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Posted Date: 11 July 2025

doi: 10.20944/preprints2025071011.v1

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Article

A Cross-Sectional Study Evaluating the Knowledge, Attitudes, and Behaviors Related to Smoking Among University Students in Pakistan

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Abstract

Background: A global issue, tobacco use is on the rise among young people in Asian nations like Pakistan, especially among college students. This study's initial goal was to investigate smoking behaviors, attitudes, and smoking-related information among Pakistani students in different departments and colleges. **Methods:** A cross-sectional descriptive study was conducted in both urban and rural areas between February and April 2025. Data were acquired from Pakistani University's faculties as well as Community College departments. The questionnaire was based on the Global Health Professionals and Global Youth Tobacco Surveys. A total of 760 the students were randomly selected. **Results:** In the current study, 53 (27.3%) smokers scored very high on the FTND, making them predisposed to heavy smoking dependency. A linear regression analysis found a strong association between students' smoking knowledge and age, residency, smoking status, and geographic location ($p<0.001$). Significant indicators of smoking knowledge included sex, marital status, and school year ($P<0.05$). The study indicated that age, family income, marital status, and school-year level were significantly related to students' attitudes and perspectives on smoking ($P<0.001$). However, the study indicated that age >24 years and second and fourth school years were significantly connected to smoking behavior ($P < 0.001$). Students with positive attitude ratings had decreased rates of smoking dependency ($P<0.05$). Smokers exhibited more positive attitudes and views about smoking compared to nonsmokers, and nonsmokers had more smoking-related information ($P<0.001$). Students from various departments and colleges had significantly diverse knowledge levels on the detrimental impacts of smoking and hazardous tobacco components from cigarettes ($P<0.001$). **Conclusions:** The results of the FTND test demonstrated that smokers are highly dependent on smoking in this study. Smoking attitudes, knowledge, and dependence were all higher among fourth-year students. In contrast to nonsmokers, who were more cognizant of the harmful effects of smoking, smokers tended to have more favorable attitudes toward smoking. Departmental and college-level smoking data discrepancies highlight the need for targeted anti-smoking campaigns and enhanced public awareness of the risks associated with tobacco use.

Keywords: smoking; related knowledge; attitudes; behaviours; students; Pakistan

Introduction:

One of the world's most pressing health problems, tobacco use is on the rise among college students in Pakistan and other Asian countries. Pakistan has been more open over time. However, there has been a significant increase in the number of young Asians and teenagers of both genders who smoke, particularly among university students (Cui et al., 2018).

Tobacco smoking is one of the most serious issues confronting world health; it kills over 6 million people each year and is linked to high health-care expenses and low productivity (Goodchild et al., 2018). Approximately 80% of smokers in middle- and low-income nations die from tobacco- related

illnesses (Sathish et al., 2022). Tobacco consumption in emerging nations is anticipated to increase by 3.4% per year (Ahluwalia et al., 2021). A recent investigation on the prognosis of tobacco usage found that tobacco epidemics have worsened in eastern Mediterranean and African countries with poor health systems (Abu-Rmeileh et al., 2022). Cigarette smoking has three types of detrimental effects: slow, gradual, and cumulative. The dangers of smoking are widely documented; nonetheless, the number of smokers among adult students remains high (Hashemi- Aghdam et al., 2022). People's smoking habits can be influenced by a variety of circumstances, including financial position, having parents, siblings, or friends who smoke, and the social milieu around them (Aryee et al., 2024). The long-term repercussions of tobacco use may be simpler to overlook because young people believe they are immune to these dangers (Outman et al., 2023). As a result, some surveys on smoking prevalence have been done, with the majority of findings indicating that smoking is widespread in Pakistan, particularly among university students (Abu- Rmeileh et al., 2022; Zubair et al., 2022). However, medical organizations such as the American Society of Clinical Oncology (ASCO) and the World Health Organization (WHO) encourage young people not to smoke any form of substance because it is harmful to both them and society (Hanna, 2013). As a result, identifying knowledge and ideas about smoking dependency would be beneficial to the Pakistani student population, as no studies have been undertaken in this nation to assess diverse knowledge, beliefs, and other aspects among university students.

