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Knowledge and Beliefs of Oral Manifestations Related to Drug Abuse; A Study among Saudi and Kuwaiti Students

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Abstract: *This cross-sectional study aims to evaluate the knowledge and beliefs of Saudi and Kuwaiti dental students regarding oral manifestations associated with drug abuse. Drug abuse, including the use of methamphetamine, heroin, cocaine, and opioids, can cause severe oral health issues such as xerostomia, dental caries, periodontal disease, bruxism, and oral mucosal lesions. Prescription drugs can also contribute to oral health complications due to their impact on saliva production, increasing the risk of infections and caries. Previous studies indicate that dental students may have limited knowledge of drug-related oral health impacts, likely due to gaps in the curriculum and limited clinical experience with drug-dependent patients. In this study, 447 dental students from Saudi Arabia and Kuwait participated in a survey that assessed their knowledge of drug-related oral health issues, experiences with drug abuse cases, and perceived need for further education. Findings revealed significant differences between Saudi and Kuwaiti respondents in clinical exposure, with Saudi students more frequently treating patients with a history of drug abuse. Additionally, high rates of uncertainty were observed among respondents regarding the oral impacts of various drugs, with a majority expressing a desire for increased education on the topic. This study emphasizes the importance of incorporating comprehensive drug-abuse-related oral health education into the dental curriculum, enhancing future practitioners' ability to diagnose and manage substance-related oral health issues effectively.*

Keywords: *Drug abuse, Oral manifestations, Dental students, Perceptions*

INTRODUCTION

Persistent drug effects on the oral cavity depend on the type of drug in use and may result in xerostomia, dental caries, periodontal diseases, bruxism, and oral mucosal lesions [1]. Particularly, methamphetamine, heroin, and cocaine cause tooth decay, gingival recession, tooth enamel, and tissue necrosis, known as 'meth mouth' [2, 3].

Oral complications can also be blamed on abuse of prescription drugs like opioids and stimulants, as they interfere with saliva production, thus resulting in high instances of caries and infection. Various works of

literature show that although dental students possess relatively negligible information regarding the general effects of illicit drug use, their knowledge gaps are comparatively much larger when it comes to the specific consequences of drug use on oral health status or the handling of a patient that is substance dependent [4, 5].
Over the past decade, the variety of new and emerging tobacco and nicotine products has expanded, with e-cigarettes being one of the most prominent additions. Additionally, heated tobacco products [6] and nicotine pouches [7] have contributed to this diverse product landscape. At the same time, more permissive laws have increased access to cannabis products, which, although not classified as tobacco, are often used alongside it. Research shows that cannabis smoke shares several chemical properties with tobacco smoke and is linked to similar health risks, such as cardiovascular [8] and respiratory impairments [9].
Drug abuse also indirectly impacts oral health due to various lifestyle factors common among users, including poor oral hygiene, high sugar consumption, and nutritional deficiencies. Drug users often prioritize substance use over oral health, with factors like dental fear, self-medication, and limited access to dental care exacerbating their oral health neglect. Furthermore, drug abuse is associated with a higher incidence of orofacial trauma, as injuries resulting from accidents or violence are prevalent among this group [10]. Consequently, the possibility of drug abuse should be considered when treating dental trauma patients.
Studies have also described the manner in which drug and substance addiction impact oral health, mirroring the effects of the various substances. Periodontal disease, xerostomia, and an elevated caries rate were linked to the prevalence of drug misuse and substance use, including cocaine and methamphetamine. It was found that the majority of drug users in the sample had some kind of serious oral disease and that the diseases spread proportionately to the extent, duration, and frequency of substance use [11, 12].
Another study revealed that knowledge among dental students concerning drug-related oral conditions was moderate, and the authors attributed it to variations in the dental training curriculum and placed concern on substance abuse perception [13, 14].

The rationale of the study

Dental students, as future practitioners of the health care field, have a major role in diagnosing and managing these oral signs. Such knowledge, as well as the belief they have cultivated about drug abuse and its consequences on oral health, might impact their diagnosis, treatment, and recommendation for patients suffering from such conditions.

Null hypothesis

The level of knowledge among Saudi and Kuwaiti dental students regarding the drug abuse-related oral manifestations is low.

Aim of the study

To determine the level of knowledge and awareness among dental students regarding the oral manifestations of drug abuse.

Objectives

- To evaluate the knowledge of Saudi and Kuwaiti dental students,
- To list down the oral manifestations associated with drug abuse.
- To determine the experience of dental students treating patients with a history of drug abuse.

Materials and Methods

Study design: A survey-based, cross-sectional study was conducted among dental students in Saudi Arabia and Kuwait.

Sampling: A total of 447 dental students were included in this study, with 278 from Saudi Arabia and 169 from Kuwait. The sample was calculated using raosoft.com:

The margin of error:	**5%**
Confidence level:	95%
Estimated Population size:	Saudis 1000, Kuwaitis 300
Response distribution:	50%
Minimum sample size:	447 (278 Saudi and 169 Kuwaiti students)

Survey characteristics: A closed-ended survey was designed with two main components. One is the demographics, and the other is related to the oral manifestation due to drug abuse to assess the knowledge and beliefs. Validity was tested by asking the senior researchers in REU to review and rectify the survey questions wherever needed. As far as the reliability of the survey is concerned, it was measured by sending it to 20 participants as a pilot study and calculating Cronbach's alpha value (0.83).

