Caballero-Orbegoso C, et al. TUMI Oral Health. 2026;1(2): e003
https://doi.org/10.64716/vnv7sf89

TUMI Oral health

ORIGINAL RESEARCH

Open Access

Knowledge of oral cancer and associated factors among senior dental students at a Peruvian university: A cross-sectional study.

Claudia Nathaly Caballero-Orbegoso [1], Jeiser Yubel Zavaleta-Valverde [2]

[1] Catholic University of Los Angeles of Chimbote, Undergraduate, Trujillo, Peru.

[2] Universidade do Oeste Paulista, Department of Dentistry, Presidente Prudente, São Paulo, Brazil.

Corresponding author

Claudia Caballero-Orbegoso

e-mail: claudiamelcaball@gmail.com
Catholic University of Los Angeles of Chimbote, Undergraduate, Trujillo, Peru.

Received: April 15, 2026
Revised: April 18, 2026
Accepted: April 28, 2026

Academic Editor
Yovana Gutierrez, MSc

Abstract

Oral cancer represents a significant global public health concern due to its high morbidity and mortality, largely attributed to late diagnosis and insufficient awareness among healthcare professionals. Dental students play a crucial role in early detection and prevention; therefore, assessing their level of knowledge is essential to identify educational gaps. This study aimed to determine the level of knowledge regarding oral cancer among senior dental students at a Peruvian university. An observational cross-sectional study was conducted among 73 students enrolled in the final academic years. Data were collected using a structured online questionnaire administered via Google Forms, evaluating knowledge across five domains: epidemiology, etiopathogenesis, diagnosis, treatment, and prevention. Descriptive statistics were applied to summarize the findings. Overall, 83.6% (n = 61) of participants demonstrated a high level of knowledge, while 9.6% (n = 7) and 6.8% (n = 5) showed moderate and low levels, respectively. Regarding specific domains, high knowledge levels were observed in prevention (79.4%), treatment (76.7%), etiopathogenesis (75.3%), diagnosis (50.7%), and epidemiology (47.9%). Despite the generally high overall knowledge, variability across domains suggests the presence of specific gaps, particularly in epidemiological and diagnostic aspects. In conclusion, senior dental students exhibited a predominantly high level of knowledge about oral cancer; however, targeted educational strategies are recommended to strengthen critical areas and enhance early detection competencies.

Keywords: Oral Cancer, Knowledge, Dental Students, Early Diagnosis, Health Education.

TUMI ORAL HEALTH
ISSN (Online): 3119-7701

Introduction

Oral cancer represents a significant global public health burden due to its high morbidity, mortality, and impact on essential functions such as speech, mastication, and quality of life. Most malignancies arising in the oral cavity correspond to oral squamous cell carcinoma, accounting for approximately 90% of cases [1]. Despite advances in diagnostic and therapeutic strategies, the incidence of oral cancer continues to increase in several regions, particularly in low- and middle-income countries [2]. Established risk factors such as tobacco use, alcohol consumption, and human papillomavirus infection play a critical role in its development and progression [3,4]. Importantly, prognosis is strongly associated with early detection, making timely diagnosis a key determinant of survival outcomes [2].

From a clinical standpoint, oral cancer is particularly relevant to dental practice because many lesions are accessible through routine intraoral examination. This provides an opportunity for early identification of suspicious lesions and potentially malignant disorders [5]. However, delayed diagnosis remains a common issue and is frequently associated with insufficient knowledge, inadequate screening practices, and limited recognition of early clinical signs among healthcare professionals [6]. In Latin American settings, additional barriers such as limited access to healthcare services and deficiencies in diagnostic capacity further complicate early detection [7]. Evidence from Peru has also highlighted persistent challenges in the timely diagnosis of oral cancer, especially in vulnerable populations [8], emphasizing the need to strengthen professional training in this field.

Previous studies assessing knowledge of oral cancer among dental students have reported heterogeneous results across different populations. While some studies describe acceptable awareness of selected risk factors, others have identified important deficiencies in knowledge related to early diagnosis, recognition of potentially malignant disorders, and preventive strategies [9,10]. These gaps have been reported in undergraduate dental populations from different regions, including Europe, Asia, and the Middle East [11–13]. Similarly, studies conducted in Latin America and Peru have demonstrated predominantly moderate or insufficient levels of knowledge among dental students, suggesting that current undergraduate training may not be fully adequate to ensure optimal clinical preparedness [14–17].

Assessing oral cancer knowledge in senior dental students is clinically and academically relevant because these individuals are close to entering professional practice and are expected to play a central role in prevention, early detection, and patient education. Identifying gaps in their knowledge may contribute to improving undergraduate curricula and strengthening competency-based training in oral health care. The objective of this study was to evaluate knowledge of oral cancer among senior dental students at a Peruvian university and to explore associated factors. This research is justified by its contribution to the clinical and educational understanding of oral cancer preparedness in future dental professionals, with direct implications for early detection and evidence-based dental practice.

