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Knowledge, Attitudes, and Oral Health Literacy Regarding Tobacco and Substance Use among Students of Medical Sciences

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Abstract

Background

Tobacco and substance use are associated with various oral health consequences, while knowledge, attitudes, and oral health literacy are important factors related to exposure to these consequences. The present study aimed to assess knowledge and attitudes regarding the oral health consequences of tobacco and substance use and their association with oral health literacy among student of medical sciences in Iran.

Methods

This cross-sectional analytical study was conducted during the 2025–2026 academic year on 225 medical sciences students from across Iran who were enrolled at Arak University of Medical Sciences at the time of the study; these individuals were selected using stratified random sampling. Data were collected using a questionnaire assessing knowledge and attitudes regarding tobacco products and substances, as well as the Adult Oral Health Literacy–Adult Questionnaire (OHL-AQ), and were analyzed using SPSS version 27.

Results

The mean scores for knowledge, attitudes, and oral health literacy were 7.37 ± 1.07, 25.24 ± 4.51, and 10.86 ± 3.00, respectively. A significant positive correlation was observed between knowledge and oral health literacy ($\rho = 0.329$, $P < 0.001$), as well as between knowledge and attitudes ($\rho = 0.326$, $P < 0.001$). In contrast, no significant association was found between attitudes and oral health literacy ($\rho = 0.016$, $P = 0.807$). Furthermore, knowledge and oral health literacy scores differed significantly according to sex, field of study, and parental educational level ($P < 0.05$).

Conclusion

Iranian medical sciences students demonstrated a relatively favorable level of knowledge and attitude regarding the oral health consequences of using tobacco products and other substances. Given that the students in this study came from diverse cultural backgrounds across Iran, it is recommended that health education programs for medical sciences students emphasize both the cognitive and skill-based dimensions of oral health—while accounting for variables such as sex, field of study, and parental education level.

Background

Oral health is an integral component of overall health, and despite the high preventability of oral diseases, they continue to impose a substantial burden on individuals and healthcare systems worldwide. Among modifiable risk factors, tobacco use is considered an important factor associated with oral diseases and has been linked to outcomes such as periodontal diseases and oral cancer [1, 2]. However, available evidence indicates that knowledge, attitudes, and oral health-related behaviors are not necessarily aligned, and differences may exist among these dimensions [3–4]. Therefore, assessing knowledge and attitudes toward the oral health consequences of tobacco use may contribute to a better understanding of these dimensions in health-related populations.

In addition to possessing health-related information, an individual's ability to understand and use oral health information for informed decision-making is important. This ability is encompassed by the concept of oral health literacy (OHL). Oral health literacy is a multidimensional concept that encompasses aspects ranging from understanding information to skills related to the use of information and health decision-making [5–6].

Health sciences students, as future members of the healthcare team, are in a position to play a role in communicating and providing health-related information to patients [7]. Studies conducted among students from various health sciences disciplines have also reported differences in oral health-related knowledge, attitudes, and behaviors [8]. Although previous studies among student populations have examined knowledge and attitudes regarding the oral health consequences of tobacco use, as well as oral health literacy, these topics have largely been investigated as separate components [3, 9]. Therefore, simultaneous assessment of these components may contribute to a better understanding of the relationships among knowledge, attitudes, and oral health literacy among health sciences students.

Given the increasing prevalence of tobacco use among young people and adolescents and the detrimental effects of this risk factor on oral and dental health, examining the importance of knowledge, attitudes, and oral health literacy in promoting health, as well as addressing the oral consequences of tobacco use in young populations, is of considerable importance. Therefore, the present study was conducted to determine knowledge and attitudes regarding the effects of tobacco use on oral health and their association with oral health literacy among students of Medical Sciences.

Methods

Study Design and Setting

This analytical cross-sectional study was conducted during the 2025–2026 academic year, involving 225 full-time, active students from across Iran who were enrolled at Arak University of Medical Sciences in the fields of medicine, dentistry, nursing, paramedical sciences, public health, and rehabilitation.

The sample size was calculated based on a correlation coefficient test, assuming an expected correlation coefficient of 0.20, a significance level of 0.05, and 80% power, using Fisher's transformation. The calculated sample size was 194 participants. Considering a 10% probability of non-response or

unusable data, the required sample size was determined to be 214 participants. Ultimately, 225 students were included in the final analysis.