Data collection and analysis: Survey Monkey was used to construct the questionnaire and send it to the participants using emails and WhatsApp groups. Data from Survey Monkey was downloaded as Excel sheets and transferred to SPSS version 21. SPSS generated inferential as well as descriptive statistics. A chi-square test was done, and results were presented in the form of tables and graphs with p-values to compare between study groups.

Ethical approval: This proposal was submitted by the supervisor to the REU research center for ethical approval.

Results and Discussion

Table 1. Demographics and descriptive statistics

1	**Gender**	**Male: 45.7%, Female: 54.3%**
2	Nationality	Saudi: 31%, Kuwaiti: 68.7%
3	Student year	4^{th}: 15% 5^{th}: 32.2% 6^{th}: 40.1% Intern: 12%
4	Have you treated a patient with drug abuse history?	Yes: 18.6% No: 63% Can't remember: 18.4%
5	Alcohol related oral manifestation include Dental Caries; Necrotizing ulcerative gingivitis; Periodontitis; Gingival recession; Decreased salivary flow	Strongly disagree: 2% Disagree: 4.7% Not sure: 51.9% Agree: 33.3% Strongly agree: 8.2%
6	Hallucinogens related oral manifestations include Orofacial damage; Bruxism; Trismus	Strongly disagree: 1.6% Disagree: 4.9% Not sure: 63.2% Agree: 26.8% Strongly agree: 3.5%
7	Amphetamines related oral manifestations include Decreased salivary flow; Xerostomia; Rampant caries; Excessive tooth wear	Strongly disagree: 1.3% Disagree: 4.7% Not sure: 65.4% Agree: 23.9% Strongly agree: 4.7%

8	Cannabinoids related oral manifestations include Caries; Periodontitis; Cannabic stomatitis; Sialostasis; Xerostomia; Leukoplakia; Increased bacterial plaque; Moderate and severe gingivitis; Candidosis; Oral papilloma	Strongly disagree: 1.3% Disagree: 5.5% Not sure: 64.3% Agree: 25.7% Strongly agree: 3.1%
9	Cocaine related oral manifestations include Palatal perforations; Irritation and dryness of the oral mucosa; Acute pain; Acute necrotizing ulcerative gingivitis (GUN); Periodontitis; Gingival laceration	Strongly disagree: 1.8% Disagree: 4% Not sure: 61.9% Agree: 27.3% Strongly agree: 5.1%
10	Ecstasy related oral manifestations include Xerostomia; Caries; Tooth erosion; Bruxism; Trismus; Bite of lips and tongue; Tremor of the face; Nystagmus; Abfraction injuries; Dentin sensitivity; tooth mobility	Strongly disagree: 1% Disagree: 6% Not sure: 66.5% Agree: 23.3% Strongly agree: 3.3%
11	Nicotine related oral manifestations include Periodontitis; Leukoplakia; Leukoedema; Necrotizing ulcerative gingivitis; Oral cancer; Oral cancer	Strongly disagree: 1.3% Disagree: 3.3% Not sure: 51.9% Agree: 35% Strongly agree: 8.4%
12	Opioids related oral manifestations include Atypical caries; Bruxism; Dental calculus; Necrotizing ulcerative gingivitis; Periodontitis; Xerostomia; Herpes simplex; Oral papilloma; Candidiasis; Leukoplakia; Oral carcinoma	Strongly disagree: 1.6% Disagree: 3.8% Not sure: 51.7% Agree: 37.3% Strongly agree: 5.8%
13	Do you think you need more knowledge and awareness regarding the drug related oral manifestations?	Strongly disagree: 1.1% Disagree: 2% Not sure: 11.1% Agree: 64.7% Strongly agree: 21.1%

This table summarizes responses from a survey that assesses demographics, experience with drug-abuse patients, and knowledge of drug-related oral health issues among respondents, likely dental or healthcare students. The first few entries cover basic demographic information. Gender is divided into male and female, while nationality includes individuals from Saudi Arabia and Kuwait. The respondents' academic standing ranges from 4th-year students to interns, indicating a diverse range of experience levels among participants.

One of the survey questions addresses respondents' past experiences with patients who have a history of drug abuse. Results show that only 18.6% have treated such patients, while a majority, 63%, reported they had not, and 18.4% couldn't remember. This indicates that while some students have exposure to such cases, a large percentage have not, which could influence their knowledge and preparedness in dealing with drug-related oral health manifestations.

The table then delves into specific oral health issues linked to various substances. Respondents were asked about their awareness of oral manifestations caused by alcohol use, including dental caries, gingival recession, and decreased salivary flow. A significant 51.9% of respondents were uncertain, while 33.3% agreed with these associations. Similarly, oral effects related to hallucinogen use, like orofacial damage and bruxism, showed that 63.2% were unsure, with 26.8% agreeing. These high rates of uncertainty suggest gaps in knowledge or confidence regarding the oral impacts of different drugs.

