

Effect of A Structured Educational Intervention Compared With Baseline on Oral Cancer and Tobacco Awareness Among College Students in Jamnagar: A Before-and-After Study

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Abstract

Background:

Tobacco, alcohol, and areca nut are important risk factors for oral cancer. Educational interventions may improve awareness of oral cancer and its associated risk factors among young adults.

Objective:

To assess changes in oral cancer and tobacco awareness following an educational intervention among college students in Jamnagar, Gujarat, India

Methods:

A single-group, before-and-after study was conducted among 180 college students who completed paired assessments before and after an educational intervention. Responses to 15 awareness and attitude items were combined to generate a composite score ranging from 0 to 19. Pre-intervention and post-intervention scores were compared using a paired-samples t-test.

Results:

The mean awareness score increased from 10.14 ± 4.19 before the intervention to 13.34 ± 3.32 afterward. The mean paired increase was 3.20 ± 3.17 points (approximate 95% confidence interval (CI): 2.73–3.67; paired-samples t-test (t) 179 = 13.54; probability (p) < 0.001). Scores increased in 146 students (81.1%), remained unchanged in 15 (8.3%), and decreased in 19 (10.6%).

Conclusion:

The educational intervention was associated with a significant improvement in oral cancer and tobacco awareness scores among college students. Further studies with longer follow-up periods are needed to determine whether these improvements are sustained and translate into preventive behaviours.

Keywords: Awareness; Before-and-after study; College students; Health education; Oral cancer; Tobacco.

Introduction

Oral cancer is a significant public health challenge in India, where exposure to tobacco, alcohol, and areca nut contributes substantially to disease risk. Effective prevention requires greater public understanding of these exposures and their potential consequences for oral health [1, 2]. Awareness programmes should address the harmful effects of both smoked and smokeless tobacco products, as well as areca nut consumption. They should also educate individuals about potential warning signs, including persistent oral ulcers and unexplained white or red patches. Although these changes do not necessarily indicate malignancy, their early recognition and timely professional evaluation are important components of oral cancer awareness.

College students represent an important target population for preventive health education because attitudes, lifestyle choices, and substance-use behaviours may develop or become established during adolescence and early adulthood. Educational initiatives delivered in college settings can provide opportunities to communicate information about oral cancer risk factors, early warning signs, and preventive practices. Nevertheless, general awareness of tobacco-related harm may not reflect a comprehensive understanding of oral cancer, its associated risk factors, or the importance of seeking professional assessment when suspicious oral changes occur. Structured educational interventions may therefore help address gaps in knowledge and encourage informed health-related decisions.

Previous research has investigated educational approaches for improving oral cancer awareness among young people. An Indian study involving preuniversity students assessed the effectiveness of a structured instructional module using intervention and comparison groups [3]. Furthermore, a systematic review reported improvements in knowledge

following several educational interventions, although variations in assessment tools, intervention methods, and study designs limited direct comparisons across studies [4]. The extent to which these improvements are maintained over time remains an important consideration. Evaluating educational programmes within specific institutional settings can help identify learning needs and provide evidence to guide future awareness initiatives [5].

In this context, the present study evaluated changes in oral cancer and tobacco awareness among college students of an engineering institute in Jamnagar, Gujarat, India. Awareness scores were assessed before and after an educational intervention in the same group of students. In addition to examining the overall change in scores, the study considered individual questionnaire responses to identify improvements and persistent gaps in awareness. The findings may help inform the development of targeted oral cancer education programmes for college students.

Materials and Methods

Study Design and Eligibility Criteria

A single-group, before-and-after study was conducted among college students of an engineering institute in Jamnagar, Gujarat, India. The study was completed on a single day using a convenience sampling approach. Students who were present on the day of data collection and willing to participate were eligible for inclusion. All students present at the college were offered an educational session focusing on oral cancer awareness and tobacco cessation. Awareness levels were assessed immediately before and after the intervention using a structured questionnaire to evaluate changes in participants' responses.

Sample Size Calculation

The sample size was determined using G*Power software, version 3.1.9.7. The study protocol specified an assumed effect size of 0.20, a two-sided significance level of 0.05, and statistical power of 80% for the Wilcoxon signed-rank test. Based on the protocol, the minimum required sample was 164 paired observations, with the target increased to 180 to account for an anticipated 10% allowance. A total of 180 complete pre-intervention and post-intervention assessment pairs were included in the final analysis.

