

Assessment of Oral and Periodontal Health Literacy among Medical Students and Faculty: A Cross-sectional Study

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ABSTRACT

Introduction: Oral and periodontal diseases are highly prevalent and contribute substantially to systemic inflammation, impaired daily functioning, and reduced quality of life. Because oral health is closely interconnected with general health, medical practitioners play a crucial role in early detection, initial management, and timely referral of dental and periodontal conditions.

Aim: To evaluate the knowledge, awareness, and attitudes regarding oral and periodontal health among undergraduate and postgraduate medical students and teaching faculty members.

Materials and Methods: This cross-sectional questionnaire-based study was conducted in the Department of Periodontology at the UPUMS, Saifai, Etawah, Uttar Pradesh, India, from January 2023 to June 2023. The sample size calculated was 1000, out of which 992 completed the questionnaire. Medical students and faculty were included, which were further categorised into three groups: undergraduate medical students (Group I), postgraduate medical students (Group II), and medical faculty members with senior residents (Group III). A structured, pre-tested and validated closed-ended 20 questionnaire assessed knowledge (Q1-5), awareness (Q6-14), and attitudes (Q15-20) toward oral and periodontal health. Demographic parameters such as age, gender, and level of education were recorded and

considered during analysis. Data were analysed using Statistical Package for Social Sciences (SPSS) version 21.0, and group comparisons were made using the Chi-square test ($p < 0.05$ considered significant).

Results: Significant differences were found across all groups ($p < 0.001$). Faculty members demonstrated the highest levels of knowledge and awareness, followed by undergraduate and postgraduate students. Most participants (Group I: 77.6%, Group II: 70%, Group III: 98.9%) recognised dental plaque and calculus as primary aetiological factors, though only a minority of undergraduates (31.7%) had received professional brushing instruction. Awareness of systemic implications, such as the link between periodontal diseases and cardiovascular or diabetic conditions, increased with professional level. Attitude scores indicated that faculty exhibited the most positive outlook toward oral health promotion (91.3%) and referral practices (86.9%).

Conclusion: The study revealed substantial gaps in knowledge and awareness about oral and periodontal health among medical undergraduates, emphasising the need for integrating oral health education into the medical curriculum. Enhanced interdisciplinary collaboration and targeted educational initiatives could improve early identification, preventive counselling, and referral practices for oral health care.

Keywords: Health promotion, Oral hygiene, Periodontitis, Preventive dentistry, Surveys and questionnaires

INTRODUCTION

Sir William Osler's described the mouth as "the mirror of general health," aptly emphasising the close interrelationship between oral health and overall systemic well-being. Oral health is a fundamental component of general health, influencing an individual's ability to eat, speak, communicate, and maintain an acceptable quality of life [1]. Among oral diseases, periodontal diseases have emerged as a significant public health concern due to their high global prevalence and chronic inflammatory nature. More importantly, a growing body of evidence has established a bidirectional relationship between periodontal diseases and various systemic conditions, underscoring their broader clinical relevance [2,3].

Periodontal inflammation is known to contribute to an increased systemic inflammatory burden through the release of pro-inflammatory cytokines, acute-phase proteins, and alterations in lipid metabolism. These changes may play a role in the pathogenesis or progression of systemic diseases such as cardiovascular disorders, diabetes mellitus, adverse pregnancy outcomes, and respiratory diseases. Conversely, systemic conditions can influence periodontal health by modifying host immune responses and increasing susceptibility to periodontal breakdown. For instance, chronic periodontitis is widely regarded as the sixth complication of diabetes mellitus, while hormonal changes during pregnancy are known to exacerbate gingival inflammation [4].

In the Indian context, particularly in rural and semi-urban areas, access to dental care remains limited, and awareness regarding oral health is often inadequate. As a result, individuals frequently consult medical practitioners rather than dental professionals for oral health concerns. This places medical professionals in a pivotal position to serve as the first point of contact for patients with oral and periodontal conditions. Therefore, it is imperative for them to possess adequate knowledge and awareness of common oral diseases, their systemic implications, and appropriate referral pathways. Such competence can facilitate early detection, timely intervention, and improved overall patient care, while also promoting preventive oral health practices.

Despite the recognised importance of interdisciplinary collaboration between medical and dental professionals, several studies conducted both globally and within India have reported variable levels of knowledge, awareness, and attitudes toward oral health among medical practitioners and students [5-12]. These inconsistencies highlight persistent gaps in medical education and training with respect to oral health. Moreover, region-specific data are scarce, particularly from Institutions such as Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah, where no comprehensive assessment has been undertaken to evaluate these parameters.