For amphetamines, which can cause xerostomia and excessive tooth wear, 65.4% were unsure, showing a similar pattern of uncertainty. Respondents were also questioned about cannabinoids and their links to conditions like leukoplakia and candidosis, with 64.3% expressing uncertainty. Cocaine's oral effects, such as palatal perforations, followed a similar trend: 61.9% of respondents were unsure, though a higher number, 27.3%, agreed with these associations.

The examination looked into oral symptoms of ecstasy, nicotine, and opioids. Issues associated with ecstasy usage, such as tooth erosion and trismus, left 66.5% uncertain, whereas nicotine's effects, such as periodontitis and oral cancer, had a somewhat lower incidence of confusion at 51.9%, with 35% agreeing on its negative oral health consequences. Opioid-related oral difficulties exhibited substantial ambiguity (51.7%), but there was greater agreement (37.3%) on the observed circumstances.

Finally, respondents were asked if they required more information about the impact of drugs on their dental health. A clear majority, 64.7%, agreed, with 21.1% strongly agreeing, showing a significant need for additional education on these topics. This identifies an educational gap that respondents believe should be filled to better educate them for addressing drug-related oral health symptoms in their future careers.

Table 2. Comparison on the basis of nationalities.

	Nationality		
Questions	**Saudi**	**Kuwaiti**	**P-value**
Have you treated a patient with drug abuse history?	Yes: 24% No: 61% Can't remember: 14%	Yes: 14% No: 67% Can't remember: 19%	.030*
Alcohol related oral manifestation include Dental Caries; Necrotizing ulcerative gingivitis; Periodontitis; Gingival recession; Decreased salivary flow	Strongly disagree: 3% Disagree: 5% Not sure: 46% Agree: 37% Strongly agree: 9%	Strongly disagree: 1% Disagree: 4% Not sure: 56% Agree: 31% Strongly agree: 8%	.290
Hallucinogens related oral manifestations include Orofacial damage; Bruxism; Trismus	Strongly disagree: 3% Disagree: 4% Not sure: 58% Agree: 31% Strongly agree: 4%	Strongly disagree: 1% Disagree: 5% Not sure: 66% Agree: 25% Strongly agree: 3%	.401
Amphetamines related oral manifestations include Decreased salivary flow; Xerostomia; Rampant caries; Excessive tooth wear	Strongly disagree: 2% Disagree: 3% Not sure: 67% Agree: 25% Strongly agree: 2%	Strongly disagree: 1% Disagree: 4% Not sure: 66% Agree: 23% Strongly agree: 6%	.345
Cannabinoids related oral manifestations include Caries; Periodontitis; Cannabic stomatitis; Sialostasis; Xerostomia; Leukoplakia; Increased bacterial plaque; Moderate and severe gingivitis; Candidosis; Oral papilloma	Strongly disagree: 2% Disagree: 6% Not sure: 58% Agree: 31% Strongly agree: 2%	Strongly disagree: 1% Disagree: 5% Not sure: 67% Agree: 24% Strongly agree: 3%	.363
Cocaine related oral manifestations include Palatal perforations; Irritation and dryness of the oral mucosa; Acute pain; Acute necrotizing ulcerative	Strongly disagree: 2% Disagree: 3% Not sure: 57% Agree: 33% Strongly agree: 4%	Strongly disagree: 1% Disagree: 4% Not sure: 64% Agree: 25% Strongly agree: 6%	.395

gingivitis (GUN); Periodontitis; Gingival laceration			
Ecstasy related oral manifestations include Xerostomia; Caries; Tooth erosion; Bruxism; Trismus; Bite of lips and tongue; Tremor of the face; Nystagmus; Abfraction injuries; Dentin sensitivity; tooth mobility	Strongly disagree: 2% Disagree: 7% Not sure: 61% Agree: 27% Strongly agree: 3%	Strongly disagree: 1% Disagree: 6% Not sure: 68% Agree: 22% Strongly agree: 3%	.687
Nicotine related oral manifestations include Periodontitis; Leukoplakia; Leukoedema; Necrotizing ulcerative gingivitis; Oral cancer; Oral cancer	Strongly disagree: 2% Disagree: 2% Not sure: 43% Agree: 42% Strongly agree: 12%	Strongly disagree: 1% Disagree: 3% Not sure: 56% Agree: 32% Strongly agree: 8%	.052
Opioids related oral manifestations include Atypical caries; Bruxism; Dental calculus; Necrotizing ulcerative gingivitis; Periodontitis; Xerostomia; Herpes simplex; Oral papilloma; Candidiasis; Leukoplakia; Oral carcinoma	Strongly disagree: 2% Disagree: 3% Not sure: 40% Agree: 47% Strongly agree: 7%	Strongly disagree: 1% Disagree: 4% Not sure: 57% Agree: 33% Strongly agree: 5%	.031*
Do you think you need more knowledge and awareness regarding the drug related oral manifestations?	Strongly disagree: 1% Disagree: 1% Not sure: 11% Agree: 64% Strongly agree: 24%	Strongly disagree: 1% Disagree: 3% Not sure: 11% Agree: 67% Strongly agree: 17%	.400

Table 2 reveals statistically significant differences between Saudi and Kuwaiti respondents in their experience and understanding of drug abuse and its effects on oral health. A notable difference is found in their experiences with treating patients who have a history of drug abuse ($p = 0.030$). Specifically, 24% of Saudis reported having treated such patients, compared to only 14% of Kuwaitis, indicating slightly more exposure to these cases among Saudi respondents.