Educational Intervention and Data Collection

A structured educational module addressing oral cancer and tobacco cessation awareness was prepared by personnel with relevant training in these subject areas. The educational content covered tobacco-related risks, other recognized risk factors for oral cancer, potential warning signs, and the importance of preventive practices and timely professional consultation. The same trainer delivered the session to all participants to maintain consistency in the educational approach.

Data collection was performed on the same day as the intervention. Participants completed the questionnaire before the educational session and again immediately afterward. The same questionnaire was used at both time points to facilitate paired comparisons of awareness scores. Questionnaires containing incomplete or missing responses were excluded from the analysis.

Questionnaire Validation and Reliability

The questionnaire was reviewed by other examiners to evaluate the clarity, relevance, and suitability of its items for assessing oral cancer and tobacco cessation awareness among college students. Content validity was evaluated using the average scale-level Content Validity Index (S-CVI/Ave), which was 0.81. The questionnaire's internal consistency coefficient was 0.72. Test-retest reliability was assessed using the intraclass correlation coefficient (ICC), which was 0.79, indicating good reproducibility of scores across repeated assessments.

Questionnaire Structure and Scoring System

The questionnaire collected information on participants' demographic characteristics, current tobacco use, and responses to 15 awareness and attitude items (Q9–Q23). A composite scoring system was used to quantify the appropriateness of participants' responses, with a possible total score ranging from 0 to 19. Higher scores indicated a greater number of appropriate responses.

Twelve items were assigned one point each for an appropriate response. Question 11 (Q11) allowed a maximum of four points, with one point awarded for each appropriate disease option selected. Question 12 (Q12) awarded two points for identifying both tobacco and alcohol and one point for identifying either factor individually. Question 13 (Q13) awarded one point for identifying either a non-healing oral ulcer or a white or red patch as a potential warning sign. The total score was calculated by summing the points obtained across the relevant items. The same scoring criteria were applied to the pre-intervention and post-intervention assessments.

Statistical Analysis

Data were analysed using International Business Machines Corporation (IBM) Statistical Package for the Social Sciences (SPSS) Statistics Armonk, New York, USA, version 25.0. Participant characteristics were summarized using frequencies and percentages. Awareness scores at baseline and after the intervention, together with individual paired score differences, were described using means and standard deviations.

A two-sided paired-samples t-test was used to compare the mean awareness scores before and after the educational intervention. The mean paired difference was calculated, and an approximate 95% confidence interval (CI) of 2.73–3.67 points was reported. Statistical significance was set at probability (p) < 0.05. Changes in individual questionnaire items were examined descriptively using percentage-point differences between pre-intervention and post-intervention responses.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Ethics Committee. Participation was voluntary, and students' willingness to participate was considered an eligibility requirement.

Results

A total of 180 students completed both pre-intervention and post-intervention assessments. The majority were male (163, 90.6%), while 17 (9.4%) were female. More than half of the participants (98, 54.4%) were aged 16–17 years, followed by 56 (31.1%) aged 18–19 years. Regarding the year of study, second-year students constituted the largest proportion (81, 45.0%), followed by first-year students (49, 27.2%), diploma students (41, 22.8%), and third-year students (9, 5.0%). With respect to current tobacco use, 20 students (11.1%) reported tobacco use, whereas 141 (78.3%) reported no current use. Responses from the remaining 19 students (10.6%) were classified as unclear or not applicable. The demographic characteristics and tobacco-use status of the participants are presented in Table 1

Table 1: Participant characteristics (N = 180)

Characteristic	Category	n (%)
Gender	Male	163 (90.6)
	Female	17 (9.4)
Age group	16–17	98 (54.4)
	18–19	56 (31.1)
	20–21	16 (8.9)
	22–25	10 (5.6)
Year of study	Second year	81 (45.0)
	First year	49 (27.2)
	Diploma	41 (22.8)
	Third year	9 (5.0)
Current tobacco use	No	141 (78.3)
	Yes	20 (11.1)
	Unclear/not applicable	19 (10.6)

The mean awareness score increased from 10.14 ± 4.19 before the educational intervention to 13.34 ± 3.32 after the intervention. The mean paired increase was 3.20 ± 3.17 points, with an approximate 95% confidence interval (CI) of 2.73–3.67. This improvement was statistically significant, as demonstrated by the paired-samples t-test $t(179) = 13.54$, $p < 0.001$. Individual score changes showed that 146 students (81.1%) improved, 15 (8.3%) had no change, and 19 (10.6%) experienced a decrease in their scores are presented in Table 2.

