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Extent of Awareness, Prevalence and Associated Factors on Cigarette Smoking among Adolescents in Riyadh Schools: A Descriptive Study

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A B S T R A C T

Background: Tobacco use remains one of the leading preventable causes of morbidity and mortality worldwide, claiming over 8 million lives each year (WHO, 2023). Among these figures, a growing concern is the increasing prevalence of cigarette smoking among adolescents, a trend that poses significant public health risks. Adolescents are particularly vulnerable to the harmful effects of smoking, not only due to the physiological impact during a critical developmental period, but also because early exposure often leads to long-term nicotine dependence and other health complications.

Methods: A descriptive correlational research design was conducted among 283 adolescents from Riyadh International Schools using a validated questionnaire measuring extent of awareness, prevalence and its associated factors. The instrument demonstrated good reliability (Cronbach's α=0.788). Data were analyzed via SPSS v23, employing descriptive statistics and Pearson product moment correlation coefficient (r), Spearman r, one way of ANOVA (F) test and Point-Biserial r pb were used to analyze the correlation and differences between variables ($p \leqslant 0.05$).

Results: The adolescents perceived a great extent of awareness on the basic meaning of smoking and common diseases like lung cancer, COPD, and stroke. The Policies like smoking bans in schools and hospitals are well known (means > 3.77) among the adolescents. The methods of cessation like nicotine therapy (mean=3.696) and diversion techniques (mean=3.410) are also highly recognized. Smoking awareness demonstrates an upward trend with advancing age and academic progression ($F = 6.386$, $p = 0.005 < 0.05$), whereas no statistically significant ethnic disparities in awareness were identified.

Conclusion: The adolescents have a great extent of awareness regarding cigarette smoking. There is substantial gaps show limited awareness that smoking is associated with neurological damage or diseases beyond the respiratory system. While policies exist to control smoking in public spaces and restrict access, adolescents are not fully informed of these laws. Awareness of specific policies, especially about advertising restrictions and sales prohibitions, is relatively low. Adolescents are less aware of the presence and risks of alternative nicotine products, such as e-cigarettes and smokeless tobacco.

Keywords: Adolescents, associated factors, awareness, cigarette smoking, prevalence, knowledge, Riyadh Schools, Saudi Arabia

1. Introduction

Cigarette smoking is one of the major causes of preventable disease and mortality around the world (WHO, 2021). Tobaccotactics.org (2021) revealed that most of cigarette smoking increased in underdeveloped countries. In 2020, the prevalence of cigarette smoking in Saudi Arabia was 14.30%. This was an increasing trend with 0.1% increase from 2019. The most recent demographic surveys in Saudi Arabia suggest that prevalence among male was 23.7% and 1.5% for female. Alasqah et.al.,(2019) cited that the progressive rate of smokers among Saudi adolescents was increasing and that World Health Organization approximates that adolescents smokes' could be 38% for males and 2% among females by the year 2025.

Furthermore, the WHO identifies that adolescent periods in the age group 10 to 19 years as the considerable risk to unwanted behaviors such as cigarette smoking which is one of the leading cause of preventable death affecting 250 million children and adolescents in developing countries due to tobacco consumption (Moonajilin et al., 2021). Considering the number of population, adolescents need to understand the harmful effects of smoking from severity of respiratory illness to a potential exacerbation of the lung function. The prevention should start at the school level in order to improve health outcomes. Research has shown that tobacco use has harmful effects nearly every organ of the human body (CDC, 2020).

Nurses play an important role as part of the primary prevention to raise the issue of smoking cessation to adolescents. Determining the associated factors can provide a perspective on the challenges the teenagers are facing. Anan (2022,p119) recommended on their study the need for periodic assessment among adolescents about their risk. Jebunnahar (2019) emphasized the awareness on smoking effects among secondary schools. With the current prevalence rate of adolescents' smokers which progressively intense, this provoked the researchers to focus on the extent of awareness about cigarette

smoking among adolescents to help policy makers develop school health programs' area of concentration. Providing smoking awareness for teenage school students enhance behavior and information. However, there is a need to investigate the current trends since this study carried out 10-19 years old adolescents. No prior studies focus on extent of awareness among international schools. Hence, the present descriptive study investigates extent of awareness, prevalence and associated risk among adolescents sample. Cigarette smoking is one of the major causes of preventable disease and mortality around the world (WHO, 2021). Tobaccotactics.org (2021) revealed that most of cigarette smoking increased in underdeveloped countries. In 2020, the prevalence of cigarette smoking in Saudi Arabia was 14.30%. This was an increasing trend with 0.1% increase from 2019. The most recent demographic surveys in Saudi Arabia suggest that prevalence among male was 23.7% and 1.5% for female. Alasqah et.al.,(2019) cited that the progressive rate of smokers among Saudi adolescents was increasing and that World Health Organization approximates that adolescents smokes' could be 38% for males and 2% among females by the year 2025.