There is also a significant difference in responses related to opioids' impact on oral health ($p = 0.031$). Saudis showed a higher level of agreement (47%) that opioids are associated with various oral health issues, such as necrotizing ulcerative gingivitis and xerostomia, while 33% of Kuwaitis agreed. This difference may suggest variations in awareness or direct experience with opioid-related conditions.

Lastly, while the p-value for nicotine-related oral manifestations is 0.052, which is just above the typical significance threshold, it indicates a borderline difference in how respondents from the two nationalities perceive nicotine's effects on oral health, with Saudis more likely to link nicotine use to conditions such as periodontitis and oral cancer. This pattern in responses suggests that Saudi and Kuwaiti respondents may differ slightly in their exposure to, or awareness of, drug-related oral health impacts.

Table 3. Comparison on the basis of gender.

	Gender		
Questions	**Male**	**Female**	**P-value**
Have you treated a patient with drug abuse history?	Yes: 15% No: 63% Can't remember: 22%	Yes: 19% No: 67% Can't remember: 14%	.087

Alcohol related oral manifestation include Dental Caries; Necrotizing ulcerative gingivitis; Periodontitis; Gingival recession; Decreased salivary flow	Strongly disagree: 1% Disagree: 4% Not sure: 61% Agree: 26% Strongly agree: 8%	Strongly disagree: 2% Disagree: 4% Not sure: 45% Agree: 39% Strongly agree: 10%	.030*
Hallucinogens related oral manifestations include Orofacial damage; Bruxism; Trismus	Strongly disagree: 1% Disagree: 3% Not sure: 72% Agree: 22% Strongly agree: 2%	Strongly disagree: 2% Disagree: 5% Not sure: 56% Agree: 32% Strongly agree: 5%	.022*
Amphetamines related oral manifestations include Decreased salivary flow; Xerostomia; Rampant caries; Excessive tooth wear	Strongly disagree: 1% Disagree: 5% Not sure: 72% Agree: 21% Strongly agree: 2%	Strongly disagree: 2% Disagree: 3% Not sure: 61% Agree: 27% Strongly agree: 7%	.040*
Cannabinoids related oral manifestations include Caries; Periodontitis; Cannabic stomatitis; Sialostasis; Xerostomia; Leukoplakia; Increased bacterial plaque; Moderate and severe gingivitis; Candidosis; Oral papilloma	Strongly disagree: 1% Disagree: 6% Not sure: 68% Agree: 23% Strongly agree: 2%	Strongly disagree: 2% Disagree: 5% Not sure: 60% Agree: 29% Strongly agree: 4%	.156
Cocaine related oral manifestations include Palatal perforations; Irritation and dryness of the oral mucosa; Acute pain; Acute necrotizing ulcerative gingivitis (GUN); Periodontitis; Gingival laceration	Strongly disagree: 0% Disagree: 4% Not sure: 66% Agree: 26% Strongly agree: 4%	Strongly disagree: 3% Disagree: 3% Not sure: 58% Agree: 29% Strongly agree: 7%	.051
Ecstasy related oral manifestations include Xerostomia; Caries; Tooth erosion; Bruxism; Trismus; Bite of lips and tongue; Tremor of the f++ace; Nystagmus; Abfraction injuries; Dentin sensitivity; tooth mobility	Strongly disagree: 1% Disagree: 4% Not sure: 71% Agree: 23% Strongly agree: 2%	Strongly disagree: 1% Disagree: 8% Not sure: 62% Agree: 25% Strongly agree: 5%	.158
Nicotine related oral manifestations include Periodontitis; Leukoplakia; Leukoedema; Necrotizing ulcerative gingivitis; Oral cancer; Oral cancer	Strongly disagree: 2% Disagree: 2% Not sure: 43% Agree: 42% Strongly agree: 12%	Strongly disagree: 1% Disagree: 3% Not sure: 56% Agree: 32% Strongly agree: 8%	.003*
Opioids related oral manifestations include Atypical caries; Bruxism; Dental calculus; Necrotizing ulcerative gingivitis; Periodontitis; Xerostomia; Herpes simplex; Oral papilloma; Candidiasis; Leukoplakia; Oral carcinoma	Strongly disagree: 1% Disagree: 5% Not sure: 55% Agree: 36% Strongly agree: 2%	Strongly disagree: 2% Disagree: 2% Not sure: 48% Agree: 38% Strongly agree: 9%	.024*
Do you think you need more knowledge and awareness regarding the drug related oral manifestations?	Strongly disagree: 1% Disagree: 2% Not sure: 10% Agree: 59% Strongly agree: 25%	Strongly disagree: 2% Disagree: 2% Not sure: 11% Agree: 59% Strongly agree: 25%	.011*

Table 3 displays significant differences between male and female respondents regarding their understanding and perceptions of oral health manifestations related to drug abuse, with p-values below 0.05 indicating noteworthy gender differences.