Table 2: Paired awareness scores and direction of change (N = 180)

Measure	Result
Before, mean $\pm$ SD	10.14 ± 4.19
After, mean $\pm$ SD	13.34 ± 3.32
Paired change, mean $\pm$ SD	3.20 ± 3.17
Approximate 95% CI for change	2.73–3.67
Paired t test	$t(179) = 13.54$; $p < 0.001$

Measure	Result
Improved	146 (81.1%)
Unchanged	15 (8.3%)
Decreased	19 (10.6%)

The post-intervention response percentages were higher than the pre-intervention percentages across all 15 questionnaire items are presented in Table 3. The greatest increase was observed in the recognition of oral cancer risk factors, which rose from 48.9% to 76.1%, representing a 27.2-percentage-point increase. This was followed by improvements in knowledge of tobacco-related diseases (43.5% to 65.7%; 22.2 percentage points), perceptions regarding the influence of tobacco use on peer acceptance (50.6% to 71.7%; 21.1 percentage points), awareness of the association between early detection and improved oral cancer survival (56.1% to 76.7%; 20.6 percentage points), and concern about the health effects of tobacco on oneself and family members (54.4% to 74.4%; 20.0 percentage points). In contrast, the smallest increase was observed in knowledge of the age group at greater risk of oral cancer, which increased from 52.8% to 56.7% (3.9 percentage points). These findings indicate improvements in reported awareness and attitudes following the educational session, although the magnitude of change varied across questionnaire items.

Table 3: Pre- and post-intervention item percentages

Question	Before (%)	After (%)	Difference (pp)
Awareness of tobacco-related health harms	68.9	84.4	15.5
Knowledge of where to seek help for quitting tobacco	53.3	70.6	17.3
Knowledge of tobacco-related diseases	43.5	65.7	22.2
Recognition of oral cancer risk factors	48.9	76.1	27.2
Recognition of early signs of oral cancer	51.7	71.1	19.4
Belief that early detection improves oral cancer survival	56.1	76.7	20.6
Knowledge of the age group at greater risk of oral cancer	52.8	56.7	3.9
Belief that tobacco use improves peer acceptance	50.6	71.7	21.1
Belief that tobacco reduces stress	58.9	66.1	7.2
Concern about tobacco's health effects on self and family	54.4	74.4	20.0
Belief that occasional tobacco use is harmful	61.7	73.3	11.6
Support for oral cancer screening among tobacco users	63.3	70.6	7.3
Perceived adequacy of oral cancer knowledge	48.3	58.9	10.6
Perceived need for oral cancer awareness programmes	63.9	76.1	12.2

Question	Before (%)	After (%)	Difference (pp)
Willingness to participate in oral cancer screening	58.9	68.9	10.0

Differences are calculated from displayed rounded percentages; they may differ by 0.1 percentage point from calculations based on unrounded counts. For knowledge of tobacco-related diseases and recognition of oral cancer risk factors, confirm whether percentages represent full item correctness, mean points divided by maximum points, or another definition.

Discussion

The present study demonstrated a statistically significant increase in oral cancer and tobacco awareness scores following an educational intervention among college students in Jamnagar, Gujarat. The mean paired improvement was 3.20 points (95% CI: 2.73–3.67), and 146 students (81.1%) showed an increase in their scores. However, 15 students (8.3%) showed no change, while 19 (10.6%) recorded lower post-intervention scores. These findings indicate that the overall improvement was not uniform across participants. The greatest descriptive gains were observed in the recognition of oral cancer risk factors and knowledge of tobacco-related diseases, whereas knowledge of the age group at greater risk of oral cancer showed comparatively little change. Collectively, these results highlight the potential value of structured educational sessions while identifying specific areas that may require further reinforcement.