Materials and Methods:

This cross-sectional descriptive study was conducted among university students during the summer semester of the 2019–3 academic year with clearance from the university board of Pakistani Universities and Colleges, which serves both rural and urban areas of the provinces of Punjab. Students from three different faculties at these Universities (Commerce and Economics, Engineering, and Medicine and Health Sciences), as well as Community Colleges in high class, completed a self-administered, anonymous questionnaire about smoking behavior, habits, attitudes, and smoking knowledge (Cui et al., 2018). These statistics were collected from Pakistan three departments (the Nursing, Laboratory, and Assistant Doctor Departments) between February 1st and April 30th, 2025. We categorized smoking using the WHO smoking status criteria, which were based on (Alaouie et al., 2022) definitions for waterpipe smoking.

Study Sample

The cohort studies included 810 full-time students enrolled in rural and urban locations; 810 students were chosen by stratified randomization and invited to participate in the study. Of the 810 students approached, 790 agreed to participate and complete the questionnaire; 30 questionnaires were discarded because they were incorrectly completed. A total of 760 students were enrolled in the survey (overall response average of (94.41%). Sample size calculation: For the cross-sectional survey, the following formula was used: $N = Z^2 \cdot \alpha / 2p(1-p) / d^2$, where " α " is commonly set as 0.05, " $Z^2 \cdot \alpha / 2$ " is 1.96, and " p " is the predicted incidence of a certain disease. In this study, " p " represents the smoking rate. Previous studies in India found that smokers made up 9% of undergraduates and 7.1% of postgraduate medical students (Chow et al., 2024). In Palestine, 27% of young people smoked (Abu Shomar et al., 2014). Because the larger " $p(1-p)$ " is, the larger the sample size is, the final " p " value is 27% higher. The variable " d^2 " represents the permissible deviation error, and in this study, the value of " d " is 0.05. The estimated value is $N=303$. The estimated sample size was 334, assuming a 10% loss to follow-up rate. The actual survey surveyed 760 students, which was enough to meet the sample size requirements.

Questionnaire Used in the Study

The questionnaire was in English and was based on tobacco-use assessment models such as the Global Health Professionals Survey and the Global Youth Tobacco Survey (Of & Cajan, 2014). The

average time to complete the questionnaire was quarterly. The first nine items (sociodemographic profile) and smoking status (cigarette and waterpipe) were obtained. Smoking cessation: Patients have the ability and desire to quit smoking. In addition, smokers responded to 8 questions about student attitudes and beliefs about smoking, as well as 6 questions about smoking behavior and habits. Twelve questions about the negative effects of cigarette smoking (lung cancer, emphysema, aging, throat cancer, stroke, ischemic heart disease, mouth cancer, tuberculosis, gastric ulcer, diabetes mellitus, arthritis, and cataract) were used to assess students' overall knowledge and attitudes toward the impact of smoking on health. Six questions about the toxic substances found in cigarettes (nicotine, tar, carbon dioxide, carbon monoxide, hydrogen cyanide, and nitrogen oxide) were used to assess students' general knowledge of the detrimental health impacts of smoking.