For alcohol-related oral manifestations (p = 0.030), female respondents were more likely to agree (39%) that alcohol use is associated with conditions like dental caries and gingival recession, compared to 26% agreement among males. This suggests that females may have a higher awareness or perception of alcohol's impact on oral health.

Regarding hallucinogen-related oral health issues (p = 0.022), female respondents were more likely to agree (32%) that hallucinogens are linked to effects like orofacial damage and bruxism, while only 22% of males agreed. This indicates a gender difference in recognizing hallucinogen-related oral effects.

For amphetamines' oral impacts (p = 0.040), a higher percentage of females agreed (27%) on issues like xerostomia and excessive tooth wear compared to 21% of males, suggesting that females may be more aware of these effects.

Nicotine-related oral health manifestations (p = 0.003) also revealed a significant difference, with males more likely to agree (42%) than females (32%) about its association with conditions like periodontitis and oral cancer. This shows a stronger acknowledgment among males regarding nicotine's impact on oral health.

The awareness of opioid-related oral manifestations (p = 0.024) differed slightly, with 38% of females agreeing compared to 36% of males, showing a slight but significant difference in recognizing opioids' effects on oral health.

Lastly, when asked if they needed more knowledge on drug-related oral manifestations (p = 0.011), both genders showed a high level of agreement, though females had a slightly stronger response, indicating a slightly greater perceived need for education on this topic among female respondents.

Table 4. Comparison on the basis of dentistry year.

	Dentistry Year				
Questions	**4th**	**5th**	**6th**	**Intern**	**P-value**
Have you treated a patient with drug abuse history?	Yes: 15% No: 77% Can't remember: 8%	Yes: 15% No: 65% Can't remember: 21%	Yes: 21% No: 62% Can't remember: 17%	Yes: 14% No: 65% Can't remember: 22%	.187
Alcohol related oral manifestation include Dental Caries; Necrotizing ulcerative gingivitis; Periodontitis; Gingival recession; Decreased salivary flow	Strongly disagree: 2% Disagree: 7% Not sure: 41% Agree: 38% Strongly agree: 13%	Strongly disagree: 3% Disagree: 3% Not sure: 60% Agree: 32% Strongly agree: 2%	Strongly disagree: 1% Disagree: 4% Not sure: 48% Agree: 36% Strongly agree: 12%	Strongly disagree: 2% Disagree: 6% Not sure: 63% Agree: 22% Strongly agree: 8%	.043*
Hallucinogens related oral manifestations include Orofacial damage; Bruxism; Trismus	Strongly disagree: 2% Disagree: 5% Not sure: 61% Agree: 25% Strongly agree: 8%	Strongly disagree: 2% Disagree: 5% Not sure: 65% Agree: 27% Strongly agree: 2%	Strongly disagree: 2% Disagree: 4% Not sure: 66% Agree: 26% Strongly agree: 2%	Strongly disagree: 2% Disagree: 6% Not sure: 55% Agree: 31% Strongly agree: 6%	.734
Amphetamines related oral manifestations include Decreased	Strongly disagree: 2% Disagree: 5%	Strongly disagree: 1% Disagree: 2%	Strongly disagree: 1% Disagree: 4%	Strongly disagree: 2% Disagree: 8%	.740

