Demographic characteristics and their impact on the prevalence of smoking among university students in Yemen: an analytical study

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Abstract

The prevalence of tobacco smoking among university students is increasing worldwide, particularly in Yemen. Breaking traditional norms that once limited smoking to older, uneducated women. This shift highlights a growing public health concern, especially among youth and teenagers. This **aims** of this study is to analyze the relationship between demographic characteristics and the prevalence of smoking among university students in Yemen.

Methods: A cross-sectional descriptive study was conducted from March-May 2019 in urban and rural areas of Hodeidah and Hajja Provinces. A standardized questionnaire, adapted from global health and youth tobacco surveys, was administered to 760 randomly selected full-time students from all academic years, achieving a 94.4% response rate.

Results: A cross-sectional study of 760 university students revealed a smoking prevalence of 25.5%, with higher rates observed among female, older, single, and dormitory-residing students, as well as those in Medicine and Health Sciences or urban areas (P<0.001). Logistic regression analysis showed that males were less likely to smoke than females (OR 95% CI: 1.308–3.12, P<0.05), and smoking was significantly associated with age (P<0.001), being single (OR 95% CI: 1.058–2.678, P<0.05), and living away from family (OR 95% CI: 1.214–2.978, P<0.05). Low family income was identified as a risk factor and significant predictor of smoking status (P<0.05), with college affiliation also strongly associated (P<0.001). An analysis of smoking types among university students revealed significant associations with gender, family income and area (P<0.001) and age (P=0.002). while waterpipe smoking was higher among students living with families (52.7% vs. 9.8%) (P<0.001). and the third and fourth years the highest combined smoking rates (52.4% and 100.0%, respectively) (P<0.001). Departmental differences showed the highest rates of waterpipe smoking among nursing students (60.9%), cigarette smoking in laboratory

students (100.0%), and combined smoking in community college students (48.2%) (P<0.001). These findings highlight the influence of demographic, residential, and academic factors on smoking behavior.
Conclusions: Smoking prevalence among Yemeni university students was higher than previous national rates. Smoking was significantly associated with gender, residence, age, marital status, income, and college department, highlighting the need for targeted health education and anti-smoking programs in higher education institutions.
Keyword: Smoking prevalence, university students, Yemen, demographic factors.

Introduction

Tobacco smoking is a growing global health concern, especially among youth in Arab countries like Yemen, with university students being particularly affected. Traditionally viewed as a male-dominated habit, recent years have seen an increase in smoking among young Arab women and teens, reflecting broader social changes. Tobacco kills nearly 6 million people annually and imposes high health and economic costs, with 80% of deaths occurring in low- and middle-income countries where smoking rates continue to rise [1][2].

The harmful effects of smoking are well-documented, contributing to both common diseases like cancer and heart disease and less common conditions such as psoriasis and Chronic Obstructive Pulmonary Disease (COPD). Globally, approximately 22% of adults were smokers in 2012, with rates higher in low- and middle-income countries [3]. In Yemen, surveys such as the Global Youth Tobacco Survey (GYTS) have revealed concerning statistics, including 14.1% shisha usage and 6.8% cigarette smoking among students, with boys smoking more than girls [4].

This study explores the demographic and behavioral factors associated with smoking among Yemeni youth, including smoking types, duration, cessation attempts, and challenges. The findings aim to inform effective smoking cessation strategies and raise awareness of this growing issue. Despite awareness of smoking hazards, these behavioral factors continue to fuel the habit, especially among young, educated women [5] [6].

3. Material and Methods

This cross-sectional descriptive study was conducted during the summer semester of the 2019/3 academic year among university students in Hodeidah and Hajja provinces, Yemen, after obtaining approval from the university boards of Hodeidah University and Community College. Data were collected using a self-administered, anonymous questionnaire on demographic and behavioral factors related to smoking. Participants included students from three faculties at Hodeidah University (Commerce & Economics, Engineering, and Medicine & Health Sciences) and three departments at Community College (Nursing, Laboratory, and Assistant Doctor). The study, conducted between March 1 and May 30, 2019,

classified smoking status based on WHO criteria for cigarette smoking and Maziak et al.'s criteria for waterpipe smoking. [6,7].