Methods

Study Design and reporting guideline

An observational, cross-sectional study was conducted among senior dental students at a Peruvian university during the 2021-I academic term. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [18].

Participants, population, and sample

The study population consisted of students enrolled in the 7th, 8th, and 9th academic cycles of the dental program during the study period. Because all eligible students were invited to participate, a census sampling strategy was used. The final sample comprised 73 students.

Inclusion criteria were students officially enrolled during the 2021-I academic term who agreed to participate voluntarily by providing informed consent. Students with incomplete questionnaire responses were excluded from the analysis. Additionally, students with conditions that could interfere with the proper completion of the questionnaire were excluded according to the original study protocol.

Procedures and data collection

Prior to data collection, authorization was obtained from the corresponding academic authorities. Data were collected through an online self-administered questionnaire created using Google Forms. The survey included information regarding the study title, objectives, instructions, and informed consent. The questionnaire was distributed virtually with prior coordination with faculty members. Participants completed the instrument in approximately 10 to 15 minutes. Responses were automatically recorded and exported to a database, which was subsequently reviewed, coded, and organized in Microsoft Excel for analysis.

Measurement instrument

Knowledge of oral cancer was assessed using a structured questionnaire previously applied in Peruvian dental students. The instrument consisted of 24 multiple-choice questions covering five domains: epidemiology, etiopathogenesis, diagnosis, treatment and oral complications, and prevention. The overall level of knowledge was classified as low (0–12 points), moderate (13–15 points), or high (16–24 points). Domain-specific classifications were established according to the operationalization matrix. Additionally, the questionnaire collected participant characteristics, including age, sex, academic cycle, and previous participation in the diagnosis of an oral cancer case.

The instrument was adopted from a previously used questionnaire with content validity supported by expert judgment; however, no additional psychometric validation or reliability testing was performed in the present study.

Variables

The primary variable was knowledge of oral cancer, categorized as an ordinal qualitative variable according to the total score obtained from the questionnaire. It was evaluated across five dimensions: epidemiology, etiopathogenesis, diagnosis, treatment and oral complications, and prevention. Based on the overall score, the level of knowledge was classified as low, moderate, or high. The associated factors included sex, categorized as male or female, and age, categorized into two groups: 18–35 years and 36 years or older.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 25.0 and Microsoft Excel. Descriptive statistics were used to summarize the data, including absolute frequencies and percentages. Bivariate analysis was conducted to assess the association between the overall level of oral cancer knowledge and the variables sex and age. The chi-square test was applied, and a significance level of 5% ($p < 0.05$) was considered. The results for the five knowledge dimensions were presented descriptively using frequencies and percentages.

Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki [19]. Ethical approval was obtained from a duly constituted institutional ethics committee. Participation was voluntary, and informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were ensured throughout the study, and the data were used exclusively for research purposes.

Results

A statistically significant association was found between sex and the level of oral cancer knowledge among senior dental students ($p = 0.035$), with female students showing a higher proportion of high

knowledge (91.5%) compared to male students (69.2%) (Table 1).

In contrast, no statistically significant association was observed between age group and knowledge level (p = 0.124), although students aged 18–35 years demonstrated a higher proportion of high knowledge (86.4%) compared to those aged ≥36 years (57.1%). Overall, most students exhibited a high level of oral cancer knowledge (83.6%), while 9.6% demonstrated a moderate level and 6.8% a low level (Table 2).

Regarding the evaluated dimensions, the highest proportion of high knowledge was observed in prevention (79.4%), followed by treatment and oral complications (76.7%) and etiopathogenesis (75.3%). Conversely, lower proportions of high knowledge were identified in diagnosis (50.7%) and epidemiology (47.9%) (Table 3).

Table 1. Association between the overall level of oral cancer knowledge and selected factors among senior dental students at a Peruvian university.

Factor	Category	Low n (%)	Moderate n (%)	High n (%)	Total n (%)	p-value*
Sex	Male	4 (15.4)	4 (15.4)	18 (69.2)	26 (100.0)	0.035
	Female	1 (2.1)	3 (6.4)	43 (91.5)	47 (100.0)	
Age group	18–35 years	4 (6.1)	5 (7.6)	57 (86.4)	66 (100.0)	0.124
	≥36 years	1 (14.3)	2 (28.6)	4 (57.1)	7 (100.0)	

Discussion

The present study found that most senior dental students demonstrated a high level of knowledge regarding oral cancer, with 83.6% classified in the highest category. This finding suggests an adequate level of theoretical preparation in this population, which is particularly relevant considering the critical role of dental professionals in early detection and prevention. Given that oral cancer prognosis is strongly associated with early diagnosis, as highlighted by Sun et al. [2] and Chamoli et al. [3], a high level of knowledge among future professionals may contribute to improved clinical outcomes and reduced disease burden.