salivary flow; Xerostomia; Rampant caries; Excessive tooth wear	Not sure: 59% Agree: 26% Strongly agree: 8%	Not sure: 72% Agree: 21% Strongly agree: 4%	Not sure: 64% Agree: 27% Strongly agree: 4%	Not sure: 67% Agree: 20% Strongly agree: 4%	
Cannabinoids related oral manifestations include Caries; Periodontitis; Cannabic stomatitis; Sialostasis; Xerostomia; Leukoplakia; Increased bacterial plaque; Moderate and severe gingivitis; Candidosis; Oral papilloma	Strongly disagree: 5% Disagree: 3% Not sure: 54% Agree: 34% Strongly agree: 3%	Strongly disagree: 0% Disagree: 2% Not sure: 72% Agree: 24% Strongly agree: 2%	Strongly disagree: 1% Disagree: 7% Not sure: 64% Agree: 24% Strongly agree: 4%	Strongly disagree: 4% Disagree: 8% Not sure: 59% Agree: 27% Strongly agree: 2%	.051
Cocaine related oral manifestations include Palatal perforations; Irritation and dryness of the oral mucosa; Acute pain; Acute necrotizing ulcerative gingivitis (GUN); Periodontitis; Gingival laceration	Strongly disagree: 3% Disagree: 5% Not sure: 52% Agree: 28% Strongly agree: 11%	Strongly disagree: 2% Disagree: 2% Not sure: 69% Agree: 24% Strongly agree: 2%	Strongly disagree: 1% Disagree: 2% Not sure: 61% Agree: 31% Strongly agree: 6%	Strongly disagree: 4% Disagree: 8% Not sure: 59% Agree: 24% Strongly agree: 6%	.123
Ecstasy related oral manifestations include Xerostomia; Caries; Tooth erosion; Bruxism; Trismus; Bite of lips and tongue; Tremor of the face; Nystagmus; Abfraction injuries; Dentin sensitivity; tooth mobility	Strongly disagree: 3% Disagree: 7% Not sure: 57% Agree: 26% Strongly agree: 7%	Strongly disagree: 0% Disagree: 5% Not sure: 69% Agree: 24% Strongly agree: 2%	Strongly disagree: 0% Disagree: 8% Not sure: 67% Agree: 21% Strongly agree: 4%	Strongly disagree: 4% Disagree: 2% Not sure: 67% Agree: 25% Strongly agree: 2%	.109
Nicotine related oral manifestations include Periodontitis; Leukoplakia; Leukoedema; Necrotizing ulcerative gingivitis; Oral cancer; Oral cancer	Strongly disagree: 2% Disagree: 2% Not sure: 51% Agree: 33% Strongly agree: 13%	Strongly disagree: 2% Disagree: 2% Not sure: 60% Agree: 32% Strongly agree: 5%	Strongly disagree: 0% Disagree: 2% Not sure: 49% Agree: 39% Strongly agree: 10%	Strongly disagree: 4% Disagree: 6% Not sure: 43% Agree: 35% Strongly agree: 12%	.224
Opioids related oral manifestations include Atypical caries; Bruxism; Dental calculus; Necrotizing ulcerative gingivitis; Periodontitis; Xerostomia; Herpes simplex; Oral papilloma;	Strongly disagree: 5% Disagree: 2% Not sure: 52% Agree: 33% Strongly agree: 8%	Strongly disagree: 2% Disagree: 4% Not sure: 56% Agree: 34% Strongly agree: 5%	Strongly disagree: 0% Disagree: 2% Not sure: 50% Agree: 42% Strongly agree: 6%	Strongly disagree: 4% Disagree: 8% Not sure: 47% Agree: 37% Strongly agree: 4%	.222

Candidiasis; Leukoplakia; Oral carcinoma					
Do you think you need more knowledge and awareness regarding the drug related oral manifestations?	Strongly disagree: 2% Disagree: 7% Not sure: 15% Agree: 54% Strongly agree: 23%	Strongly disagree: 1% Disagree: 2% Not sure: 11% Agree: 73% Strongly agree: 15%	Strongly disagree: 1% Disagree: 1% Not sure: 12% Agree: 66% Strongly agree: 20%	Strongly disagree: 4% Disagree: 2% Not sure: 4% Agree: 65% Strongly agree: 25%	.101

Table 4 highlights significant differences between dentistry students at various academic stages in their perceptions of alcohol-related oral manifestations, with a p-value of 0.043. This indicates that year level impacts awareness or agreement regarding the oral health effects associated with alcohol, such as dental caries, gingival recession, and decreased salivary flow.

In the 4th-year group, 38% agreed and 13% strongly agreed that alcohol is associated with these oral health conditions, reflecting a relatively high level of agreement. In contrast, 5th-year students showed less agreement, with only 32% agreeing and 2% strongly agreeing, suggesting possible variations in knowledge or confidence in identifying these effects as students progress. Among 6th-year students, 36% agreed, and 12% strongly agreed, displaying an increase in awareness compared to the 5th-year group. Finally, interns showed lower agreement overall, with only 22% agreeing and 8% strongly agreeing.

This difference may reflect variations in exposure to clinical cases or educational emphasis on alcohol-related oral health impacts at different stages of dental education. The increased awareness among 4th-year and 6th-year students, compared to 5th-year students and interns, may suggest fluctuations in curriculum focus on these topics across academic years.

To build a full comparison between the current study and past research on drug addiction and its impact on oral health, this discussion will examine major findings, highlighting patterns and discrepancies between the studies. The current study gives new insights into the perspectives and experiences of Saudi and Kuwaiti respondents by using statistical analysis and an assessment of demographic variables such as nationality, gender, and academic level, which aligns with or diverges from earlier studies. This topic examines survey responses from dentistry or healthcare students regarding demographics, exposure to drug-abuse cases, and understanding of drug-related oral health issues. The participants, who were primarily from Saudi Arabia and Kuwait and ranged in age from fourth-year students to interns, had little experience with drug-abuse patients (18.6%), which may have influenced their preparation. High ambiguity was seen regarding the oral effects of substances such as alcohol and amphetamines, with more than half unaware of these effects, emphasizing knowledge gaps. Furthermore, 64.7% indicated a need for further information on drug-related oral health, underlining the need for incorporating this into the curriculum. By analyzing the oral health implications of opioids, alcohol, hallucinogens, amphetamines, and nicotine, this discussion seeks to place the current findings in the larger context of existing research on drug usage and dental health consequences.