Understanding the baseline knowledge, awareness, and attitudes of medical students and faculty in this setting is essential for identifying

existing gaps and designing targeted educational interventions. Furthermore, such data can contribute to strengthening interdisciplinary collaboration between medical and dental fields, ultimately improving patient outcomes. Therefore, the present study was undertaken with the primary objective of assessing the level of knowledge, awareness, and attitudes toward oral and periodontal health among undergraduate and postgraduate medical students and teaching faculty at UPUMS, Saifai, Etawah, Uttar Pradesh. The secondary objective was to compare these parameters across the three groups.

The null hypothesis (H0) stated that there is no significant difference in knowledge, awareness and attitude toward oral and periodontal health among the three groups.

The alternative hypothesis (H1) stated that a significant difference exists among them.

MATERIALS AND METHODS

This cross-sectional questionnaire-based study was conducted in the Department of Periodontology at the UPUMS, Saifai, Etawah, Uttar Pradesh, India. The study was carried out over a period of six months from January 2023 to June 2023. Ethical approval for the study was obtained from the Institutional Ethics Committee (IEC) of UPUMS (Approval No. 2/2021-22). Written informed consent was obtained from all participants before their inclusion in the study, and confidentiality of the collected data was ensured.

Sample size calculation: G*Power software (version 3.1.9.4) was used to calculate the sample size. Based on prior research [13] and maintaining the study's power at 95% with conventional values of alpha error at 0.05 and an effect size of 0.14 (as determined from the previous study), the minimum sample size calculated was 900 participants. Considering an anticipated attrition/non response rate of 10%, the final sample size was increased to 1000 participants. A total of 1000 participants were approached, of which 992 completed the questionnaire adequately and were included in the final analysis, yielding a response rate of 99.2%.

Inclusion criteria: The study included MBBS undergraduate students, MD/MS postgraduate medical students (all the specialties of medical science), senior residents, and medical teaching faculty members who were willing to participate and provided written informed consent.

Exclusion criteria: Individuals who did not consent to participate or submitted incomplete questionnaires or students and faculty from non medical fields were excluded from the study.

Study Procedure

Participants were categorised into three groups:

- Group I (undergraduate medical students, n=700);
- Group II (postgraduate medical students, n=200); and
- Group III (teaching faculty members and senior residents, n=92).

A structured questionnaire comprising 20 closed-ended, pretested, and validated self-administered items was designed to assess participants' knowledge, awareness, and attitudes regarding oral and periodontal diseases. The questionnaire evaluated understanding of aetiopathogenesis, prevention, risk factors, systemic associations, and the role of medical professionals in oral health promotion. The questionnaire consisted of two sections. The first section included the demographic details of the participants, while the second section comprised a 20-item structured questionnaire.

These questions were categorised into knowledge-based (Q1-5), awareness-based (Q6-14), and attitude-based (Q15-20) items. The questionnaire contained both single-response (e.g., tools to maintain oral hygiene) and multiple-response items (e.g., specialties of dentistry). The scoring was based on correct responses without any negative marking.

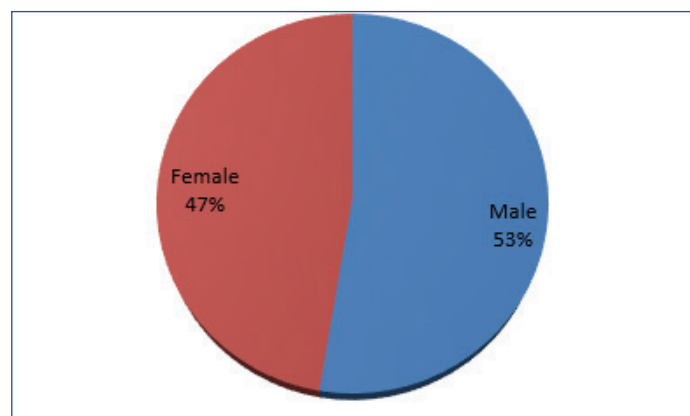
The questionnaire used in the present study was developed after an extensive review of previously published Knowledge, Attitudes and Practices (KAP) surveys related to oral and periodontal health. To ensure content validity, the initial draft was evaluated by a panel of five experts from the Departments of Periodontology and community medicine, who assessed each item for clarity, relevance, and appropriateness. Necessary modifications were made based on their feedback. Face validity was established by conducting a pilot test among 30 medical students who were not included in the final sample. The internal consistency of the questionnaire was assessed using Cronbach's alpha, which yielded a value of 0.82, indicating good reliability. The pilot study also confirmed that the questionnaire was easy to understand, required no further modifications, and was suitable for large-scale administration. The questionnaire was distributed to participants and responses were collected and analysed.