Research Objectives

This study aims to evaluate the extent of awareness, prevalence and associated factors on cigarette smoking among adolescents in Riyadh Schools. Specifically, it sought to answer the following objectives:

1. Identify the demographic characteristics of the adolescents in terms of

a. Age

b. Years of Education

c. Ethnicity

d. Have your ever smoked

e. Smoked in the last 3 days

f. Smoking status

2. Assess the prevalence of cigarette smoking based on the characteristics of the smokers and associated factors on cigarette smoking

3. Examine the adolescents' extent of awareness towards cigarette smoking in terms of

a. Meaning

b. Effects on health

c. Policy on tobacco used

d. Ways to stop smoking

Hypotheses

H_1: There is no significant difference on the level of awareness on cigarette smoking as to demographic characteristics

H_2: There is no significant correlation between smoking associated factors and awareness on cigarette smoking

2. Research Methodology

Study design

This study employed quantitative descriptive-correlational research design. As a descriptive research, it will determine the extent of awareness, prevalence and associated factors on cigarette smoking among adolescents. This study will also ascertain the correlation between variables.

Data Collection Methods

The content of this study was confined to the extent of awareness, prevalence and associated factors on cigarette smoking among adolescents. A self-constructed questionnaire was designed that served as the research instrument to answer the objectives of the study. The instrument is divided into four (4) parts. The first part is on the demographic characteristics of the respondents. The next is the characteristics of the smokers and the factors associated with cigarette smoking. The last part is the extent of awareness on cigarette smoking. A 4 point Likert scale as: (4) Great extent; (3) Moderate extent; (2) Fair extent; (1) Less extent was utilized on this study. For content validation, the questionnaire was submitted to experts for scrutiny of the contents. The researchers follow the suggestions and recommendation of the experts. Then, a pilot testing was conducted using 10 adolescents which are not part of the actual study participants. The calculated Cronbach alpha equals to 0.788 which was described as accepted.

Sample Characteristics

The study population of this research focus on the adolescents studying in the international schools in Riyadh City. Considering the margin error of 5%, the sample size was calculated using the Slovin's Formula with 285 adolescents in view of the 5 international schools in Riyadh. In the choice of actual participants, stratified random sampling technique was used. This sampling technique is appropriate because a group was formed based on the adolescents' characteristics. The following eligibility criteria were used. Inclusion criteria includes: male adolescents age ranging from 10-19 years old; currently studying in high school; of any nationality or ethnicity. The exclusion criteria includes: incomplete response to the questionnaire and unwilling to participate during the conduct of the study.

Survey Administration

Once the approval in the conduct of the study was secured, the administration of the data gathering tool was implemented. The permission letter was given to 5 schools in Riyadh using an online tool Google link. This was conducted for a period of approximately 60 days. To prevent the multiple participation of the respondents, the collection of email registry and allowing only one attempt was implemented.

Study Preparation

The researchers will make sure that all approval were secured at hand before the conducting the research. The researchers will attend first a debriefing session with their research supervisor before the survey starts.

Ethical consideration

Ethical approval from the Institutional Review Board of Riyadh Elm University will be taken. Through permission letter and personal visit, approval from five international schools was secured. Consent for the respondents allows the willingness of the adolescents to participate on the study. With permission granted, it allows the researchers to administer the questionnaire to the study participants.

Statistical analysis

The statistical application was employed to analyse the data. The frequency and percentage was used to the demographic profile of the respondents, prevalence, characteristics of the smokers and the factors associated with cigarette smoking; weighted arithmetic mean and standard deviation was utilized in determining the extent of awareness on cigarette smoking; Pearson product moment correlation coefficient (r), Spearman *r*, one way of ANOVA (F) test and Point-Biserial r_{pb} were used to analyse the correlation and differences between variables. A significant level of $p < 0.05$ was considered as a statistical significance.