In this study, stratified sampling was performed based on the field of study, with allocation proportional to the size of each stratum, and participants were selected using simple random sampling within each stratum. The inclusion criteria were active, full-time enrollment, completion of at least one academic semester, and the ability to understand the Persian language. The exclusion criteria included students who withdrew from further participation or submitted incompletely completed questionnaires.

Data Collection Instruments

In the present study, in addition to collecting students' demographic information (age, sex, field of study, history of parental substance use, household size, parents' occupations, and parents' educational levels), the remaining data were collected using two instruments.

The first instrument was a questionnaire assessing knowledge and attitudes toward tobacco products and substances and their associated consequences, adapted from the questionnaire used in the study by Roustaeezadeh et al..[10]. The questionnaire included personal and background information, familiarity with tobacco products and substances, 10 knowledge questions, and 7 attitude items. The knowledge section assessed the consequences of the use of these substances on oral and dental health. Scores of 1, 0.5, and 0 were assigned to correct, "I don't know," and incorrect responses, respectively, resulting in a total knowledge score ranging from 0 to 10. A score of 6 or higher was considered indicative of good knowledge. The attitude section consisted of 7 items rated on a five-point Likert scale, with a total score ranging from 7 to 35; a score of 22 or higher was considered indicative of a favorable attitude [10].

The second instrument was the **Oral Health Literacy–Adult Questionnaire (OHL-AQ)**, which was developed and validated by Naghibi Sistani et al.[11] This instrument consists of 17 scored items across four domains: reading comprehension, numeracy, listening, and decision-making. A score of 1 was assigned to each correct response, whereas incorrect or "I don't know" responses received a score of 0. The total score ranged from 0 to 17, with higher scores indicating a higher level of oral health literacy. In the present study, no cutoff point was established for this instrument, and the score was analyzed as a continuous variable.

Data Analysis

Data were analyzed using SPSS version 27 (IBM Corp., Armonk, NY, USA). Categorical variables were described using frequencies and percentages, while continuous variables were described using the mean ± standard deviation, median, and interquartile range. The normality of the distributions of knowledge, attitude, and oral health literacy scores was assessed using the Shapiro–Wilk test. Given the non-normal distribution of the scores, Spearman's correlation coefficient was used to assess

correlations between the main scores and quantitative variables. Comparisons of scores between two groups were performed using the Mann–Whitney U test, while comparisons among more than two groups were performed using the Kruskal–Wallis test. A significance level of 0.05 was considered statistically significant.

Ethical Considerations

This study was conducted following approval by the Ethics Committee of Arak University of Medical Sciences (code: IR.ARAKMU.REC.1405.161). Before enrollment, the study objectives were explained to the participants, and informed consent was obtained. Participation was voluntary, and participants' information was kept confidential; the results were reported without identifying personal information. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Demographic Characteristics of the Participants

A total of 225 students participated in the study, including 111 (49.3%) males and 114 (50.7%) females. The mean age of the participants was 23.83 ± 3.21 years, with ages ranging from 19 to 39 years. Regarding field of study, the largest proportion of participants were dental students, with 63 students (28.0%), followed by medical students, with 37 students (16.4%). Nursing, public health, laboratory sciences, midwifery, and anesthesia students accounted for 33 (14.7%), 32 (14.2%), 26 (11.6%), 21 (9.3%), and 13 (5.8%) participants, respectively.

No history of parental substance use was reported for 187 participants (83.1%), whereas such a history was reported for 38 participants (16.9%). The most common household size was four members, comprising 93 participants (41.3%). Regarding fathers' occupations, 147 participants (65.3%) had fathers who were employees, 57 (25.3%) had fathers who were self-employed, and 21 (9.3%) had fathers who were manual workers. Fathers' educational levels were reported as illiterate for 3 participants (1.3%), below diploma level for 51 (22.7%), associate degree for 143 (63.6%), and master's degree for 28 (12.4%). Mothers' educational levels were reported as illiterate for 11 participants (4.9%), below diploma level for 76 (33.8%), associate degree for 114 (50.7%), and master's degree for 24 (10.7%). Other demographic and background characteristics of the participants are presented in Table 1 (Table 1).