Statistical Analysis

For all studies, IBM-SPSS statistics software version 24 was utilized. The data was analyzed using logistic regression and linear logistic regression, and the significance and relationship between smoking and related factors like sex, age, marital status, study level, residence, income, department/college, and area were assessed using chi-square tests (χ^2 test). To examine smoking-related knowledge across departments and colleges, paired t tests were employed. At the 5% threshold, every result was deemed statistically significant (Jakobsen et al., 2014). According to the categories of dependence and forms of smoking behavior dependence, college students' levels of smoking behavior dependence have been assessed using the Fagerstrom test for nicotine dependence (FTND). Each of the six items on the FTND may have a different score depending on the question. Scores for the multiple-choice questions range from 1 to 4. The sum of the items results in a score between 6 and 22. The range of the FTND score is 6–22. Low for ($6 \leq \text{score} \leq 10$), moderate for ($11 \leq \text{score} \leq 14$), high for ($15 \leq \text{score} \leq 18$), and very high for ($19 \leq \text{score} \leq 22$) were the cut-off scores for the FTND. Due to their susceptibility to high smoking dependency, smokers with scores between 6 and 14, which are regarded as mild to moderate smoking dependency, should think about quitting. According to Fagerstrom, smokers who score 15–18 and 19–20 points are deemed to be at high risk for smoking dependency and require prompt treatment (Farooq et al., 2020). Those who scored 19 to 22 or above on the FTND were deemed to have a tobacco smoking dependency in the current study.

Results:

A total of 760 students participated in the study, 289 (38.0%) of whom were female and 471 (62.0%) of whom were male; 66.8% of the students were in the 18–24 age range. 53 (27.3%) smokers in the current study had very high FTND scores, making them susceptible to high smoking dependency.

Knowledge of Smoking Among Urban and Rural College Departments

Students from different departments and colleges had significantly varying levels of awareness regarding some harmful effects and toxic compounds from cigarettes ($P < 0.001$). (Table 1) Results of a pairwise comparison of students' understanding of the negative consequences and hazardous compounds of smoking across various departments and colleges.

First, students from various departments and institutions were asked to rate their understanding of the harmful effects of smoking cigarettes. Students from the Department of Nursing and Assistants and those from the College of Commerce had significantly different levels of knowledge ($P < 0.001$). Compared to the students from the Department of Nursing and Assistants, the College of Commerce students knew a lot more about the negative effects of cigarettes. The knowledge level of the College of Engineering students was much higher than that of the Department of Laboratory and the College of Medicine students ($P < 0.05$). The knowledge levels of the College of Engineering students were much higher than those of the Department of Nursing and Assistants students ($P < 0.001$). The knowledge levels of the College of Medicine students were much higher than those of the Nursing

and Assistant Department students ($P<0.001$). The knowledge levels of the Department of Laboratory students were much higher than those of the College of Nursing students ($P<0.001$). The knowledge levels of the Laboratory Department students were much higher than those of the Assistant Department students ($P<0.001$).

Second, an assessment was conducted to determine the students' level of awareness on the harmful chemicals found in cigarettes. Students from the Nursing and Assistants Department and those from the College of Commerce had significantly different levels of knowledge ($P<0.001$). The knowledge levels of the College of Commerce students were higher than those of the Nursing and

Assistant Department students. The knowledge levels of the College of Engineering students were significantly higher than those of the College of Commerce students ($P<0.05$). The knowledge levels of the College of Engineering students were greater than those of the College of Medicine and Department of Laboratory students ($P<0.05$), as well as those of the Nursing and Assistant Department ($P<0.001$).

The knowledge level of the College of Medicine students was much higher than that of the Nursing and Assistant Department students ($P<0.001$ and $P<0.05$, respectively). The knowledge level of the Laboratory Department students was significantly higher than that of the Nursing and Assistant Department students ($P<0.001$ and $P<0.001$, respectively).

Third, students from various departments and institutions were asked to rate their general degree of smoking-related knowledge. The knowledge levels of the College of Commerce students were much lower than those of the College of Engineering students ($P<0.05$), but they were significantly higher than those of the Nursing and Assistants Department students ($P<0.001$). The knowledge levels of the College of Engineering students were much higher than those of the Department of Laboratory ($P<0.05$) and the College of Medicine and Nursing and Assistant Department ($P<0.001$). The knowledge levels of the College of Medicine students were much higher than those of the Nursing and Assistant Department students ($P<0.001$). The knowledge levels of the Laboratory Science Department students were much higher than those of the Nursing and Assistant Department students ($P<0.001$). (Table 1).