3 Results and Discussion

Table 1. Demographic characteristics of the adolescents (n=283)

Variables	**N**	**%**	**Variable**	**N**	**%**
Age			***Have you ever smoked***		
10-13 years old	47	17	Yes	77	27
14-16 years old	166	59	No	206	73
17-19 years old	70	24	***Smoked in the last 30 days***		
Years of Education			Yes	65	23
Grade 7	47	17	No	218	77
Grade 8	39	14	***Smoking status***		
Grade 9	26	9	Non smoker	224	79
Grade 10	101	36	Regular smoker	45	16
Grade 11	46	36	Occasional smoker	14	5
Grade 12	24	8			
Ethnicity					
Saudi	257	91			
Non-Saudi	26	9			

Table 1 shows the demographic profile of 283 adolescents. Based on the table, the largest numbers of respondents belong to the age group of 14 to 16 years or 166 of the total sample. On the cross-sectional study of Al Zalabani & Kasim (2015), they utilized 3,322 adolescents with age ranging from 11–19-year-old students in Madinah who had 15.17% prevalence of smoking cigarettes which is similar to the results of this study wherein ever tried garnered

27% and current smoking 23%. Among those by smoking status, 79% were non-smokers, 16% were regular smokers, and 5% were occasional smokers. Meanwhile, from the educational level, the largest group belongs to Grade 10 (36%), followed by lower numbers representing Grade 7 (17%), and least is Grade 9 (9%). In terms of ethnicity, most of the participants were Saudi nationals (91%), and 9% were non-Saudi. For their smoking habit, 27% had attempted smoking at least once, and 23% had smoked in the past 30 days. Similarly, in a systematic review conducted by Al-Hazzaa et al. (2018), the prevalence of tobacco smoking among Saudi adolescents was 2.4% to 39.6% in various regions and studies. The review also highlighted strong correlations with peer and family influences to support evidence on experimentation and prevalence of current smoking. These findings indicate that although a good percentage of the adolescent population has tried smoking, most still consider themselves non-smokers.

Table 2. Prevalence of smokers among adolescents based on characteristics

Variables	**Number of smokers (n=45)**	**Prevalence of smokers (%)**
Cigarette used per day		
1-2 sticks per day	10	22
10 sticks per day	27	6
1 pack per day	8	18
Place of smoking		
public places	7	16
school	9	2
in the house/in the car	26	58
Anywhere	3	7
Time of doing smoking		
after mealtime	24	53
before mealtime	3	6
before sleeping	6	13
before using bathroom	1	3
anytime	11	24

****The number of smokers is from the total populations of 283.***

Table 2 presents the prevalence of smokers among adolescents based on characteristics. It can be seen on the results the smoking habits among 45 adolescents' smokers who made up 16% of the overall sample of 283. Out of those who smoked, the most common reported number of sticks to consume per day was 10 (27 teens), while this group only accounted for 6% prevalence when viewed in terms of the total sample. In comparison, 10 and 8 adolescents reported smoking 1–2 sticks daily and one pack daily with prevalence of 22% and 18% respectively. Consequently, cigarette smoking continues to be a major public health concern, particularly among adolescents and young adults. One of the key indicators used to assess smoking behavior is the number of cigarettes (sticks) smoked per day (CPD). This parameter not only reflects the intensity of smoking but is also significantly associated with the risk of developing various health conditions (Nielsen et al., 2020). In a study conducted in Northern Saudi Arabia, a cross-sectional survey among 305 adolescents aged 11 to 19 revealed that 27% of current smokers reported smoking 1–3 sticks per day, 56% smoked between 4–10 sticks per day, and 17% smoked more than 11 sticks daily (Alzahrani et al., 2016). These findings indicate that low to moderate cigarette consumption is the most prevalent pattern among adolescents, with peer pressure and environmental factors playing critical roles in influencing smoking frequency. Jha et al. (2013) analysis revealed that even individuals smoking fewer than 10 sticks per day had significantly elevated risks of lung cancer, heart disease, and early mortality, underscoring the fact that no level of smoking is safe.

On the other hand, for the place where smoking occurred, the majority of the settings were at home or in a vehicle garnering a 58% or 26 of the total number of smokers. The physical environment in which adolescents engage in smoking behavior plays a crucial role in reinforcing or mitigating tobacco use. While many nations have implemented restrictions on public smoking, studies have shown that adolescents often smoke in private and less regulated spaces such as homes, vehicles, and school premises. These settings not only facilitate access to cigarettes but also provide a sense of social comfort and reduced risk of detection. In the United States, the Youth Risk Behavior Surveillance System (YRBSS) identified that a substantial proportion of high school students engage in smoking within school properties, private vehicles, and homes. That report noted that approximately 14% of teen smokers had smoked on school property (Underwood et.al., 2019). In Australia, the National Drug Strategy Household Survey (NDSHS) reported that adolescents often smoke in private vehicles, particularly when traveling with peers. The confined nature of vehicles presents not only a health risk due to secondhand smoke exposure but also reinforces peer-based smoking culture. These findings have led to legislative changes, such as banning smoking in cars with minors present (Australian Institute of Health and Welfare, 2019). Similarly, the Canada's Canadian Tobacco, Alcohol and Drugs Survey (CTADS) study