Treatment experiences with drug-abusing patients

The table reveals statistically significant differences between Saudi and Kuwaiti respondents in their exposure to drug abuse cases and understanding of related oral health effects. Saudi respondents reported a higher rate of treating patients with a history of drug abuse (24%) compared to their Kuwaiti counterparts (14%), indicating greater clinical exposure among Saudis ($p = 0.030$). This variation aligns with findings in other studies, where knowledge and beliefs about substance use and its effects on health were significantly influenced by variables such as country, gender, training stage, and smoking status. For instance, Alhajj *et al.* (2022) found that knowledge was highest among respondents from Malaysia [15], particularly among females, students in clinical

years, and those who had never used e-cigarettes or smoked. Positive beliefs were similarly linked to country (highest in Jordan and Kuwait), gender (female), marital status (married), and non-smoking status. These findings suggest that nationality, gender, and lifestyle factors significantly impact knowledge and attitudes towards substance-related health issues, with Saudi students potentially benefiting from greater clinical exposure to drug-related cases compared to Kuwaiti students.

In the present study, a significant disparity emerged between Saudi and Kuwaiti respondents in their experiences treating patients with a history of drug abuse ($p = 0.030$). Specifically, 24% of Saudi participants reported such experiences, compared to only 14% of Kuwaiti respondents. This finding suggests a higher exposure to drug-abusing patients among Saudi practitioners, potentially influenced by regional factors such as variations in drug abuse prevalence or differences in healthcare infrastructure and policies. In contrast, prior studies have not extensively compared practitioner exposure to drug-abusing patients based on nationality, though research suggests that clinical experiences with drug-abusing patients may impact healthcare providers' ability to recognize and address oral health issues [16].

Opioid-related oral health perceptions

The current study indicates that a significant proportion of Saudi respondents (47%) associate opioids with oral health issues, including necrotizing ulcerative gingivitis and xerostomia, whereas only 33% of Kuwaiti respondents share this perception ($p = 0.031$). This discrepancy could reflect national differences in exposure to opioid-related oral health effects or disparities in professional education and awareness. Prior research corroborates that opioids can lead to severe oral health complications, including tooth decay, periodontal disease, and salivary hypofunction [17]. Angelillo *et al.* (2023) further identified common manifestations such as tooth loss and mucosal infections among opioid users, supporting the link observed in the present study between opioid abuse and oral health deterioration [16]. However, the present study adds new insights by examining the influence of nationality on perceived knowledge, suggesting that respondents from Saudi Arabia may possess greater awareness of opioid-related oral issues.

Nicotine's impact on oral health

Nicotine-related oral health issues were perceived differently by Saudi and Kuwaiti respondents, with Saudis showing a slightly higher tendency to associate nicotine with periodontitis and oral cancer ($p = 0.052$). Although not statistically significant, this trend aligns with existing literature indicating the adverse effects of nicotine on periodontal tissues, reduced epithelial attachment, and alveolar bone height. Bergeron's early observations in 1859 laid the foundation for linking tobacco use to gingival disease, tooth loss, and other complications. The current study contributes to this body of evidence by highlighting potential cross-national variations in the perception of nicotine's harmful effects on oral health, suggesting that Saudi respondents may have slightly greater exposure to or awareness of these issues, possibly due to differing public health campaigns or educational content.

Gender differences in alcohol-related oral health perceptions

The present study also reveals gender-based differences in the perception of alcohol's effects on oral health. Female respondents were more likely than males to agree that alcohol is associated with dental caries and gingival recession (39% versus 26%, $p = 0.030$), which could indicate a higher level of awareness among females regarding alcohol's impact on oral health. Prior studies have explored similar gender differences, such as those observed by Khocht *et al.* (2003), where male alcohol users exhibited greater gingival recession than females, possibly due to biological and hormonal factors that offer females some protection against alcohol-related oral damage [18]. Thus, while the present findings align with existing research in highlighting a gender difference in awareness, they also suggest that females may have a heightened perception of alcohol's oral health implications, possibly due to social or educational influences.

Hallucinogen-related oral health awareness

Regarding hallucinogens, the present study found that 32% of female respondents recognized their association with oral health issues such as orofacial damage and bruxism, compared to only 22% of males ($p = 0.022$). This gender difference in awareness aligns with previous research by Taghi *et al.* (2016), which documented a range of oral complications among hallucinogen users, including TMJ pain, muscle sensitivity, and temperature sensitivity [19]. Additionally, studies have linked hallucinogen use with complications such as dry mouth, bruxism, and temporomandibular joint (TMJ) tenderness [20]. The present study extends this understanding by revealing gender-based variations, indicating that females may be more attentive to the oral health risks associated with hallucinogens, potentially influenced by differences in social awareness or health education.