STATISTICAL ANALYSIS

Data were entered and analysed using the SPSS version 21.0 for Windows. Descriptive statistics, including frequencies and percentages, were used to summarise responses. Comparative analysis between groups was performed to evaluate differences in knowledge, awareness, and attitudes. Chi-square test was used to compare categorical variables across groups; $p < 0.05$ was considered significant.

RESULTS

A total of 992 participants who were willing to participate were included in the study, comprising 700 undergraduate students (group I), 200 postgraduate students (group II), and 92 faculty members/senior residents (group III). The remaining eight participants were excluded from the study due to incomplete or inadequately filled questionnaires. The gender distribution across the groups is shown in [Table/Fig-1], however, it was not used for comparative analysis.



[Table/Fig-1]: Gender distribution of the study.

Knowledge-based Responses

Significant differences were observed among the three groups as shown in [Table/Fig-2] ($p < 0.001$). Faculty members/senior residents demonstrated the highest proportion of correct responses, followed by postgraduate and undergraduate students. Most participants correctly identified dental plaque, calculus, and local inflammation as aetiological factors for periodontal diseases, although this knowledge was more consistently observed in groups II and III. Recognition of smoking as a major risk factor was substantially higher among faculty members. Only a small proportion of undergraduate students had previously received professional instruction on proper brushing techniques compared with 73.9% of group III participants.

Awareness-based Responses

Awareness regarding systemic effects and complications of dental diseases also showed statistically significant differences ($p < 0.05$) as shown in [Table/Fig-3]. While misconceptions were common among

S. No.	Questions	Options	Correct responses			χ^2 -value	p-value
			Group I n (%)	Group II n (%)	Group III n (%)		
1.	What are the factors responsible for gum/periodontal diseases	a. Dental plaque and calculus b. Inflammation of the tongue c. Smoking d. Dental caries	543 (77.6%)	140 (70%)	91 (98.9%)	453.70	<0.001
2.	What are the tools to maintain oral hygiene	a. Tooth brushes and paste b. Interdental brush c. Dental floss d. All of the above	345 (49.3%)	176 (88%)	76 (82.6%)	129.41	<0.001
3.	How many times it is advised to brush your teeth	a. Once daily b. Twice daily c. Trice daily	406 (58.0%)	182 (91.0%)	84 (91.3%)	124.41	<0.001
4.	Have you ever been demonstrated by professional the right technique for brushing	a. Yes b.No	222 (31.7%)	90 (45.0%)	68 (73.9%)	66.01	<0.001
5.	It is better not to brush your teeth when the gum bleeds	a. Agree b. Disagree c. Don't know	322 (46.0%)	107 (53.5%)	52 (56.5%)	35.65	<0.001

[Table/Fig-2]: Responses of medical professionals based on knowledge of oral and periodontal health.

Chi-square test, p-value<0.05 statistically significant.

S. No.	Questions	Options	Correct responses			χ^2 -value	p-value
			Group I n (%)	Group II n (%)	Group III n (%)		
1.	What adverse effect does scaling have on teeth	a. Thinning of teeth b. Increase in mobility of tooth c. Both d.None	123 (17.57%)	60 (30.0%)	60 (65.2%)	139.76	<0.001
2.	Tooth extraction may lead to problem in vision	a. Agree b. Disagree c. Don't know	141 (20.1%)	116 (58.0%)	60 (65.2%)	185.59	<0.001
3.	If a tooth comes out accidentally, is it possible to replace it in the jaw?	a. Yes b.No c. Don't know	262 (37.4%)	78 (39.0%)	56 (60.9%)	34.59	<0.001
4.	Which is the speciality of dentistry	a. Prosthodontics b. Ododontics c. Periodontics d. Hypodontics	284 (40.57%)	72 (36%)	64 (69.5%)	193.49	<0.001
5.	Gums/periodontal diseases is a risk factor for	a. Peptic ulcer b. Heart attack c. Infective endocarditis d. Myocardial infarction	524 (74.9%)	176 (88.0%)	88 (95.7%)	127.68	<0.001
6.	Does pregnancy increases the risk of gum/periodontal problems?	a. Yes b. No c. Don't know	384 (54.7%)	110 (55.0%)	60 (65.2%)	11.08	0.026
7.	Oral disease have an effect on systemic diseases/conditions like it can lead to low birth baby	a. Agree b. Disagree c. Don't know	383 (51.8%)	90 (45.0%)	56 (60.9%)	9.69	0.046
8.	Does periodontal disease can affect the blood sugar levels in diabetic patients?	a. Yes b. No c. Don't know	363 (53.4%)	90 (45.0%)	68 (73.9%)	27.81	<0.001
9.	Which life threatening condition may be because of untreated dental disease	a. Cavernous sinus b. Ludwig's angina c. Both d. None	199 (28.4%)	128 (64.0%)	60(65.2%)	144.44	<0.001

[Table/Fig-3]: Responses of medical professionals based on awareness of oral and periodontal health.