have shown that youth exposure to tobacco often occurs within familial environments. They found that adolescents with at least one smoking parent or sibling are more likely to smoke in cars or at home. These environments become recurring points of access and reinforcement, leading to habitual smoking patterns (Health Canada, 2019).

In terms of timing of smoking, over half (53%) of young smokers indicated having ever smoked after eating, while others smoked anytime (24%), before bedtime (13%), before eating (6%), or before going to the bathroom (3%). This means that after mealtime is the time where smokers frequently smoke. Cigarette smoking behavior is influenced not only by psychosocial and environmental factors but also by specific moments in daily routines. One commonly observed pattern among habitual smokers is the tendency to smoke immediately after eating—a behavior rooted in both physiological feedback and psychological reinforcement. Pharmacokinetics likely plays a role in the timing of smoking. Research in Clinical Pharmacology & Therapeutics showed that high-protein meals can boost liver blood flow, leading to an approximately 18% drop in blood nicotine. This temporary reduction might prompt smoking after meals as a way to restore desired nicotine levels (Benowitz et.al., 2009). Cultural and behavioral contexts further shape this habit. Yu et al. (2021), in a Chinese observational study, found that individuals who engaged in mentally demanding activities after dinner smoked significantly more cigarettes per day compared to those who did not. This association underscores the role of evening routines and cognitive triggers in escalating tobacco use. The ritual of smoking after meals is a common observation, with media and qualitative research noting its role as a symbolic act of closure that reinforces both addiction and cultural identity (India Today, 2024). Collectively, these findings suggest that postprandial smoking is driven by a bio psychosocial mechanism: physiologically, nicotine impacts digestion and metabolism; behaviorally, dinner-related routines trigger cravings; and emotionally, smoking provides a sense of satisfaction and completion.

Table 3. Prevalence of smokers based on associated factors on cigarette smoking (n=283)

Associated Factors	**Number of adolescents (n)**	**Number of smokers (n)**	**Prevalence of smokers (%)**	**Crude Odd Ratio (OR)**	**Standard Error (SE)**	**95% CI for AOR**
Parental smoking						
Yes	148	23	52.29%			
No	135	22	47.7%	**0.95**	**0.325**	**0.50 -1.79**
Roommates are smokers						
Yes	158	24	55.83%			
No	125	21	44.16%	**0.89**	**0.326**	**0.47-1.68**
Friends are smokers						
Yes	67	19	28.67%			
No	216	26	76.32%	**2.89**	**0.342**	**1.48-5.66**
Have knowledge on harmful effects of smoking						
Yes	249	36	87.98%			
No	34	9	3.18%	**2.13**	**0.428**	**0.92-4.93**
Parental marriage status						
Married	225	29	35. 00%			
Separated Divorce	40	14	12.89%			
Widow	18	3	6.36%	**3.64**	**0.387**	**1.71-7.76**
Number of siblings						
Only child	39	11	13.78%			
With brother or sister	244	34	86.21%	**2.43**	**0.401**	**1.11-5.32**
Overall	**n = 283**	**45**	**16%**			

The table above illustrates the prevalence of cigarette smoking among 283 adolescents in relation to a number of associated factors. Based on the results, 16% of adolescents surveyed were classified as current smokers. Among the independent variables assessed, the presence of smoking peers demonstrated

the most significant and strongest association with adolescent smoking behavior. Specifically, 28.36% of the adolescents reported that their friends smoked. Statistical analysis showed that those with smoker friends were 2.89 times more likely to smoke compared to those without smoker friends (crude OR = 2.89; 95% CI: 1.48–5.66), indicating a robust and statistically significant relationship. Correspondingly, these findings emphasized the influence of peers in adolescent smoking uptake. A meta-analysis conducted examining 19 studies across Ethiopia reported that peer pressure was associated with a pooled odds ratio of 2.68 (95% CI: 2.37–3.03) for current smoking among students, closely aligning with the present study's results (Alemayehu et al., 2022). This means that adolescents with smoker friends are nearly three times more likely to engage in smoking behaviors than their counterparts without such influences.