When analyzing the results according to dimensions, higher levels of knowledge were observed in prevention, treatment, and etiopathogenesis, whereas lower proportions of high knowledge were identified in diagnosis and epidemiology. This pattern is consistent with the findings of Carter and Ogden [9], who reported that students often show better understanding of general concepts but have limitations in recognizing early clinical signs. Similarly, Shadid et al. [11] and Petrauskienė et al. [12] found that although dental students demonstrate acceptable theoretical knowledge, gaps persist in diagnostic competencies, which are essential for early detection. These findings reinforce the concern that insufficient clinical recognition skills may contribute to delayed diagnosis, as reported by Martínez-Ramírez et al. [7].

In relation to associated factors, female students and those aged 18–35 years showed a higher proportion of high knowledge levels. Although the association with sex has been inconsistently reported in the literature, studies such as those by Poudel et al. [14] and Tarakji [13] suggest that differences in knowledge may be influenced by educational engagement and learning behaviors rather than biological factors. Regarding age, younger students may demonstrate better academic performance due to more recent exposure to theoretical training, which could explain the observed trend. However, further analytical studies are needed to confirm

these associations and explore their underlying causes.

Table 2. Overall level of oral cancer knowledge among senior dental students at a Peruvian university.

Level of knowledge	f	%
Low	5	6.8
Moderate	7	9.6
High	61	83.6
Total	73	100.0

Table 3. Level of oral cancer knowledge according to dimensions among senior dental students at a Peruvian university.

Dimension	Level of knowledge	f	%
Epidemiology	Low	17	23.3
	Moderate	21	28.8
	High	35	47.9
Etiopathogenesis	Low	8	11.0
	Moderate	10	13.7
	High	55	75.3
Diagnosis	Low	6	8.2
	Moderate	30	41.1
	High	37	50.7
Treatment and oral complications	Low	7	9.6
	Moderate	10	13.7
	High	56	76.7
Prevention	Low	1	1.4
	Moderate	14	19.2
	High	58	79.4

From a clinical and educational perspective, these findings highlight the importance of reinforcing specific competencies related to early diagnosis and epidemiological understanding of oral cancer. As emphasized by Haj-Hosseini et al. [5], the early identification of potentially malignant disorders is a key component of dental practice. Moreover, Poudel et al. [17] demonstrated in a systematic review that knowledge gaps among healthcare providers remain a global issue, underscoring the need for continuous training. Therefore, integrating more clinically oriented training strategies and diagnostic simulations into undergraduate curricula could improve students' preparedness for real-world scenarios.

This study has several strengths, including the use of a structured instrument and the inclusion of all eligible students through a census sampling approach, which reduces selection bias. However, some limitations should be acknowledged. First, the cross-sectional design does not allow for causal inferences. Second, the use of a self-administered questionnaire may introduce response bias. Third, the absence of psychometric revalidation of the instrument in the current sample may affect measurement precision. Similar methodological limitations have been described in previous studies evaluating knowledge of oral cancer among students [20,21].

Future research should focus on longitudinal and interventional designs to evaluate the effectiveness of educational strategies aimed at improving diagnostic competencies in oral cancer. Additionally, incorporating objective clinical assessments rather than self-reported questionnaires may provide more robust evidence. Expanding the study population to include multiple institutions would also enhance generalizability. As highlighted by Warnakulasuriya [22] and Seoane et al. [23], improving professional training and awareness remains a fundamental strategy to reduce diagnostic delays and improve patient outcomes in oral cancer. Furthermore, recent evidence by Kujan et al. [24] supports the integration of structured screening protocols in dental education as a means to strengthen early detection practices.

Conclusions

Senior dental students demonstrated a predominantly high level of knowledge regarding oral cancer. However, variability across specific domains particularly in epidemiology and diagnosis suggests the presence of targeted gaps in critical areas related to early detection. Additionally, differences observed according to sex and age indicate that knowledge distribution is not entirely

uniform within the study population. These findings highlight the need to strengthen specific components of undergraduate dental education to improve diagnostic preparedness and support early identification of oral cancer.

Author Contributions Statement (CRediT)

CC: Conceptualization, Formal analysis, Data curation, Validation, Visualization, Methodology, Writing – Original Draft, Supervision.

JZ: Resources, Project administration, Funding acquisition, Writing – Review & Editing.

Acknowledgments and Funding

The authors would like to acknowledge the academic authorities and faculty members of the dental program for their support in facilitating data collection, as well as the students who voluntarily participated in this study.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest

The authors declare no financial, institutional, or personal conflicts of interest that could have influenced the conduct or publication of this study.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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