Table 1. Linear Regression Analysis of Smoking-related knowledge (n=760).

Factor	β	SE	Wald- χ^2	P value
Sex	-1.535	0.612	-2.186	0.021*
Age	2.53	0.494	3.303	<0.001**
Marital status	-1.80	0.729	-2.172	0.023*
Study level	1.14	0.324	2.61	0.007
Residence	-2.4	0.645	-3.26	<0.001**
Family income	-0.004	0.460	-0.011	0.88
Department	0.224	0.39	0.54	0.45
Smoking	3.802	0.79	6.01	<0.001**
Area	4.004	1.34	3.44	<0.001**

(Estimated coefficient; SE, standard error; **P value is highly statistically significant; *P value is statistically significant).

Knowledge on Smoking and How It Affects Smokers

Age, place of residence, smoking status, and geographic region were all statistically significantly correlated with students' smoking-related knowledge, according to linear regression analysis ($P<0.001$). Additionally, smoking-related knowledge was significantly predicted by sex, marital status, and school year level ($P<0.05$). There was no significant correlation between smoking-related knowledge and department or college affiliation or family income ($P>0.05$) (Table 2).

Table 2. Influence Factors on Attitudes and Beliefs Concerning Smoking (n=760).

Factors	Scores	One way analysis of variance	P Value
Sex			
Male	7.85 ±1.316	-1.002	0.315
Female	7.85±1.367	-1.002	0.315
Age			
<18 Years	7.65±1.10	30.32	<0.001**
18-24 years	7.54±1.2	30.32	<0.001**
Over 24 years	8.60±1.62	30.32	<0.001**
Marital Status			
Married	7.80±1.30	7.73	0.002**
Single	7.10±1.44	7.73	0.002**
Department/College			
Nursing	8.04±1.05	1.66	0.105
Laboratory	8.04±1.04	1.66	0.105
Assistant Doctor	7.76±0.76	1.66	0.105
Commerce and Economics	7.81±1.86	1.66	0.105
Engineering College	7.40±1.50	1.66	0.105
Medicine and Health Sciences	7.71±1.55	1.66	0.105
Study level			
First-year	7.83±1.36	10.43	<0.001**
Second-year	7.53±1.43	10.43	<0.001**
Third-year	7.10±1.32	10.43	<0.001**
Fourth Year	8.12±1.11	10.43	<0.001**
Residence			
With Family	7.80±1.22	0.23	0.52
Dormitory	7.73±1.44	0.23	0.52
Family income (per month)			
Low	7.00±1.44	3.021	0.045*
Average	7.51±1.30	3.021	0.045*
High	7.55±1.051	3.021	0.045*
Area			
Urban Area	7.66±1.65	50005	0.023*
Rural Area	7.55±0.96	50005	0.023*±

**P value is highly statistically significant; *P value is statistically significant.

Perceptions and Attitudes About Smoking and How They Affect Smokers

Table 3 shows the elements that influenced the students’ attitudes and beliefs about smoking. Students’ attitudes and opinions about smoking were substantially correlated with their age and school year level (P<0.001). Geographic location, marital status, and family income were significantly significant determinants of smoking attitudes and beliefs (P<0.05). According to a linear regression analysis, students’ attitudes and views about smoking were significantly correlated with age, marital status, family income, and school year (P<0.001). However, there were no significant correlations between attitudes or beliefs about smoking and sex, domicile, department and college affiliation, or location (P>0.05) (Table 4).

Table 3. Linear Regression Analysis of the factors Influencing Attitudes and Beliefs Concerning Smoking (n=760).

