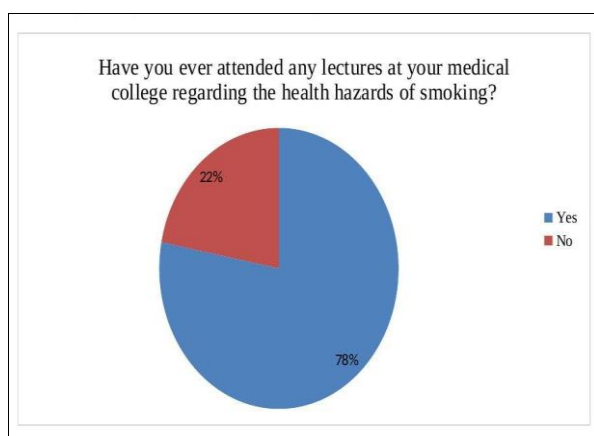


Figure 10: Percentage of students who reported attending lectures about the dangers of smoking.

4. DISCUSSION

Tobacco smoking remains a major global public health concern despite widespread awareness of its harms, and this issue also affects medical students, who are expected to model healthy behavior and to support patients in quitting smoking.^[2,3]

The overall smoking prevalence of 31.3% found in this study of 486 medical students in Mosul is relatively high compared with other Iraqi and regional settings. A 2023 study among medical students in Najaf reported a lower prevalence of 17.3%,^[4] while studies at Hawler Medical University in Erbil reported prevalences of 12.2% (2024) and 12.3% (2009).^[5,6] In contrast, a 2020 study of 300

health hazards of smoking (Figure 10).

medical students in Baghdad reported a higher prevalence of 46.7%.^[7] These differences likely reflect variation in regional and cultural factors, sample characteristics, academic stress levels, study period, and the strength of local anti-smoking policies.

The sex disparity observed here (41.5% among males versus 13.4% among females) is consistent with a 2023 Mosul-based study reporting 30% prevalence among males and 7% among females,^[8] a systematic review and meta-analysis of Iranian university students reporting 26% versus 7%,^[9] and a cross-sectional study across Syria, Lebanon, and Palestine reporting cigarette-smoking prevalence among men as high as 51.3% in Syria, compared with 8.4-24.3% among women across these countries.^[10] This disparity likely reflects social and cultural norms that create greater pressure on women not to smoke.

Smoking prevalence fluctuated across academic stages, rising through the middle years before declining sharply in the sixth (final) stage. Early increases may reflect stress and adaptation to a new academic and social environment, while the mid-course peak may relate to heavier workloads and expanded social interactions; the decline in the final year likely reflects growing health awareness and professional responsibility as graduation approaches, consistent with the higher proportion of ex-smokers among senior students in this cohort.

Prevalence was higher among rural (43.2%) than urban (29.6%) students, a pattern that may relate to differences

in health awareness, education levels, parental supervision, and access to smoking-prevention programs,^[10] and that echoes mixed urban-rural gradients reported in a Levantine cross-sectional survey.^[10]

A strong association between family smoking and student smoking was observed, consistent with an English meta-analysis of 58 studies showing that household smoking exposure increases the odds of smoking initiation by 119% if the mother smokes, 66% if the father smokes, 173% if both parents smoke, and 130% if a sibling smokes.^[11] Similarly, the strong peer-influence gradient found here parallels a 15-country meta-analysis of 75 studies, in which adolescents with smoker friends were found to be nearly twice as likely to initiate smoking.^[12]

Regarding parents' marital status, findings for widowed and married parents were consistent with a U.S. study linking single-parent (divorced or widowed) households with higher smoking rates (37% versus 22.7% for two-married-parent households)^[13] and with Indonesian data showing a 1.3-fold higher smoking risk among adolescent boys with divorced mothers;^[14] the low prevalence found here among students with divorced parents likely reflects the very small number of such students ($n = 5$) and should be interpreted cautiously.

The progressive rise in smoking prevalence with parental loss mirrors a UK cohort study of 10,940 children, in which those who had lost a parent were 2.58 times more likely to have started smoking by age eleven,^[15] an association that may in part be mediated by the increased anxiety and depression associated with parental bereavement.