The observed improvement is consistent with the broader evidence supporting educational approaches to oral cancer awareness. Vibhakar et al. (2021) [6] evaluated a structured instructional module among 500 pre-university students divided into experimental and control groups of 250 participants each. Their study reported significant improvements in knowledge, attitudes, and practices in the experimental group. Although the direction of the findings is comparable, the inclusion of a control group in their study provides a stronger basis for distinguishing intervention-associated changes from other influences. Similarly, Ahuja et al. (2022) [7] conducted a systematic review of 27 studies and reported that most educational interventions improved oral cancer knowledge, although differences in study designs and assessment instruments complicated comparisons across studies. The findings of the present study add to this evidence by demonstrating a measurable increase in scores within a college-based population. Nevertheless, the magnitude of improvement should not be compared directly with studies using different questionnaires, scoring ranges, or follow-up periods.

An important finding was the substantial increase in recognition of oral cancer risk factors, from 48.9% before the intervention to 76.1% afterward, representing a 27.2-percentage-point difference. Knowledge of tobacco-related diseases also increased considerably, from 43.5% to 65.7%, while general awareness of tobacco-related health risks increased from 68.9% to 84.4%. This pattern suggests that familiarity with general anti-tobacco messages may coexist with gaps in knowledge about specific diseases and carcinogenic exposures. Asthana et al. (2019) [8] reported an association between smokeless tobacco use and oral cancer in a systematic global review and meta-analysis. Their findings reinforce the importance of addressing smokeless tobacco alongside smoked products in educational programmes. Awareness initiatives should also explain the risks associated with areca nut consumption and other established exposures. Linking these risks to practical preventive measures may help students develop a more comprehensive understanding of oral cancer prevention.

Recognition of early warning signs increased from 51.7% to 71.1%, while awareness that early detection can improve oral cancer survival increased from 56.1% to 76.7%. Despite these gains, the percentage recognizing warning signs remained lower than the percentage endorsing the importance of early detection. This distinction is relevant because understanding the value of early diagnosis does not necessarily ensure that individuals can identify potentially suspicious oral changes. Bhat et al. (2020) [9] examined oral cancer awareness among non-healthcare students in Bengaluru and identified gaps in the recognition of specific oral symptoms. Although their cross-sectional study did not evaluate an educational intervention, it provides useful context for understanding the difference between general awareness and the ability to recognize warning signs. In the present study, knowledge of the age group at greater risk of oral cancer increased by only 3.9 percentage points, from 52.8% to 56.7%. This comparatively small change may reflect differences in baseline knowledge, the content delivered, or the way the question was understood. Further investigation of the item wording and educational material would be necessary before drawing conclusions about the reasons for this limited change.

The variation in item-level responses also raises questions about the intensity and delivery of educational interventions. Nayak et al. (2018) [10] assessed an application-based educational approach for improving oral cancer knowledge and reported improvements following the intervention. Their findings suggest that digital educational tools may offer an additional means of delivering oral cancer information to students. However, the present study did not compare

different educational formats, and it therefore cannot establish whether digital learning, classroom instruction, or repeated exposure would produce greater improvements. Kakodkar et al. (2022) [11] reviewed school-based tobacco prevention programmes conducted in India between 2000 and 2020, highlighting the relevance of educational interventions in adolescent populations. Although school-based programmes may differ from college-based initiatives in content and implementation, both settings offer opportunities to introduce preventive messages before harmful behaviours become established. Future programmes could investigate whether follow-up sessions, digital reminders, or interactive learning activities improve knowledge retention.

Attitudinal responses require careful interpretation because changes in response percentages do not necessarily represent favourable changes in attitudes. The percentage associated with the item concerning tobacco use and peer acceptance increased by 21.1 percentage points, while that concerning the perceived stress-reducing effects of tobacco increased by 7.2 percentage points. These differences can be interpreted as improvements only if the reported percentages represent appropriate responses, such as rejecting these beliefs. If they represent agreement with the beliefs, the interpretation would be different. The original response coding should therefore be checked before describing these findings as favourable attitudinal changes. Concern about the effects of tobacco on personal and family health increased from 54.4% to 74.4%, while awareness that occasional tobacco use can be harmful increased from 61.7% to 73.3%. These items address different aspects of risk perception and social beliefs and should not be treated as interchangeable indicators. Furthermore, changes in reported concern or attitudes cannot, by themselves, establish a reduction in tobacco consumption.