3.1 Sample of the Study

The cohort studies consisted of 805 full-time students enrolled in rural and urban areas; 805 students were selected using stratified randomization and were invited to participate in the study. Of the 805 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%). The study consisted of full-time students enrolled at rural and urban area, Hodeidah & Hajja provinces and the study was as following; In urban area- the cohort study consisted of full-time students enrolled at Hodeidah University. 405 students for both gender between the first years to the last academic year have participated in this study in terms of health-related college (Medicine) and non-health related college (Commerce & Economics and Engineering) so the study sample was a fair representation of the students. The students were randomly selected and agreed to participate in the study using stratified randomization. 405 students were chosen using stratified randomization and were invited to participate in the survey. Of the 405 students approached, 390 students agreed to participate and filled the questionnaire; 10 questionnaires were discarded because they were incorrectly filled. A total of 380 students were enrolled in the study (overall response rate 93.8%).

In the rural Hajja province, three health-related departments (Nursing, Laboratory, and Assistant Doctor) from the seven departments at the Community College were purposively selected. From a total of 1,093 students enrolled in these departments during the 2019 academic year, a stratified sample of 400 students (36.6%) was randomly selected, proportionally representing the student population in each department. All 400 students completed the questionnaire, achieving an initial response rate of 100%. After excluding 20 incomplete responses, 380 questionnaires were included in the final analysis, resulting in a response rate of 95%.

The data has been collected in difficult conditions for several reasons; living situation and economic was very difficult in the country. Since the year of 2015, the country has a civil war. The attendance in university was

disturbed and non-regular; some students left the study without a notice. The rural areas were safer than the big cities, some students moved to the rural area because of the fear of war. Therefore, the study was limited to the existing students at the university and had to be finished in such a short time period.

3.2 Data Collection

Questionnaires were distributed to students during classroom breaks and collected immediately upon completion. Participation was voluntary, anonymous, and solely for research purposes, with no penalties for non-participation.

3.3 Questionnaire of the Study

Five contents of 40 items of questions were used to gather the information about basic demographic properties, about participants' points of views about smoking behaviour, habits and attitude of all of them towards smoking. And the questionnaire included the factors sex, age and marital status, also included other factors as shown in the questionnaire. The questionnaire was in Arabic language derived from models used for the assessment of tobacco use; containing the global health professionals' survey and the global youth tobacco survey [8, 9]. And the average needed time to answer the questionnaire was quarter an hour.

The first 9 items (socio-demographic profile) covered sex, age, type of college, marital status, residence, level of study, family income and smoking status (both cigarette and water pipe). Smoking cessation possible to quit smoking and their willingness to quit smoking). Also, smokers answered 8 questions about attitudes and beliefs concerning smoking among students. And 6 questions about smoking behaviour and their smoking habits (their first smoking attempt, amount, type and duration of smoking, smoking expenses, previous attempts to quit smoking and the longest abstinence time from smoking). This study focuses on analyzing demographic characteristics (such as age, gender, marital status, economic background, and geographical location) and their association with smoking behaviors.

3.4 Statistical Analysis

The IBM-SPSS statistics computer package version 24 was used for all analyses. logistic regression and linear logistic regression were used for the data analysis, and chi-squared tests (χ^2test) or Fisher s' exact were performed to determine the significance and association between smoking and related factors such as sex, age, marital status, study level, residence, income, departments/college and areas. All results were considered statistically significant at the 5% level of significance.