Chi-square test p-value<0.05 statistically significant; p-value <0.001 highly significant

undergraduates- such as believing that tooth extraction affects vision-postgraduates and faculty members demonstrated greater awareness.

Attitude-based Responses

Attitude-based questions also showed significant intergroup differences ($p<0.001$) as shown in [Table/Fig-4]. Faculty members

exhibited the most positive attitudes toward oral health care and referral practices, followed by postgraduate students. Although most respondents across all groups acknowledged the importance of routine dental check-ups and the role of medical professionals in promoting oral health, group I demonstrated comparatively lower recognition of the impact of untreated oral diseases on overall health and clinical practice.

S. No.	Questions	Options	Correct responses			χ^2 -value	p-value
			Group I n (%)	Group II n (%)	Group III n (%)		
1.	Have you noticed gum changes in patient taking anti-hypertensive and/or anti-convulsant drugs	a. Yes b. No c. Don't know	206 (29.42%)	158 (79.0%)	76 (82.6%)	209.85	<0.001
2.	If yes, have you referred those patients to a dentist/ Periodontist	a. Yes b. No c. Not answered	386 (55.14%)	158 (79.0%)	80 (86.9%)	25.55	<0.001

3.	Will routine dental check-up improve quality of life	a. Agree b. Disagree c. Don't know	524 (74.85%)	188 (94.0%)	84 (91.3%)	32.08	<0.001
4.	General practitioner can also be an oral health promoter	a. Yes b. No	585 (83.6%)	176 (88.0%)	84 (91.3%)	5.42	0.066
5.	As a medical graduate/postgraduate, do you think you should know more about oral cavity and oral disease	a. Yes b. No	546 (78.0%)	182 (91.0%)	80 (87.0%)	19.43	<0.001
6.	Lack of treatment of oral disease may affect your clinical practice	a. Agree b. Disagree c. Neither agree nor disagree	404 (57.7%)	158 (79.0%)	72 (78.3%)	49.33	<0.001

[Table/Fig-4]: Responses of medical professionals based on attitude towards oral and periodontal health.

Chi-square test p-value <0.05 statistically significant, p-value <0.001 highly significant

DISCUSSION

The present study evaluated the knowledge, awareness, and attitudes related to oral and periodontal health among medical undergraduates, postgraduates, and faculty members. Overall, participants demonstrated a satisfactory baseline understanding of oral and periodontal health; however, notable gaps-particularly among undergraduate students- highlight the need for strengthened oral health- related education within the medical curriculum. Based on the observed statistically significant differences among the groups, the null hypothesis was rejected, and the alternative hypothesis was accepted, indicating that knowledge, awareness, and attitudes toward oral and periodontal health varied significantly with the level of education and clinical experience.

The present study assessed a large population from rural North India and included three distinct levels of medical education- undergraduate students, postgraduate trainees, and faculty members. Most previous studies have focused exclusively on students, whereas the inclusion of postgraduate trainees and faculty in the present study allowed a more comprehensive evaluation of oral health knowledge, awareness, and attitudes across academic hierarchies. Jadhav BJ et al., assessed first-year undergraduate students from various disciplines at a university in Maharashtra [14], while Verma L et al., evaluated postgraduate students at Punjab University [13]. Nagrik A et al., included interns, postgraduates, and faculty members; however, their study population (n=180) was considerably smaller than that of the present study (n=992), limiting the scope of comparison [5].

Gender has been reported to influence attitudes toward oral health. In the present study, no statistically significant difference was observed between male and female participants. In contrast, Farsi NJ et al., reported better oral health knowledge and practices among female participants [15]. This difference may be attributed to greater health consciousness, increased concern for aesthetics, and more frequent dental visits among females, leading to better oral health awareness.