The findings relating to oral cancer screening indicate a distinction between supporting screening in principle and expressing personal willingness to participate. Support for screening among tobacco users increased from 63.3% to 70.6%, whereas willingness to participate in screening increased from 58.9% to 68.9%. These changes suggest greater stated receptiveness to screening-related activities, but they do not demonstrate actual participation. Singh et al. (2017) [12] evaluated health education supported by pictorial brochures among 85 men aged 15–59 years in Chandigarh and reported an increase in mean awareness scores from 5.3 to 6.7. Their study also assessed oral self-examination, which was performed by 77 participants. Unlike the present study, their evaluation included a reported behavioral outcome. However, oral self-examination is not equivalent to attending a professional oral cancer screening examination, and the two outcomes should be distinguished. Future evaluations could therefore measure not only screening awareness and willingness but also actual attendance, referral completion, and other relevant preventive actions.

Knowledge of where to obtain assistance for tobacco cessation increased from 53.3% to 70.6%, representing a 17.3-percentage-point improvement. Nevertheless, knowledge of cessation support remained below general awareness of tobacco-related health risks after the intervention. This finding suggests that educational sessions may benefit from providing explicit information about cessation services and referral pathways alongside information about tobacco-related harm. Awareness of available support, however, should not be interpreted as evidence that participants subsequently accessed these services. Ghasemian et al. (2024) [13] conducted a cluster-randomized controlled trial among 400 adults in Tehran, comparing a presentation-plus-pamphlet approach with WhatsApp-based education. The study assessed oral cancer-related knowledge and tobacco-smoking outcomes and reported improvements following educational intervention, with knowledge outcomes favouring the presentation group. Differences between these findings and those of other digital education studies indicate that the effectiveness of a delivery format may depend on the population, intervention content, frequency of exposure, and outcome measured. Because the present study involved a single educational session and immediate reassessment, it cannot determine which educational format would be most effective or whether the observed gains would persist.

Further evidence supporting the need for longer-term evaluation comes from Dhanapriyanka et al. (2023) [14], who investigated a health promotion intervention among 240 vulnerable young people aged 15–24 years in Sri Lanka using intervention and control groups with six-month follow-up. Mean knowledge scores increased from 4.4 to 7.2 in the intervention group, compared with a change from 4.6 to 4.7 in the control group. The study also examined selected practices related to tobacco chewing and oral self-examination. Although the participants' age range overlaps with that of the present study, differences in setting, intervention components, baseline exposures, and scoring instruments limit direct numerical comparisons. Nevertheless, the inclusion of a control group and longer follow-up illustrates the value of assessing whether knowledge gains are sustained and accompanied by changes in preventive practices. Future research among college students could incorporate repeated assessments to examine knowledge retention, tobacco initiation or cessation, use of cessation services, and participation in appropriate oral health examinations.

Several methodological considerations should be taken into account when interpreting the present findings. First, the single-group before-and-after design does not include an untreated comparison group, limiting the ability to attribute the observed changes exclusively to the educational intervention. Repeated exposure to the questionnaire, participants'

desire to provide socially acceptable responses, and other influences may also have contributed to the differences. Second, the immediate post-intervention assessment provides no evidence regarding the durability of the observed improvements. Third, the composite score combined awareness and attitude items, which represent related but distinct constructs. The scoring system also assigned different weights to certain questions, including multiple-response items, which should be clearly explained when interpreting the total score. In addition, item-level changes were examined descriptively; without paired item-level statistical tests and corresponding confidence intervals, differences between individual items should not be interpreted as statistically significant. The predominance of male participants (90.6%) and students aged 16–17 years (54.4%) may also limit the generalizability of the findings to more diverse student populations. Finally, the small change in knowledge of the age group at greater risk highlights the importance of examining individual learning outcomes rather than relying exclusively on an overall score.

Overall, the findings indicate that an educational session was followed by higher oral cancer and tobacco awareness scores among college students, with improvements observed across all 15 questionnaire items at the descriptive level. The largest percentage-point gains concerned recognition of oral cancer risk factors and knowledge of tobacco-related diseases, whereas knowledge of the age group at greater risk showed a comparatively limited change. These findings support the inclusion of specific risk-factor information, recognition of warning signs, and clear guidance on tobacco cessation support in college-based educational programmes. Future studies should use controlled designs, longer follow-up periods, and separate measures of knowledge, attitudes, and behaviour to determine whether immediate improvements in questionnaire scores translate into sustained preventive practices.