4. Results

4.1 Characteristics of the samples

Characteristics	Total	Percent (%)
Gender		
Male	471	62.0
Female	289	38.0
Age		
<18years	104	13.7
18-24years	508	66.8
Over 24years	148	19.5
Marital status		
Married	604	79.5
Single	156	20.5
Department /College		
Nursing	164	21.6
Laboratory	123	16.2
Assistant Doctor	93	12.2
Commerce	140	18.4
Engineering	120	15.8
Medicine	120	15.8
Study level		
First-year	464	61.1
Second-year	196	25.8
Third-year	76	10.0
Fourth year	24	3.2
Residence		

With family	513	67.5
Dormitory	247	32.5
Family income (per month)		
Low	420	55.3
Average	243	32.0
High	97	12.8
Type of smoking		
Cigarette	84	11.1
Water pipe	67	8.8
Both Cigarette + Water pipe	43	5.7
Nothing	566	74.5
Area		
Urban area	380	50.0
Rural area	380	50.0

The study surveyed 760 university students, comprising 471 males (62.0%) and 289 females (38.0%), with 66.8% aged 18–24 years. Most participants were from the College of Nursing (21.6%), followed by Commerce (18.4%) and Laboratory (16.2%). The majority were married (79.5%), living with their parents (67.5%), and 55.3% came from low-income families. The overall response rate was 94.4%. (Table 1).

Table 1 the study sample based on the demographic characteristics (n=760)

4.2 Smoking behaviors and the factors influencing smoking

4.2.1 Smoking status

Among 760 university students, 25.5% were smokers. Smoking prevalence was higher among older (48.6%) and single students (39.7%) compared to younger (30.8%) and married students (21.9%) ($P<0.001$). Third- and fourth-year students, Medicine and Health Sciences students (44.2%), dormitory residents (33.2%), low-income students (29.0%), and urban students (38.7%) had significantly higher smoking rates compared to their counterparts ($P<0.001$). (Table 2).

Table 2 smoking behaviors and influencing factors on smoking status (n=760)

Characteristics factors	Smokers No (%)	Non-Smokers No (%)	Total No (%)	$\chi 2$-test/ Fisher's exact test	*P*-value
Gender					
Male	116(24.6)	355(75.4)	471(62.0)	0.525	0.469
Female	78(27.0)	211(73.0)	289(38.0)		
Age					
<18years	32(30.8)	72(69.2)	104(13.7)	59.425	<0.001**
18-24years	90(17.7)	418(82.3)	508(66.8)		
Over 24years	72(48.6)	76(51.4)	148(19.5)		
Marital status					
Married	132(21.9)	472(78.1)	604(79.5)	20.871	<0.001**
Single	62(39.7)	94(60.3)	156(20.5)		
Department / College					
Nursing	23(14.0)	141(86.0)	164(21.6)	74.775	<0.001**
Laboratory	14(11.4)	109(88.6)	123(16.2)		
Assistant Doctor	10(10.8)	83(89.2)	93(12.2)		
Commerce and Economic	56(40.0)	84(60.0)	140(18.4)		
Engineering college	38(31.7)	82(68.3)	120(15.8)		
Medicine and Health sciences	53(44.2)	67(55.8)	120(15.8)		
Study level					
First-year	103(22.2)	361(77.8)	464(61.1)	73.337	<0.001**
Second-year	46(23.5)	150(76.5)	196(25.8)		
Third-year	21(27.6)	55(72.4)	76(10.0)		
Fourth year	24(100.0)	0(00.0)	24(3.2)		
Residence					
With family	112(21.8)	401(78.2)	513(67.5)	11.33	<0.001**
Dormitory	82(33.2)	165(66.8)	247(32.5)		
Family income (per month)					
Low	122(29.0)	298(71.0)	420(55.3)	13.031	<0.001**
Average	61(25.1)	182(74.9)	243(32.0)		
High	11(11.3)	86(88.7)	97(12.8)		
Area					
Urban area	147(38.7)	233(61.3)	380(50.0)	69.214	<0.001**
Rural area	47(12.4)	333(87.6)	380(50.0)		
Total	194(25.5)	566(74.5)	760(100.0)		

***P value is highly statistically significant*

Logistic regression analysis showed that smoking was significantly associated with being female (OR 95% CI: 1.308–3.12, P<0.05), older age (P<0.001), and being single (OR 95% CI: 1.058–2.678, P<0.05). Students

living away from family (OR 95% CI: 1.214–2.978, P<0.05) and those with low family income (P<0.05) were more likely to smoke. Additionally, smoking was strongly linked to academic department or college affiliation (P<0.001)(Table 3).