Also, a cross-sectional study investigating smoking behavior using the Social Cognitive Theory framework, found that the presence of smoker peers significantly predicted both experimental and regular smoking among adolescents (Xie et al., 2023). In that study, students who observed their peers smoking were far more likely to view smoking as socially acceptable and were more prone to try cigarettes themselves. Additionally, a longitudinal study among Chinese junior high school students (n = 854) demonstrated that peer networks were central predictors of smoking initiation. Adolescents embedded in social circles with smoking peers were more likely to begin smoking and maintain the habit over time (Zhang et al., 2023). These findings align with Social Learning Theory, specifically Albert Bandura's (1977) work. The theory proposes that individuals learn behaviors by observing and imitating others, particularly those within their immediate social circles. Consequently, when adolescents see smoking as a common or accepted behavior among their peers, they are more inclined to start smoking themselves to gain social acceptance and establish their group identity.

Meanwhile, parental marital status was also found to be significantly related, with separated or divorced parents having an adolescent smoking prevalence of 12.89% and an OR of 3.64 (95% CI: 1.71–7.76), implying an increased risk in comparison to those who were married. Although the results are low number compared with married, it was significant for separated and divorced. For instance, Rached et al. (2022) study found that adolescents from divorced families reported higher nicotine dependence scores. Importantly, the relationship between parental separation and adolescent smoking persisted even after controlling for psychological distress and peer influences, suggesting an independent effect of family structure on smoking behavior. Jabbour et al. (2020) similarly highlighted that parental separation was significantly associated with increased substance use, including cigarette smoking, among adolescents. The study emphasized that diminished parental supervision, emotional distress, and family instability contributed to higher smoking rates in adolescents from disrupted households. Moreover, a systematic review and meta-analysis by Amiri et al. (2021), synthesizing data from multiple observational studies, concluded that adolescents from divorced or separated families had a 45% higher likelihood of initiating or continuing smoking compared to those from intact families.

Table 4. Level of Awareness on cigarette smoking as perceived by adolescents (n=283)

Items	***4***	***3***	***2***	***1***	***Awareness Mean Score***	***Qualitative Description***
Meaning						
Cigarette smoking is an act of inhaling and exhaling fumes from burning plant material	198	82	3	0	3.689	**Highly Aware**
Cigarette contains stimulant drug called nicotine that poses health hazard	206	71	4	2	3.700	**Highly Aware**
Effects on health						
Chronic Obstructive Pulmonary Disease	269	10	3	1	3.933	**Highly Aware**
Oral Cancer	167	109	4	3	3.554	**Highly Aware**
Lung Cancer	215	66	1	1	3.749	**Highly Aware**
Increased blood pressure	117	135	28	3	3.293	**Highly Aware**
Seizure	83	172	26	2	3.187	**Aware**
Brain tumor	36	71	174	2	2.498	**Less Aware**
Stroke	87	188	5	3	3.269	**Highly Aware**
Policy on tobacco used						
Prohibited inside the hospital	219	64	0	0	3.774	**Highly Aware**
Prohibition in the school premises	255	28	0	0	3.901	**Highly Aware**
Punishment for smoking in public areas	107	82	73	21	2.972	**Aware**
Prohibits the sale of tobacco products in vending machine	58	192	31	2	3. 081	**Aware**

Prohibits the sale in public transport	42	181	53	7	2.912	**Aware**
Prohibition of advertisement, and promotions	102	144	37	0	3.230	**Aware**
Ways to stop smoking						
Use diversional activities e.g., yoga, meditation,	119	162	1	1	3.410	**Highly Aware**
Use nicotine substituting therapy e.g., chewing gums	201	79	2	1	3.696	**Highly Aware**
Use of electronic cigarette	34	66	179	4	2.459	**Less Aware**
Use other tobacco products	50	51	139	43	2.382	**Less Aware**
Professional consultation	42	232	5	4	3.102	**Aware**

Legend: *4.0-3.26 Great extent, 3.25-2.51Moderate extent, 2.5-1.76 Fair extent, 1.75-1.00 Less extent*