Limitations

The study does not establish whether awareness was retained over time or whether tobacco use changed. The predominantly male sample also limits generalizability. Item percentages were analyzed descriptively; they do not establish statistically significant changes for individual questions.

Conclusion

Oral cancer and tobacco awareness scores were higher after the educational intervention among the 180 college students assessed in Jamnagar. Most students improved, although some showed no change or lower scores. College-based education may help address gaps in awareness, but controlled studies with later follow-up and separate behavioural measures are needed to evaluate sustained benefits.

Conflicts of Interest: Nil

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References

1. World Health Organization. Oral health [Internet]. Geneva: WHO; 2025 Mar 17 [cited 2026 Sep 28]. Available from: <https://www.who.int/news-room/fact-sheets/detail/oral-health>
2. Ray CS, Gupta PC. Oral cancer in India. *Oral Dis*. 2025;31(5):1439–1454. doi:10.1111/odi.14974.
3. International Agency for Research on Cancer. Oral cancer prevention. *IARC Handb Cancer Prev*. 2023;19:1–358. Available from: <https://publications.iarc.who.int/Book-And-Report-Series/Iarc-Handbooks-Of-Cancer-Prevention/Oral-Cancer-Prevention-2023>
4. Terwee CB, Prinsen CAC, Chiarotto A, Westerman MJ, Patrick DL, Alonso J, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. *Qual Life Res*. 2018;27(5):1159–1170. doi:10.1007/s11136-018-1829-0.
5. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39(2):175–191. doi:10.3758/BF03193146.
6. Vibhakar V, et al. Effectiveness of a structured instructional module regarding the prevention of oral cancer among adolescents in urban colleges. *J Pharm Bioallied Sci*. 2021;13(Suppl 1):S167–S170. doi:10.4103/jpbs.JPBS_633_20.
7. Ahuja NA, Kedia SK, Ward KD, Pichon LC, Chen W, Dillon PJ, et al. Effectiveness of interventions to improve oral cancer knowledge: a systematic review. *J Cancer Educ*. 2022;37(3):479–498. doi:10.1007/s13187-021-01963-x.
8. Asthana S, Labani S, Kailash U, Sinha DN, Mehrotra R. Association of smokeless tobacco use and oral cancer: a systematic global review and meta-analysis. *Nicotine Tob Res*. 2019;21(9):1162–1171. doi:10.1093/ntr/nty074.

9. Bhat PK, Sushma SG, Jayachandra MY, Aruna CN, Murthy M. Awareness about oral cancer among nonhealth professional students: a cross-sectional study in Bengaluru city. *J Oral MaxillofacPathol*. 2020;24(3):492–498. doi:10.4103/jomfp.JOMFP_304_20.
10. Nayak PP, Nayak SS, Sathiyabalan D, Aditya NK, Das P. Assessing the feasibility and effectiveness of an app in improving knowledge on oral cancer: an interventional study. *J Cancer Educ*. 2018;33(6):1250–1254. doi:10.1007/s13187-017-1239-y.
11. Kakodkar PV, Kale SS, Bhor KB, Sidhu AK. Systematic review of school-based tobacco prevention programs for the adolescents in India from 2000 to 2020. *Indian J Cancer*. 2022;59(3):317–324. doi:10.4103/ijc.IJC_1206_20.
12. Singh K, Sharma D, Kaur M, Gauba K, Thakur JS, Kumar R. Effect of health education on awareness about oral cancer and oral self-examination. *J Educ Health Promot*. 2017;6:27. doi:10.4103/jehp.jehp_82_15.
13. Ghasemian A, Sargeran K, Khami MR, Shamshiri AR. Effects of educational interventions based on the theory of planned behavior on oral cancer-related knowledge and tobacco smoking in adults: a cluster randomized controlled trial. *BMC Cancer*. 2024;24:45. doi:10.1186/s12885-024-11845-2.
14. Dhanapriyanka M, Kanthi RDFC, Jayasekara P. Effectiveness of health promotion intervention on the knowledge and selected practices related with oral cancer among a group of vulnerable youth in Sri Lanka. *BMC Public Health*. 2023;23:1355. doi:10.1186/s12889-023-16298-z.