Table 3 logistic regression used for smoking status (n=760)

Factors / Variable	***β***	***SE***	**Wald-*χ2***	***P*-value**	**OR (95% CI)**	
Sex male(reference)						
female	0.703	0.222	10.059	0.002	1.308	3.12
Age <18years(reference)			17.088	*<0.001***		
18-24years	0.607	0.289	4.42	0.036	0.309	0.96
Over 24years	0.448	0.322	1.934	0.164	0.832	2.946
Marital status single(reference)						
married	0.521	0.237	4.827	*0.028*	1.058	2.678
Study level First-year(reference)			5.11	0.164		
Second-year	0.082	0.237	0.12	0.729	0.58	1.465
Third-year	0.712	0.339	4.422	0.035	1.05	3.956
Fourth-year	22.424	7777.086	0	0.998	0	.
Residence Dormitory(reference)						
With family	0.642	0.229	7.875	*0.005**	1.214	2.978
Family income Low(reference)			11.873	*0.003**		
Average	0.459	0.222	4.255	0.039	0.632	0.409
High	1.147	0.367	9.746	0.002	0.318	0.155
Department/College Nursing(reference)			34.757	*<0.001***		
Laboratory	0.094	0.382	0.061	0.805	1.099	0.52
Assistant Doctors	0.136	0.431	0.099	0.753	0.873	0.375
Commerce	1.157	0.322	12.929	<0.001**	3.181	1.693
Engineering	0.684	0.347	3.893	0.048	1.982	1.005
Medicine	1.485	0.332	20.054	<0.001*	4.415	2.305

β = estimated coefficient; SE = standard error; OR = odds ratio; CI = confidence interval.

***P value is highly statistically significant* **P value is statistically significant*

4.2.2 Smoking types

Among the 194 smokers (25.5% of the sample), 43.3% smoked cigarettes, 34.5% smoked waterpipes, and 22.2% used both. Male smokers (59.8%) outnumbered females (40.2%) (P<0.001). Cigarette smoking was more common among males (61.7%) than females (16.7%), while waterpipe smoking was significantly higher among females (79.5%) compared to males (4.3%). Dual use of cigarettes and waterpipes was also higher in males (34.5%) than females (3.8%) (P<0.001). Cigarette smoking was most prevalent among students aged 18–24 years (48.9%), followed by those under 18 (46.9%). Conversely, waterpipe smoking was highest among students under 18 (53.1%) (P<0.05). Waterpipe smoking was highest among nursing students (60.9%), cigarette smoking was highest among laboratory students (100.0%), and combined cigarette and waterpipe smoking was most prevalent among commerce students (48.2%) (P<0.001).

With regard to school-year levels, Cigarette smoking was highest among second-year students (69.6%), waterpipe smoking among first-year students (48.5%), and both cigarette and waterpipe smoking among fourth-year students (100%), followed by third-year students (52.4%) (P<0.001). In general, cigarette smoking was higher among students who live in dormitories (58.5%) than those who live with their families (32.1%). Waterpipe smoking was higher among students who live with their families (52.7%) than those who live in dormitories (9.8%). Smoking of both cigarettes and waterpipes was higher among students who live in dormitories (31.7%) than those who live with their families (15.2%) (*P*<0.001).

Cigarette and waterpipe smoking were more common among students from high-income families (54.5% and 45.5% respectively). However, smoking of both cigarettes and waterpipes was higher among students from average-income families (37.7%) (*P*<0.001). Cigarette and waterpipe smoking were more prevalent among students from rural areas (59.6% and 40.4%, respectively) compared to urban students (38.1% and 32.7%). Overall, cigarette smoking (43.3%), exceeded waterpipe smoking (34.5%) among students in both areas (P<0.001) (Table 4).