Senior residents and faculty members consistently demonstrated the highest proportion of correct responses, particularly regarding the aetiological factors of periodontal disease, recommended brushing frequency, and appropriate oral hygiene aids. These findings support previous evidence suggesting that increased clinical exposure and professional experience enhance understanding of periodontal disease pathophysiology and preventive strategies. Deeksheetha P and Priyashashoni P (2019) reported that 55% of doctors recognised dental plaque and calculus as the primary causes of gingivitis and periodontitis [16]. In the present study, 77.6% of undergraduate students, 70% of postgraduate students, and 98.9% of faculty members correctly identified plaque and calculus as the main etiological factors (Q1, [Table/Fig-2]). However, a significant gap was observed in practical exposure: only 31.7% of undergraduate students (Q4, [Table/Fig-2]) reported being professionally instructed in toothbrushing techniques, with the proportion increasing progressively with education and experience. Similar trends have been reported in studies from India and Malaysia

[5,11]. Tom K observed that only 22.67% of medical students had received professional instruction in toothbrushing techniques [11].

Awareness of the bidirectional relationship between periodontal diseases and systemic conditions- such as diabetes mellitus, cardiovascular disease, adverse pregnancy outcomes, and infective endocarditis- was highest among faculty members. Previous studies have reported that up to 90% of medical students acknowledge the importance of oral health in maintaining systemic health [17]. However, other studies have shown that only 76.6% of students were aware of the association between diabetes and periodontitis, and just 32.1% recognised its link with cardiovascular disease [18]. In the present study, only 53.4% of undergraduate students were aware of the relationship between diabetes and periodontitis, while 74.9% (Q5, [Table/Fig-3]) recognised periodontal diseases as a risk factor for cardiovascular disease, indicating incomplete understanding among future medical practitioners.

Attitudes toward professional responsibility in oral health care were generally positive across all groups. However, only 29.42% (Q1 [Table/Fig-4]) of undergraduate students reported noticing drug-induced gingival enlargement, and just 55.14% (Q2 [Table/Fig-4]) of these students referred affected patients to a dentist or periodontist. In contrast, postgraduate students and faculty members demonstrated higher awareness and referral practices. Timely referral to dental professionals is essential for effective management of periodontal conditions. Razi MA, reported that only 44.44% of medical professionals routinely referred patients to dentists when required [7]. Another important finding from the present study was the positive attitude toward the role of general practitioners as oral health promoters. Responses to this item did not differ significantly among groups (p=0.066), indicating widespread acceptance of this responsibility (Q4, [Table/Fig-4]).

The significant intergroup difference observed in the present study underscores the urgent need to reinforce oral health education during undergraduate medical training. Evidence suggests that incorporating structured oral health modules- such as the Smile for Life curriculum- can improve physicians' competence in oral health assessment and patient counseling [19]. In a country like India, where the burden of periodontal diseases remains high, equipping medical professionals with adequate oral health knowledge is critical for early detection, timely referral, and prevention of systemic complications. Physicians with improved knowledge can better counsel patients on risk factor modification (e.g., smoking cessation and glycaemic control), promote interdisciplinary referrals to periodontists, and mitigate healthcare costs associated with delayed diagnoses-potentially lowering India's estimated annual economic burden from oral diseases, which exceeds 4.6% of global health cost [20,21].

Future curricula should be dynamic and adaptable, incorporating a continuous process of assessment, refinement, and improvement. Teaching should be aligned with emerging evidence in oral health, evolving clinical practices, and the integration of oral health into routine healthcare. Faculty development should be fostered through observation, guided teaching, and constructive

feedback [22]. A major strength of the present study is its large sample size (n=992) and inclusion of participants across multiple academic levels, allowing meaningful intergroup comparisons.

Limitation(s)

The present study has certain limitations. Being a single-centre, cross-sectional study, the generalisability of the findings is limited, and causal relationships cannot be established. Additionally, potential confounding factors such as prior dental knowledge, personal oral health practices, and access to dental care were not analysed, which may have influenced the results. Future multicentric studies with consideration of these factors are recommended.

CONCLUSION(S)

Overall, the study highlights substantial gaps in knowledge and awareness among undergraduate medical students, while postgraduate trainees and faculty members exhibit comparatively better understanding and attitudes. Strengthening oral-health training in the medical curriculum and promoting interprofessional collaboration may help bridge these gaps and improve patient care.

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AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Feb 10, 2026
- Manual Googling: Jun 27, 2026
- iThenticate Software: Jun 30, 2026 (7%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

Date of Submission: Jan 22, 2026
Date of Peer Review: Mar 14, 2026
Date of Acceptance: Jul 02, 2026
Date of Publishing: Sep 01, 2026