The socioeconomic gradients observed for housing status, household composition, and parental education/occupation are consistent with an English study of 120,496 adults reporting more than double the smoking rate among renters compared with homeowners,^[16] an Australian cohort study linking multi-family households with a 20-30% increased likelihood of continued smoking,^[17] a longitudinal U.S. study linking parents' blue-collar occupation and lower education with higher adult-smoking risk in their offspring,^[18] and a further U.S. study reporting a 28% increase in adolescent smoking risk for each step down in parental education and a 30% increase for each step down in household income.^[19] Together, these findings underscore an inverse relationship between parental socioeconomic stability and student smoking behavior.

Cigarette smoking was the leading type of tobacco used (40.4%), followed by polytobacco use (34.8%), broadly comparable with an Egyptian study reporting 14% cigarette use among Cairo University medical students,^[20] though shisha use predominated (47.2%) in an Erbil-based sample,^[21] reflecting regional and

generational differences in tobacco-product preference, including the growing popularity of shisha cafes and vaping among youth.

The finding that most students (61.8%) initiated smoking after age 18 aligns with a large household survey in Erbil, in which the majority of smokers who reported their age of initiation began after age 20,^[22] but contrasts with a Baghdad study in which most medical-student smokers (61.9%) had started before age 19^[7] and with Dutch data showing a peak age of initiation around 16 years with no evidence of a shift toward older ages;^[23] the pattern observed here may reflect the transition to university, greater financial independence, and new social experiences during young adulthood.^[24]

Most cigarette smokers in this study were light-to-moderate smokers (44.3% smoking 1-10 cigarettes/day), broadly comparable with a Baghdad study reporting that 59.3% of medical-student smokers smoked fewer than 11 cigarettes/day^[7] and a Sudanese study of 336 medical students in which most smoked 5-10 cigarettes/day,^[25] suggesting that increased health awareness gained through medical education may motivate students to limit their consumption even without complete cessation.

Consistent with the largely negative perceptions of smoking's social effects reported here, a U.S. study using identical-twin pairs discordant for smoking found a clear preference for non-smokers' faces as more attractive,^[26] while a longitudinal Iranian study of 4,853 adolescents found that lower self-confidence significantly increased the risk of both smoking experimentation and regular smoking;^[27] nonetheless, the minority who did associate smoking with attractiveness, confidence, or sociability may still represent an important target for tailored counter-messaging.

Curiosity and celebrity influence were the leading self-reported reasons for smoking initiation in this study. A Californian longitudinal study of 2,119 adolescent never-smokers found that curiosity strongly predicted subsequent experimentation with smoking,^[28] while a systematic review of 17 cohort studies involving over 100,000 adolescents found that exposure to smoking imagery in movies increased the risk of smoking initiation by 45%, an effect attributed in part to the normalizing influence of popular actors and characters who smoke on screen.^[29]

Finally, most current and former smokers in this study reported receiving advice to quit from family (90.1%) and friends (72.3%), a proportion at the higher end compared with the Global Youth Tobacco Survey across 53 of 56 countries, in which more than half of current smoking students typically received such advice (range 39.9-96.9%),^[30] likely reflecting strong family and social bonds within the local community. Similarly, 78% of the total sample reported having attended anti-smoking lectures at their medical college, and the lowest smoking

prevalence among sixth-stage students may in part reflect the cumulative effect of this educational exposure over the course of training.

5. CONCLUSION AND RECOMMENDATIONS

Smoking was relatively common among medical students in Mosul City, with an overall prevalence of 31.3%. It was more prevalent among males, rural residents, and students exposed to smoking within the family or peer group, and it was associated with lower parental education, parental unemployment, rented or shared housing, and parental loss. Cigarettes were the predominant tobacco product used; most students initiated smoking after age 18, and the majority were light smokers. Curiosity and the influence of celebrity smokers were the leading reported drivers of initiation, and although most students had received anti-smoking advice from family, friends, or their college curriculum, a substantial minority continued to smoke.

These findings support the need for targeted, multi-level interventions in this population, including structured awareness and counseling activities addressing the psychosocial and environmental determinants of smoking within medical colleges and schools; the use of pictorial and Arabic-language health warnings on cigarette packaging; enhanced anti-smoking outreach in rural areas; restrictions on tobacco advertising, particularly where it targets vulnerable groups; enforcement of a higher legal purchase age for tobacco products; smoke-free policies across schools, colleges, and public places; and increased tobacco taxation to reduce affordability and uptake.

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