Factors	Smoking types			Total No (%)	$\chi 2$-test/ Fisher's exact test	*P*-value
	Cigarette Smokers No (%)	Waterpipe Smokers No (%)	Cigarette+ Waterpipe Smokers No (%)			
Gender						
Male	71(61.7)	5(4.3)	40(34.5)	116(59.8)	117.44	<0.001**
Female	13(16.7)	62(79.5)	3(3.8)	78(40.2)		
Age						
<18years	15(46.9)	17(53.1)	0(0.0)	32(16.5)	17.035	0.002*
18-24years	44(48.9)	27(30.0)	19(21.1)	90(46.4)		
Over 24years	25(34.7)	23(31.9)	24(33.3)	72(37.1)		
Marital status						
Married	52(39.4)	45(34.1)	35(26.5)	132(68.0)	5.005	0.082
Single	32(51.6)	22(35.5)	8(12.9)	62(32.0)		
Department / College						
Nursing	9(39.1)	14(60.9)	0(0.0)	23(11.7)	-	<0.001**
Laboratory	14(100.0)	0(0.0)	0(0.0)	14(7.2)		
Assistant Doctor	5(50.0)	5(50.0)	0(0.0)	10(5.8)		
Commerce and Economic	19(33.9)	10(17.9)	27(48.2)	56(28.9)		
Engineering college	17(44.7)	11(28.9)	10(26.3)	38(19.6)		
Medicine and Health Sciences	20(37.7)	27(50.9)	6(11.3)	53(27.3)		
Study level						
First-year	45(43.7)	50(48.5)	8(7.8)	103(53.1)	129.143	<0.001**
Second-year	32(69.6)	14(30.4)	0(0.0)	46(23.7)		
Third-year	7(33.3)	3(14.3)	11(52.4)	21(10.8)		
Fourth year	0(0.0)	0(0.0)	24(100.0)	24(12.4)		
Residence						
With family	36(32.1)	59(52.7)	17(15.2)	112(57.7)	38.705	<0.001**
Dormitory	48(58.5)	8(9.8)	26(31.7)	82(42.3)		
Family income (per month)						
Low	52(42.6)	50(41.0)	20(16.4)	122(62.9)	16.706	<0.001**
Average	26(42.6)	12(19.7)	23(37.7)	61(31.4)		
High	6(54.5)	5(45.5)	0(0.0)	11(5.7)		
Area						
Urban area	56(38.1)	48(32.7)	43(29.3)	147(75.8)	-	<0.001**
Rural area	28(59.6)	19(40.4)	0(0.0)	47(24.2)		
Total	84(43.3)	67(34.5)	43(22.2)	194(100.0)		

Table 4 The influencing factors on smoking type among smokers (n=194)

***P value is highly statistically significant*

**P value is statistically significant*

5. Discussion

5.1General prevalence of smoking

A major global health concern, tobacco use is very common among young people in Arab nations like Yemen, especially among students' university. With a 94.4% response rate, reflecting strong student participation. Of the participants, 62.0% were male and 38.0% were female (Table 1).

This survey found that smoking was more common among students between the ages of 18 and 24 than in other Arab nations like Syria (11%) [10] and Jordan (17.2%) [11], as well as non-Arab nations like Cameroon (11.2%) [12], Iran (9.8%) [13], and India (20.2%) [14]. This high incidence could be explained by a combination of factors, including exposure to tobacco marketing, a lack of knowledge about the dangers of smoking, and smoking as a coping strategy for stress brought on by Yemen's economic difficulties and civil war. Disparities in smoking behaviors when compared to other populations may also be caused by cultural and socioeconomic variables.

5.2 Smoking behaviors and the factors influencing smoking

Of the 194 students that smoked in this study, 59.8% were male and 40.2% were female (Table 4). Compared to other Middle Eastern nations like Palestine (52.7% males vs. 16.5% females) [15], Saudi Arabia (32.7% vs. 5.9%) [16], Jordan (56.9% vs. 11.4%) [17], and Syria (26.1% vs. 9.5%) [18].