Factor	β	SE	t	P Value
Sex	0.143	0.110	1.202	0.182
Age	0.511	0.098	5.57	<0.001**
Marital Status	0.251	0.12	2.075	0.037*
Study level	0.15	0.065	2.30	0.020*
Residence	0.035	0.107	0.32	0.740
Family income	-0.257	0.070	-3.41	<0.001**
Department	0.015	0.060	0.252	0.781
Area	-0.35	0.205	-1.647	0.061

β , estimated coefficient; SE, standard error; ** P value is highly statistically significant; * P value is statistically significant.

Table 4. Linear Regression Analysis of the Associations between Attitudes and Smoking-Related Knowledge (n=194).

Factor	β	SE	T	P Value
Age				
18-24 years	0.138	0.061	2.15	0.030*
>24 years	0.137	0.060	2.23	0.025*
Marital Status				
Single	-0.035	0.040	-0.850	0.310
Study level				
Second- year	-0.080	0.047	-1.573	0.092
Third-year	-0.0211	0.060	-0.356	0.711
Fourth- year	-0.205	0.05	-3.332	0.001**
Residence				
Dormitory	0.018	0.047	0.394	0.68
Family income				
Average	0.003	0.03	0.080	0.821
High	-0.030	0.072	-0.41	0.662
Area				
Rural	-0.04	0.041	-1.115	0.255
Knowledge Score	0.415	0.093	4.417	<0.001**

β , estimated coefficient; SE, standard error; ** P value is highly statistically significant; * P value is statistically significant.

Associations between Knowledge, Attitudes, and Behaviors Concerning Smoking (n=760) (Table 5) shows smoking attitude scores as the dependent variable and smoking knowledge scores as the independent variable. Linear regression analysis showed that participants aged 18-24, >24, and fourth-year students had more positive sentiments toward smoking ($P < 0.05$). Fourth-year students had more positive opinions toward smoking than first-year students. Students with strong knowledge levels had positive attitudes regarding smoking ($P < 0.05$).

Table 5. Linear Regressions Used for Associations between Smoking-Related Knowledge and Attitudes and Behavior (n=194).

Factor	β	SE	T	P Value
Age				
18-24	0.0065	0.037	1.773	0.075

years				
>24 years	0.143	0.035	3.74	<0.001**
Marital Status				
Single	-0.016	0.024	-0.67	0.471
Study level				
Second- year	-0.075	0.027	-2.504	0.010*
Third- Year	0.020	0.035	0.576	0.541
Fourth- year	-0.116	0.035	-3.151	0.001*
Residence				
Dormitory	0.03	0.027	1.350	0.171
Family income				
Average	-0.025	0.021	-1.061	0.281
High	-0.042	0.043	-0.946	0.278
Area				
Urban	-0.03	0.025	-1.422	0.142
Knowledge Score				
Attitude Score	-0.105	0.044	-2.358	0.018*

β, estimated coefficient; SE, standard error; ** P value is highly statistically significant; * P value is statistically significant.

The second and fourth school years were substantially associated with smoking behavior (P<0.001). Students with positive attitude ratings had decreased rates of smoking dependency (P<0.05). The knowledge score did not substantially correlate with smoking behavior (P>0.05).

Discussion:

The purpose of this study was to compare the frequency of smoking and the knowledge and beliefs of students in Pakistani rural and urban areas. The current study received 94.4% of the responses, which suggests that the students were open to taking part. There were 38.0% female participants and 62.0% male participants. According to the findings of the FTND test, students (27.3%) were deemed susceptible, and smokers had a significant smoking dependency. Based on the FTND, our results are higher than those of a prior study conducted in the United Arab Emirates (UAE) (16.3%) (Saleh et al., 2021).

Students from the various colleges showed a clear difference in their degree of knowledge regarding the presence of dangerous chemicals in tobacco (P<0.001) and the negative effects of smoking (P<0.001). Overall, students from all departments and colleges had significantly varying levels of smoking-related information (P<0.001). The findings of the evaluation of the degree of awareness about smoking were consistent with those of a prior study that was carried out among Pakistani students in 2019 (Ullah et al., 2019).