Knowledge, Attitude, and Oral Health Literacy Scores

The mean knowledge score among the students was 7.37 ± 1.07, with a median of 8 and a range of 4.5 to 10. Based on the predefined cutoff point, 202 participants (89.8%) were classified as having good knowledge, while 23 (10.2%) were classified as having poor knowledge.

The mean attitude score was 25.24 ± 4.51, with a median of 26 and a range of 9 to 35. Based on the predefined cutoff point, 172 participants (76.4%) had a favorable attitude, whereas 53 (23.6%) had an unfavorable attitude.

The mean oral health literacy score was 10.86 ± 3.00, with a median of 11 and a range of 1 to 16. Descriptive statistics for knowledge, attitude, and oral health literacy are presented in Table 2 (Table 2).

Assessment of the Distribution of Knowledge, Attitude, and Oral Health Literacy Scores Related to Tobacco Use

The results of the Shapiro–Wilk test indicated that the distributions of knowledge, attitude, and oral health literacy scores deviated significantly from a normal distribution. The Shapiro–Wilk statistics for knowledge, attitude, and oral health literacy scores were 0.874, 0.938, and 0.947, respectively, with $P < 0.001$ in all three cases. Accordingly, nonparametric tests were used for the inferential analyses.

In this study, a significant positive correlation was observed between knowledge and oral health literacy scores ($\rho = 0.329$, $P < 0.001$). Likewise, knowledge scores were significantly and positively correlated with attitude scores ($\rho = 0.326$, $P < 0.001$). In contrast, no significant association was observed between oral health literacy and attitude scores ($\rho = 0.016$, $P = 0.807$). Details of these analyses are presented in Table 3 (Table 3).

Association of Demographic and Background Characteristics with Knowledge, Attitude, and Oral Health Literacy

A significant positive correlation was observed between age and knowledge score ($\rho = 0.137$, $P = 0.040$), although the strength of this association was weak. No statistically significant association was observed between age and oral health literacy score ($\rho = 0.090$, $P = 0.178$) or between age and attitude score ($\rho = 0.044$, $P = 0.516$).

Regarding sex, a statistically significant difference in knowledge scores was observed between males and females ($U = 4795.000$, $P = 0.001$), with a higher mean rank for knowledge scores among female students. Oral health literacy scores also differed significantly between the two sexes ($U = 4790.500$, $P = 0.002$), with female students having a higher mean rank. In contrast, the difference in attitude scores between males and females was not statistically significant ($U = 5690.000$, $P = 0.188$).

Analysis by field of study showed statistically significant differences among the different fields in knowledge scores ($H = 56.229$, $P < 0.001$), attitude scores ($H = 15.102$, $P = 0.019$), and oral health literacy scores ($H = 82.163$, $P < 0.001$). The highest mean rank for knowledge was observed among dental students (156.67), while the lowest was observed among anesthesia students (54.08). For attitude, the highest mean rank was observed among midwifery students (151.26), and the lowest among public health students (90.23). Similarly, the highest mean rank for oral health literacy was observed among dental students (168.47), whereas the lowest was observed among anesthesia students (62.42).

Regarding fathers' educational level, statistically significant differences were observed among the different educational groups in knowledge scores (H = 17.846, P < 0.001), attitude scores (H = 12.817, P = 0.005), and oral health literacy scores (H = 21.576, P < 0.001). The mean rank for knowledge ranged from 65.17 among students whose fathers were illiterate to 133.80 among those whose fathers had a master's degree. For oral health literacy, the mean rank ranged from 10.17 among students whose fathers were illiterate to 152.93 among those whose fathers had a master's degree. Regarding attitude, the highest mean rank was observed among students whose fathers had an associate degree (124.64).

Analysis of mothers' educational level showed a statistically significant difference among the different educational groups in knowledge scores (H = 11.369, P = 0.010). A significant difference was also observed in oral health literacy scores according to mothers' educational level (H = 19.509, P < 0.001). In contrast, the difference in attitude scores among the different maternal educational groups was not statistically significant (H = 3.792, P = 0.285). The highest mean rank for oral health literacy was observed among students whose mothers had a master's degree (149.25), whereas the lowest was observed among those whose mothers were illiterate (70.55).