Table 4 presents the level of awareness of adolescents regarding various aspects of cigarette smoking, including its meaning, health effects, policies on tobacco use, and ways to stop smoking. Table 4 indicates that teens have a high level of awareness concerning cigarette smoking, specifically in identifying its meaning and the impact on health. The majority of the respondents were very aware that cigarette smoking entails breathing fumes from burning plant material and that the substance includes nicotine, which is a dangerous stimulant. This means that a strong foundational understanding of cigarette smoking among the majority of respondents. This relates with the study of El-Amin et al. (2022) with finding that 97–98% acknowledged that traditional cigarettes are harmful to health, and only a small minority were unaware of nicotine's addictiveness among 7,578 Finnish adolescents (ages 12–18). This aligns with the present findings, indicating that basic knowledge about smoking and nicotine is near universal in this age group. Similarly, the study of Alenazi et.al.,(2023) using a 400 male high school students reported that over 70% were aware of the harmful effects of smoking, alcohol, and drugs. This further supports the idea that adolescents in varied cultural contexts have strong knowledge of smoking's core risks. For Vaihekoski et al. (2023) systematic review, they found that pictorial warning labels and school-based programs significantly increased basic awareness and understanding of cigarette smoking among adolescents making such educational efforts reinforce the foundational awareness observed in this study.

The present study reveals a nuanced pattern in adolescents' awareness of smoking-related health risks in increased blood pressure (Mean score=3.293, Highly Aware), Seizure (Mean score = 3.187, Aware), Brain tumor (Mean =2.498, Less Aware).These findings suggest that while adolescents recognize mainstream cardiovascular risks, such as hypertension, awareness declines when considering neurological conditions like seizures and brain tumors. This results agreed with the study of Park et.al.,(2024) which link smoking to hypertension. Their study is using urine cotinine to verify exposure found that actively smoking teens had three times greater odds of elevated blood pressure (OR = 3.00; 95% CI: 1.14–7.89) compared to non-smokers. This empirical confirmation validates the adolescents' strong perception of smoking's cardiovascular risks in our study. On the other hand, the notably lower mean for brain tumors (2.498, Less Aware) indicates a knowledge gap regarding rare smoking-related cancers. For McDonald et.al.,(2023) studies on adolescent cancer awareness found strong recognition of lung cancer but poor identification of less common forms, including brain tumors. This mirrors the present findings, where focal awareness of well-publicized harms contrasts with obscurity around rarer outcomes. It suggests that general health education may underemphasize the full spectrum of carcinogenic consequences.

On the ways to smoking cessation it was found that nicotine substituting therapy (mean=3.696) and diversional activities (mean=3.40). These methods are categorized as "Highly Aware", indicating they are well-known among the population surveyed. The data suggests that traditional and healthier methods like therapy and lifestyle changes are better known and preferred over alternatives like e-cigarettes or using other tobacco products. There's also a need to improve awareness about professional consultation as a quitting strategy. According to WHO (2021), smoking cessation remains a critical global health objective, as tobacco use is a leading cause of preventable disease and premature death. Over the years, multiple strategies have been employed to assist individuals in quitting smoking, each varying in popularity, accessibility, and perceived effectiveness. The present study aligns with existing literature that categorizes these methods based on public awareness and usage trends. Furthermore, diversional activities such as yoga, meditation, and physical exercise are considered non-pharmacological methods that support smoking cessation by reducing withdrawal symptoms and stress levels (Ussher, Taylor, & Faulkner, 2014). These activities promote emotional regulation and psychological well-being, making them favorable among individuals seeking holistic approaches. The findings of the current study relates with Zhong et al. (2024) where findings revealed that although most physicians would recommend Nicotine Replacement Therapy (NRT), only a minority considered e-cigarettes an effective smoking cessation tool—71.6 % not endorsing them. The study highlights a knowledge gap and emphasizes the need for specialized smoking cessation counseling training for GPs. Lastly, health professionals play a crucial role in promoting smoking cessation through counseling and medication prescription (Fiore et al., 2008). However, awareness of professional help as a viable quitting method remains moderate. This gap in awareness may stem from inadequate communication or access barriers in clinical settings. A study by Rigotti et al. (2012) emphasized that combining professional advice with pharmacotherapy significantly improves cessation outcomes, yet public understanding and utilization remain suboptimal.