Students, particularly those who smoke waterpipes from both urban and rural regions, were shown to be ignorant about the negative health impacts of smoking. In order to support and encourage the community to take part in lowering the high prevalence of smoking, this result indicated that the prevalence of smoking must be addressed and that proactive and minimized health education should be implemented through a variety of means, including the media, community campaigns, and even the homes of the students (Golechha, 2016).

Our findings showed that whereas smoking-related knowledge was more prevalent among nonsmokers than among smokers, smoking attitudes were more prevalent among smokers than among nonsmokers (P <0.001). These findings could serve as a foundation for tobacco prevention initiatives among college students in both urban and rural regions. Students’ irrational beliefs, the absence of smoking cessation programs (information on tobacco control policies needs to be more widely disseminated), and positive cultural behavior and beliefs regarding smoking could all

contribute to their inadequate or poor knowledge of the health risks associated with smoking. Additionally, Pakistan is economically underdeveloped which puts Pakistani students under a lot of psychological, financial, and social pressure. In general, smoking is one of the most enduring behaviors that could lead to a rise in the number of students who smoke (Naganandini et al., 2025).

Lastly, as the students examined in this study had insufficient understanding regarding the negative effects of smoking, smoking education needs to be enhanced and irrational views need to be changed. It is necessary to create and implement regulatory frameworks for tobacco use, such as health warning labels tailored to tobacco use that outline the negative consequences of waterpipe smoking. The study's findings about the causes of smoking might offer a solid foundation and recommendations for implementing antismoking initiatives, which could boost their efficacy and change smokers' attitudes and behaviors. Policymakers should take note of this study's implications. All universities should accept applications for anti-smoking programs from the Ministry of Education and Higher Education.

Teenagers and young people should be included in community education programs that highlight the negative health effects of smoking. Teachers should be given relevant and dependable knowledge. Additionally, media campaigns against smoking can help reduce smoking and motivate Pakistani entire population to take part. The findings of this study showed that nonsmokers knew more about smoking than smokers did. Nonetheless, smokers had more positive sentiments about smoking than nonsmokers did. These findings could serve as a foundation for tobacco prevention initiatives among college students in both urban and rural regions. Furthermore, the findings can significantly support the nation's tobacco control plan and enhance students' smoking-related understanding, attitudes, and behavior.

Limitations

There are several drawbacks to this study. First, reporting bias may have an impact on the conclusions that are reported, and respondents' subjective opinions may also be reflected in the data. Second, there may be limited generalizability of the study's findings because it relied on data from a large sample of college students.

Third, this study did not look at the consequences of smoking cigarettes and waterpipes in rural and urban locations. Therefore, more research is required to ascertain the impacts of smoking in Yemen's rural areas. Clarifying the logical relationship between knowledge, practice, and attitudes and connecting the three concepts (including the interplay between influencing elements in the three-concept model) presents a number of challenges.

Finally, in the current research. The FTND score indicated that smokers had a high level of smoking dependency. Student age and smoking tendency were shown to be significantly correlated; fourth-year students showed a strong correlation with smoking attitudes and achieved greater knowledge and attitude ratings as well as a lesser reliance on smoking behaviors. Students in their second and fourth years were significantly more likely to smoke.

Smokers exhibited more positive attitudes toward smoking than nonsmokers, and nonsmokers were more knowledgeable about smoking. Students from various departments and colleges had widely varying degrees of understanding regarding the harmful effects of smoking and the toxic substances found in cigarettes. Policymakers are urged by the findings to implement anti-smoking initiatives. In order to curb smoking among Pakistani university students, health education and counseling should be provided.

Acknowledgments: We profoundly appreciate all of individuals and bodies that helped with this study by uploading their work on multiple sites and by establishing the framework for our investigation. Also, their input to the field has been significant in shaping our understanding by integrating pertinent ideas.

Conflicts of Interest: The Authors declare no competing interests.

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