Amphetamine-related oral health concerns

The current study's findings on amphetamine-related oral health difficulties show that 27% of females recognize the impact of amphetamines on disorders such as xerostomia and excessive tooth wear, compared to 21% of males ($p = 0.040$). This gender awareness gap is consistent with previous research, which has connected amphetamines to significant dental damage, including "meth mouth," which is characterized by widespread caries, tooth wear, and xerostomia [21]. Earlier research found that methamphetamine users frequently have bruxism, dental sensitivity, and difficulties chewing [22]. The current study thus adds to the literature by demonstrating that female respondents may be more aware of the oral health dangers provided by amphetamines, possibly due to social and educational inequalities in drug awareness.

Academic differences in awareness of alcohol-related oral health impacts

Table 4 of the present study shows that awareness of alcohol-related oral health effects varies by academic level, with fourth-year students demonstrating the highest level of agreement (38%) that alcohol is linked to conditions like dental caries and gingival recession. Fifth-year students, in contrast, showed lower agreement levels (32%), while sixth-year students' awareness rebounded slightly (36%). This trend may reflect variations in curricular focus or clinical exposure, as certain academic years may prioritize different aspects of substance-related oral health education. Previous research by Priyadarshini *et al.* (2019) found that dental professionals with higher educational qualifications were more likely to view drug abuse as a societal issue, suggesting that academic progression influences perceptions of substance-related oral health [23]. The current study's findings are consistent with this notion, indicating that academic stage can significantly impact students' understanding of alcohol's oral health impacts.

The present study identifies statistically significant differences in dental students' awareness of alcohol-related oral health issues across academic levels ($p = 0.043$). Agreement levels were highest among 4th-year students (38% agreed, 13% strongly agreed) but decreased notably among 5th-year students (32% agreed, 2% strongly agreed), potentially indicating gaps in knowledge retention as students progress. Awareness rose again in the 6th year (36% agreed, 12% strongly agreed), likely due to clinical exposure, while interns reported the lowest agreement (22% agreed, 8% strongly agreed), possibly reflecting a shift in focus away from academic content. These fluctuations suggest that the curriculum emphasis on alcohol-related oral health varies across academic years, as seen in other studies where educational progression influences knowledge retention.

Supporting research, such as Bewick *et al.* (2008), discovered that first-year students consumed more alcohol weekly than those in subsequent years, with male students consuming more than female classmates [24]. Alcohol's impact on studies and health waned over time, coinciding with a general decrease in intake as students advanced. Shamala *et al.* (2023) discovered that only 54.5% of students felt appropriately equipped for smoking cessation counseling [25], with 5th-year students showing greater knowledge than 4th-years ($p < 0.01$). Alhajj *et al.* (2022) further noted significant associations between substance-related knowledge and factors like educational level and country ($p < 0.05$), highlighting the positive impact of academic progression and exposure

[15]. These findings underscore the need for a consistent, standardized curriculum to enhance long-term awareness and preparedness in addressing substance-related health impacts among dental students.

Nationality-based differences in perceptions of substance abuse and oral health

The present study provides unique insights into nationality-based differences in perceptions of substance abuse and oral health impacts among Saudi and Kuwaiti respondents. For example, Saudi respondents were more likely to report experience with treating drug-abusing patients and showed higher levels of agreement regarding the oral health impacts of opioids and nicotine. This contrasts with findings from previous studies, which rarely address cross-national differences in substance abuse-related oral health perceptions. The nationality-based differences observed in the present study may be influenced by variations in drug abuse prevalence, healthcare systems, or public health campaigns in Saudi Arabia and Kuwait. These findings align with Angelillo *et al.* (2023), who identified that differences in exposure to substance abuse cases can impact healthcare providers' awareness of associated oral health issues [16].

Implications of the findings and future directions

The findings of the present study carry important implications for dental education and public health. Given the observed differences in awareness based on gender, nationality, and academic level, targeted educational interventions could be developed to enhance understanding of drug abuse's oral health impacts across diverse demographics. For example, dental curricula could be adapted to include more comprehensive training on substance abuse-related oral health issues, particularly in regions or among demographics where awareness appears lower. Furthermore, the nationality-based differences observed in this study underscore the importance of culturally tailored public health campaigns to address specific needs and perceptions within different populations.

Future study should look into demographic disparities in perceptions of substance usage and oral health consequences, with an emphasis on determining the factors that underlie these differences. Furthermore, longitudinal research could shed light on how awareness of drug abuse's oral health consequences evolves over time and with increased clinical exposure. Future studies that build on the current study's findings and include lessons from past research can add to a more comprehensive understanding of the complicated relationship between drug usage and oral health outcomes.

Conclusion

In conclusion, the present study has illuminated significant demographic differences in the perception of substance abuse-related oral health impacts, drawing on comparisons with previous research to contextualize these findings. Saudi and Kuwaiti respondents differed in their experiences with drug-abusing patients and their awareness of opioid- and nicotine-related oral health issues. Gender-based differences were also evident, with female respondents showing a greater awareness of the oral health risks associated with alcohol, hallucinogens, and amphetamines. Furthermore, academic development altered dental students' perceptions of alcohol's effects on oral health, with fourth- and sixth-year students displaying higher levels of awareness than fifth-year students. These findings emphasize the necessity for focused educational interventions and culturally customized public health activities to increase knowledge of substance abuse's oral health implications across varied communities.

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