Finally, analysis of parental substance use history showed no statistically significant differences between students with and without a history of parental substance use in terms of knowledge scores (U = 3050.000, P = 0.149), attitude scores (U = 2937.000, P = 0.089), or oral health literacy scores (U = 2958.000, P = 0.102). Detailed results of the statistical tests examining demographic and background characteristics are presented in Table 4 (Table 4).

Sources of Information About Tobacco Products and Their Oral Health Consequences

The most common source of information among students regarding tobacco products and their oral health consequences was dentists, reported by 160 participants (71.1%). This was followed by the internet, reported by 150 participants (66.7%); friends, 102 (45.3%); family members, 100 (44.4%); books, 97 (43.1%); and television, 87 (38.7%). In addition, 36 participants (16.0%) reported newspapers and 9 (4.0%) reported other sources as sources of information. Detailed information regarding the sources of information is presented in Table 5 (Table 5).

Discussion

The findings of this study showed that students had relatively favorable levels of knowledge and attitudes regarding the oral health consequences of tobacco products and substance use. The mean knowledge score regarding the oral health consequences of tobacco products and substance use was 7.37 out of 10, and 89.8% of the participants demonstrated good knowledge. This finding may be attributable to students' familiarity with the theoretical aspects of tobacco use through relevant educational materials within the medical sciences curriculum. This finding is consistent with the study by Bastani et al. among Iranian health sciences students, although differences in assessment

instruments limit direct comparison [12]. In contrast, Mohebbi et al. reported lower levels of oral health knowledge and attitudes among medical students at Tehran University of Medical Sciences, which improved following an educational intervention [13].

Similarly, Hashemipour et al., despite reporting adequate knowledge and attitudes toward smoking cessation counseling, identified deficiencies in some of its specialized dimensions[14].

Therefore, the favorable level of knowledge observed in the present study should be interpreted within the context of the content of the assessment instrument and solely as an indication of awareness of the oral health consequences of tobacco and substance use.

In the present study, the mean attitude score of the students toward factors associated with the inclination to use tobacco products and substances was 25.24 out of 35, and 76.4% of the participants demonstrated a favorable attitude. This finding was consistent with the studies by Keshavarz et al. and Hashemipour et al., who reported favorable attitudes toward tobacco control and smoking cessation counseling among Iranian dental students[14–15]. However, differences in the content of the assessment instruments limit direct comparisons. In addition, Razavi et al. showed that self-reported readiness to adhere to tobacco cessation protocols was not necessarily accompanied by appropriate performance in delivering cessation interventions [16]. Therefore, a favorable attitude in the present study cannot, by itself, be considered indicative of readiness for practical intervention.

In the present study, the mean oral health literacy score was 10.86 ± 3.00 out of 17. Given the absence of a predefined cutoff point for the OHL-AQ, this score can only be interpreted quantitatively, and the adequacy of oral health literacy cannot be determined. This mean score was close to that reported by Naghibi Sistani et al. among adults in Tehran (10.5 out of 17); in that study, higher educational attainment and the use of multiple sources of information were associated with higher oral health literacy[16]. Furthermore, Yazdani et al. investigated this construct using the OHL-AQ among medical and pharmacy students in Tehran; however, differences in the study populations and academic fields limit direct comparison of the findings [17].

In the present study, knowledge was positively and significantly associated with oral health literacy and attitudes, whereas no significant association was observed between oral health literacy and attitudes. This finding was consistent with the studies by Taheri et al. and Rad et al., which reported associations between certain components of oral health knowledge and attitudes [19 – 18]. Furthermore, a positive association between knowledge and oral health literacy was reported in a study conducted among students at Jenderal Soedirman University [20]. Differences in the nature of these constructs may explain the absence of an association between oral health literacy and attitudes; however, given the cross-sectional design of the study, these relationships should be interpreted as associative rather than causal.

In the present study, female students had higher scores for knowledge and oral health literacy than male students, whereas the difference in attitudes was not statistically significant. This finding was consistent

with the studies by Bastani et al. and Naghibi Sistani et al., which reported sex-related differences in certain components of knowledge and oral health literacy [16, 12]. Age was also positively, but weakly, associated only with knowledge and was not associated with attitudes or oral health literacy. The relatively narrow age range and the predominantly young age of the participants may have contributed to this finding.