Table 5. Significant Difference on Awareness Level on cigarette smoking across demographic characteristics

Variables	**Level of Awareness (mean/SD)**	**F-value***	**p-value**	**Significance level**	***Results***	**Interpretation**
Age						
10-13 yrs old	2. 561/0.884	2.50	0.021	0.05	Reject the null hypothesis **(H_1)**	Statistically significant
14-16 yrs old	3. 137/0.738					
17-19 yrs old	3. 284/0.662					
Year Level						
Grade 7	2.563/0.871	6.386	0.005	0.05	Reject the null hypothesis **(H_1)**	Statistically significant
Grade 8	3.322/0.884					
Grade 9	3.440/0.755					
Grade 10	3.684/0.412					
Grade 11	3.641/0.315					
Grade 12	3. 638/0.354					
Ethnicity						
Saudi	3. 514/0.478	3. 073	0.276	0.05	Accept the null hypothesis **(H_1)**	Not Statistically significant
Non Saudi	3. 227/0.662					

**One way Analysis of Variance (ANOVA) statistically significant at p-value < 0.05*

The table 5 presents the difference on awareness level on cigarette smoking across demographic characteristics. It can be seen that students aged 10–13 show significantly lower awareness ($M = 2.56$, $SD = 0.884$) compared to older peers aged 14–16 ($M = 3.14$, $SD = 0.738$) and 17–19 ($M = 3.28$, $SD = 0.662$). ANOVA confirms this difference is statistically significant ($F = 2.50$, $p = 0.021 < 0.05$), meaning awareness increases with age. Based on the results, the older age/higher grade consistently associates with higher awareness. It was revealed that there is a statistically significant difference in awareness levels about cigarette smoking across age and grade/year level. This agreed with Avila et.al.,(2022) studies which found that older adolescents and higher grade students consistently reported greater awareness of tobacco harms, with school-based programs more effective for older teens. Alhyas et.al.,(2015) research noted that varying level of awareness across all age groups which are consistent with participants' age and school year. In contrast, Mohaissen et.al., (2024) study on adolescent cardiovascular awareness showed that increasing age correlated with improved knowledge, though differences were modest.

Evidently, there is a clear upward trend in awareness from Grade 7 ($M = 2.56$) through Grade 12 ($M = 3.64$). The ANOVA ($F = 6.386$, $p = 0.005 < 0.05$) indicates that this rise by academic year is statistically significant. The researchers observed that, on average, students' awareness scores increased consistently from Grade 7 to Grade 12. Because the p-value (0.005) is very small and less than the conventional significance level of 0.05, the researchers can confidently conclude that the observed upward trend in awareness across academic years is not due to random chance but represents a statistically significant and real increase in awareness as students' progress through high school. Therefore, you can be reasonably sure that students genuinely become more aware as they advance from Grade 7 to Grade 12. Shubayr et.al.,(2024) study revealed that knowledge about e-cigarettes increases with age and academic progression, mirroring the current study results that older students have higher awareness.

Meanwhile, the current study found that there is no significant difference by ethnicity which echoes broader findings that such demographic factors are less. It can be observed that although Saudis have a slightly higher mean score (3.514 vs 3.227), the difference is not statistically significant ($F = 3.073$, $p = 0.276 > 0.05$), meaning nationality did not significantly affect awareness. The findings suggest that the level of awareness between ethnicity do not differ significantly. Soulakova et.al., (2016) study which focus on tracking ethnic differences in smoking susceptibility showed variation by race and age. Also, an analysis of quitting intentions revealed that demographics beyond ethnicity (e.g., doctor's advice, tobacco dependence) were stronger predictors than race alone. They concluded that although a smoker's intention to quit may not necessarily lead to immediate smoking cessation, the lack of intention may drastically delay smoking cessation. The study highlights the importance of accounting for racial/ethnic disparities when designing and implementing interventions to motivate smokers to quit and aid smoking cessation. These findings align with your data (ethnicity) alone did not significantly affect awareness in your sample.

Table 6. Correlation between Smoking Associated Factors and Awareness on Cigarette Smoking

Smoking Associated Factors	**Type of Correlation**	**Correlation Coefficient**	**p-value**	**Significance level**	***Results***	**Interpretation**
Parental smoking	Pearson r	0.88	0.00	0.05	Statistically Significant	Strong positive correlation
Roommates are smokers	Pearson r	-0.53	0.00	0.05	Statistically Significant	Moderate negative correlation
Friends are smokers	Pearson r	0.85	0.00	0.05	Statistically Significant	Strong positive correlation
Have knowledge on harmful effects of smoking	Spearman *r*	0.792	0.00	0.05	Statistically Significant	Strong positive correlation
Parental Marriage status	Point-Biserial r_{pb}	0.034	0.00	0.05	Statistically Significant	Very weak correlation
Number of siblings	Spearman *r*	0.462	0.00	0.05	Statistically Significant	Moderate positive correlation

The table above shows the correlation between smoking associated factors and awareness on cigarette smoking. Based on the table, the parental smoking has a strong positive correlation with awareness level. This means that students with smoking parents tend to be more aware of cigarette smoking. Previous study of Subri et al. (2025) explored parental interventions for adolescents using e-cigarettes and identified challenges. It underscores the rising prevalence of e-cigarette use among Malaysian adolescents and emphasizes the importance of parental involvement in preventing adolescent e-cigarette use. The study highlights the need for education, policy interventions, and community participation, acknowledging the complexities parents face in addressing youth vaping. Likewise, studies have shown that adolescents whose parents smoke are more likely to be aware of cigarette smoking, often through direct exposure and family discussions which means that parental smoking was significantly associated with increased adolescent awareness, perception, and sometimes normalization of smoking (Alshahrani et al., 2023).