According to the survey, women smoked waterpipes at a substantially higher rate than men (79.5% vs. 4.3%). These results are in contrast to a study conducted in Jordan [19] and a study conducted in Egypt in 2012 that found that males smoked waterpipes at higher rates (49.0%) than females (16.3%) [20]. Similarly, a study conducted in Palestine found that a significant proportion of female students used waterpipes [21], while in Syria, female students smoked more cigarettes per day than male students [22]. This reflects the fact that cigarette smoking is being replaced by waterpipe use, which is considered as an aspect of a modern lifestyle or prestige among the youth of the Eastern Mediterranean region [23,24] (Table 4).

Moreover, Waterpipe smoking is often viewed as more socially acceptable for women than cigarette smoking in Arab cultures [25]. The increasing

prevalence of smoking, especially waterpipe smoking, among women in Arab countries has been widely investigated. A study in Egypt emphasized the urgent need to correct the misperception that waterpipe smoking is safer and less hazardous than cigarette smoking [26]. This may be attributed in the Yemeni culture, cigarette smoking is considered inappropriate for women, while waterpipe smoking is widely tolerated and integrated into social interactions like gatherings. This acceptance, coupled with increasing awareness and advocacy for gender equality, has led some educated Yemeni women to view waterpipe smoking as a right comparable to men's practices.

According to this study, smoking prevalence was significantly correlated with age, with students over 24 having the highest percentage (48.6%). Similar research indicates that as people become more independent, they may experience less pressure from their families [27,28]. In contrast, a study conducted in Tunisia found no age-related variation in the prevalence of smoking [29]. It is challenging to pinpoint the cause of this discrepancy, although it might be related to the various stressors that students encounter in their last year of college [11]. Which may be because different stresses or societal influences had different effects. Another factor could be increased exposure to smoking peers, instructors, and other university employees. These results imply that as students get older and attend college for longer periods of time, the prevalence of smoking may increase by age. The study revealed a significant increase in smoking prevalence correlated with academic year, indicating that senior students in their third and fourth years exhibit higher smoking rates compared to juniors (Table 2). This trend may result from prolonged exposure to smoking peers, faculty, and staff, influencing attitudes toward smoking. Targeted smoking cessation interventions are recommended for final-year students. Contrastingly, a 2006 study in Jordan reported a decline in smoking from the first year (33.3%) to the fourth year (3.7%), followed by an increase among final-year students [30].

In regard to marital status, Smoking prevalence was higher among single students (39.7%) compared to married students (21.9%) (Table 2), possibly due to greater psychological, social, and economic pressures or peer influence among single individuals, particularly those living in dormitories. Similar findings were obtained by studies in Japan and Albania [31,32].

Statistical analysis revealed that smoking prevalence was higher among students living in dormitories (33.2%) compared to those living with their families (21.8%) (Table 2). This agreement with finding of a similar study in Syria [18] and the U.S. [33], where students residing with their families were less likely to smoke. The difference may be attributed to reduced social and psychological stress and less peer pressure among students living with their families, as highlighted in previous studies on medical students [31,32].

The study found a significantly higher smoking prevalence among medical students (44.2%) compared to those in other colleges (Table 2). This contrasts with findings previous study from Syria, where smoking was more common among non-health-related students (27.8%) than medical students (14.5%) [34], and similar studies in Spain (32.5%) [35] and Saudi Arabia (19.2%) [36]. Globally, smoking prevalence among medical students varies, with rates of 25% in Germany, 0.7% in Hong Kong, 28.6% in Jordan, 20% in the U.S., 22% in Turkey, and 16.5% in Brazil [37-38], may be reason for the higher smoking rates among medical students is the intense academic pressure and stress they face, coupled with the misconception that smoking helps alleviate tension. High smoking rates among medical students are concerning as they are expected to lead smoking prevention efforts.