In the present study, knowledge, attitudes, and oral health literacy differed significantly according to academic field. Dental and anesthesia students had the highest and lowest ranks, respectively, for knowledge and oral health literacy. This finding was consistent with the results reported by Bastani et al., but differed from the study by Janatolmakan et al., which found no differences in knowledge and attitudes among medical and nursing students regarding toothbrush care[21, 12]. Differences in the study topic, assessment instruments, and characteristics of the study populations may explain this discrepancy. In addition, the extent of exposure to oral health content across different academic fields, although not directly assessed in the present study, may have contributed to the observed differences.

In the present study, paternal educational attainment was significantly associated with knowledge, attitudes, and oral health literacy, whereas maternal educational attainment was significantly associated with knowledge and oral health literacy but not with attitudes. Given the role of parents as role models, these findings highlight the importance of empowering mothers and improving their attitudes in this regard so that they can effectively serve as role models for their adolescents. This finding was consistent with the studies by Taheri et al. and Basir et al. regarding the association between parental educational attainment and certain components of oral health[19, 22]. Differences in the study populations and assessment instruments limit direct comparisons, and given the cross-sectional design, these associations cannot be considered causal. In addition, a history of parental substance use was not significantly associated with any of the main study variables.

In the present study, dentists (71.1%) and the internet (66.7%) were the most important sources of information about tobacco products and their oral health consequences. This finding was consistent with the study by Naghibi Sistani et al., which identified dentists and mass media as important sources of oral health information[16]. However, the quality and credibility of the information received were not assessed; therefore, more frequent use of a particular source does not necessarily imply that the information obtained was accurate or reliable. Nevertheless, empowering dentists and providing accurate information through reputable online sources may improve students' access to reliable information regarding the effects of tobacco products on oral health.

Among the strengths of the present study were the inclusion of a diverse sample from different fields of health sciences and the use of random sampling from different schools. The main limitations of the present study were its cross-sectional design, which limits causal interpretation, and the use of self-reported data, which may have affected the quality of the information collected. To address this issue, efforts were made to improve the quality of the collected data by explaining the study objectives and emphasizing the voluntary nature of participation. Future studies with larger sample sizes among

adolescents before entering university, as well as educational interventions delivered to students by dentists and physicians, are recommended.

Conclusion

Although the health sciences students included in the present study demonstrated favorable levels of knowledge and attitudes regarding the oral health consequences of tobacco and substance use, their oral health literacy was below the moderate level. The positive associations of knowledge with attitudes and oral health literacy, together with the observed differences according to sex, academic field, and parental educational attainment, suggest that improving knowledge alone may not be sufficient to enhance all health-related dimensions. Given the role of dentists and the internet as the most important sources of information, the development of targeted educational programs and the use of reliable information resources may be considered to improve oral health literacy and strengthen preventive attitudes among health sciences students.

Declarations

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Ethics approval and consent to participate

All participants were informed about the study and confidentiality protocols informed consent was obtained from all the participants.

The present study was approved by the Research Council of Arak University of Medical Sciences (Grant Number: 8059).

The Ethics Committee of Arak University of Medical Sciences confirmed the morality and ethics of that study; (IR.ARAKMU.REC.1405.161).

All the procedures performed in the study involving human participants, were in accordance with the ethical standards. After granting the consent of the patients, the aim of the study, the methodology, and the advantages and disadvantages of the study were explained to them. The participants were assured that they are not obliged to participate in the research and that they can leave it whenever they wish. They were also assured of the confidentiality of their information

Consent for publication

Not applicable.

Availability of data and materials

Upon request, we can offer onsite access to external researchers to the data analyzed at Arak University of Medical Sciences, Arak, Iran .

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

The authors' responsibilities were as follows: Study design: MM, MSHE, MH, MB, and MSH and; data collection: MSHE; analysis and interpretation of the data: MM, MSH,MSHE; drafting of the manuscript: MSHE, MH,MM,MB, and MSH,; critical revision of the manuscript: MM, MSH, MB and MH; study supervision: MM. All authors read and approved the final manuscript.

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Tables

Tables 1-5 are available in the Supplementary Files section.

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Supplementary Files

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