Meanwhile, the results also revealed a moderate negative correlation between roommates and awareness level which means that students with smoking roommates tend to have lower awareness. Faisal et al., (2024) research relates with peers and roommates strongly influence smoking behavior and awareness. They found that adolescents with smoking peers were more aware but also more at risk of smoking. Yet, parental marital status has a very weak correlation with awareness level among adolescents. This suggests that marital status has negligible effect on awareness. While statistically significant, the very weak correlation suggests this factor plays a negligible role in shaping awareness. This mirrors findings from global adolescent risk-behavior research that family structure had little impact on smoking awareness compared to direct exposure from smoking parents (UNICEF, 2023).

Finally, the number of siblings has moderately positive correlation to the level of awareness of adolescents to cigarette smoking. This means that larger families may have more exposure/discussion opportunities as compared to small families. Previous study found that students from larger families reported higher communication about health and more exposure to varied behaviours (both positive and negative). The increased number of siblings may promote health awareness due to shared learning or observations as noted by Alosaimi et al., (2023).

Limitations of the Study

While this study offers meaningful insights, it is not without limitations. Being descriptive in nature, it highlights associations rather than establishing causal relationships. Additionally, the reliance on self-reported data regarding smoking behaviours and awareness may introduce social desirability bias, potentially affecting the accuracy of responses. Moreover, since the research was conducted solely among students in high schools within Riyadh, its findings may not be fully generalizable to adolescents in other regions of Saudi Arabia or those outside the formal education system.

4. Conclusion

It is concluded that the prevalence rate on cigarette smoking among adolescents is 16 percent. The age and academic progression are strong predictors of smoking awareness, while ethnicity is not. This also highlights peer and familial factors in shaping adolescent awareness and behaviour. There is an upward trend in awareness across academic years is not due to random chance but represents a statistically significant and real increase in awareness as students' progress through high school. Parental smoking and friends who smoke were strongly positively correlated with students' awareness, reflecting the influence of social exposure. Parental, sibling, and peer smoking strongly influence youth awareness, attitudes, and behaviour. Roommates who smoke showed a moderate negative correlation with awareness, possibly due to normalized smoking behaviour. Parental marital status had no significant impact on smoking awareness. Overall, this study provides a timely and comprehensive assessment of adolescent cigarette smoking in Riyadh, highlighting the complex interplay of awareness, prevalence, and various associated factors. The findings underscore the urgent need for integrated,

culturally sensitive, and evidence-based interventions that address both individual-level knowledge and the powerful social, familial, and environmental influences shaping adolescent smoking behaviour.

Recommendations

Based on the study's findings, the following recommendations are proposed to enhance cigarette smoking awareness:

1. That an enhancement of the smoking education should be given to early grade levels. Educational materials should not only focus on commonly known health risks like lung cancer but also cover less familiar risks such as neurological effects (e.g., seizures, brain tumors) to broaden students' understanding of the dangers of smoking.

2. That a strengthening awareness campaigns on tobacco control policies should be implemented. School and community health programs should actively promote knowledge about these laws through posters, seminars, interactive activities, and collaboration with local health authorities to reinforce the legal consequences of tobacco use.

3. That a family-inclusive and peer-targeted intervention should be initiated. Schools can conduct parent-student workshops, and implement peer-led awareness programs to build a support network that discourages tobacco use and counters social normalization.

4. That an awareness campaign should address misconceptions about E-cigarettes and alternative products. The health campaign should prioritize clarifying the risks of these products, especially as their use is rising among youth.

5. That a further research study should be conducted to explore other influencing variables such as mental health status, academic performance, socioeconomic status, and exposure to online tobacco content. Longitudinal studies are also recommended to assess causality and behavioral changes over time.

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Author Contribution

All authors contributed to the study conception and design. Material reparation, data gathering and analysis were performed by all authors. All authors read and approved the final manuscript.

Conflict of interest

No authors of this paper have any conflicts of interest to declare.

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