The study revealed a high prevalence of waterpipe smoking among nursing students (60.9%), significantly higher than rates reported in similar studies, such as 18% in Denmark [32] and 1% in Uganda, where only third-year nursing students were sampled [39]. In Italy, smoking prevalence among nursing students was also high, reported at 43% and 51% in 2000 and 2001, respectively [40,41]. The current study found a significant association between smoking status and college affiliation ($P<0.001$) (Table 4).

The study found that smoking prevalence increased with university tenure, with senior students (third and fourth years) showing higher rates than juniors (27.6% and 100.0%, respectively). Fourth-year students exhibited more favorable attitudes toward smoking compared to first-year students, and those over 24 years old in their second or fourth years demonstrated

more favorable behaviors toward smoking (P<0.001) (Table 2). Older students frequently interact with smokers in the university environment, which may influence their attitudes and increase their vulnerability to smoking. Additionally, reduced family pressure against smoking as students gain independence contributes to this behavior. Targeted smoking cessation interventions are essential for students in their final university years.

The study found that smoking prevalence was significantly affected by family income, with higher rates among students from low-income families (29.0%) compared to those from average- (25.1%) and high-income families (11.3%) (P<0.05) (Table 2). Low family income emerged as a risk factor and significant predictor of smoking, associated with more favorable attitudes toward smoking (P<0.05). This finding aligns with the World Health Survey, which reported that the poorest men were over 2.5 times more likely to smoke than the wealthiest men in several countries [42]. This may be due to students from lower socioeconomic backgrounds experiencing more physical, psychosocial, and emotional challenges.

The study found a higher overall smoking prevalence in urban students (38.7%) compared to rural students (12.4%) (Table 2). Additionally, rural students had a higher prevalence of cigarette (59.6%) and waterpipe smoking (40.4%) compared to urban students (38.1% and 32.7%, respectively) (Table 4). Linear regression analysis showed that smoking in both urban and rural areas was a significant predictor of favorable attitudes and beliefs toward smoking (P<0.05). The smoking prevalence in this study was consistent with a previous study on rural students in Yemen [43]. Variations in smoking prevalence between students from urban and rural areas were linked to sociocultural factors, including women's participation in the labor market, religion, gender equality, and cultural beliefs and behaviors toward smoking.

5.3 Strengths and Limitations of the Study

This study provides valuable insights into the prevalence among university students in urban and rural areas of Yemen, making it the first of its kind in these regions. It highlights associated factors and offers a basis for future research. However, limitations include potential reporting bias, restricted

generalizability due to the focus on two provinces during the civil war, and the exclusion of smoking effects in urban and rural areas.

Conclusions

The study found a higher smoking prevalence among Yemeni university students compared to previous rates, with females predominantly using waterpipes and males smoking cigarettes. Smoking was significantly associated with gender, residence, marital status, age, income, and academic department. The findings emphasize the urgent need for anti-smoking programs in universities to prevent initiation and support cessation. Comprehensive smoking cessation initiatives and awareness campaigns in educational institutions are essential to curb the rising tobacco use among students.

Acknowledgements

First, we would like to thank the almighty God for making everything possible. We would like to thank the School of Medicine and Health Management of Huazhong University, China. We also thank the Health Service Management and Hospitals, Gulf Colleges, Saudi Arabia, which supported this work. We express our sincere gratitude to all my friends for directing and supporting this research.

Author Contribution Statement

AMAN, solely designed the study, analyzed the data, and drafted the manuscript. He also provided sponsorship for the manuscript and contributed to the study design and data interpretation. All aspects of the manuscript, including revisions and the final version, were completed independently.

Conflicts of interest

The author declares no conflicts of interest related to this work. This work is part of an approved doctoral thesis submitted to Tonji Medical College in partial fulfilment of the requirements for the Ph.D. degree in Health Management.

Availability of Data

Data sets generated or analysed in this study are available from the relevant author upon reasonable request.

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