RESEARCH PAPER

Awareness and knowledge of Periodontitis and its Relationship with Cardiovascular Diseases (CVDs) among dental and medical students: A Cross-sectional Questionnaire-Based study

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ABSTRACT

Introduction: Periodontitis is a highly common inflammatory disease that contributes significantly to the worldwide burden of chronic disorders. Systemic translocation of periodontal pathogenic microbes can cause inflammation and formation of atherosclerotic plaque, among other cardiovascular diseases (CVDs). The knowledge among dental and medical students regarding the sequelae of chronic periodontitis and its potential risk leading to cardiovascular diseases is limited.

Aim: This study aims to evaluate Awareness and Knowledge of Periodontitis and its Relationship with Cardiovascular Diseases (CVDs) Among Dental and Medical Students.

Materials and methods: This study was a questionnaire survey, conducted utilising a self-administered questionnaire to evaluate dental and medical students. The questionnaire contained two sections. The Participants' demographic information was included in the first section, and the questions in the second section evaluated the knowledge of the participants regarding gum diseases and their potential to CVDs. A set of Dichotomous yes/no questions and a 5-point Likert scale were employed to assess the students' awareness and attitude regarding the role of periodontal pathogens in CVDs.

Results: A total number of 540 participant responses were collected in the study. The majority were between the ages of 17 and 21 (61.4%), and 75.9% were female. Most participants (79.6%) have knowledge about gum-related diseases, and a significant number of students were aware that gum diseases can potentially cause MI/Stroke/Heart attack (72.2%).

Conclusion: Most participants possessed the baseline knowledge and the awareness regarding gum diseases and the interrelationship between periodontitis and CVDs; however, medical students displayed a higher awareness in

comparison to dental students. This study highlights the necessity for professional counselling and awareness campaigns to be organized by dental and medical professionals and clinicians for young professional students.

Keywords: Periodontal Diseases; Health Knowledge, Attitudes, Practice; Students, Dental; Students, Medical; Cross-sectional studies.

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.Introduction

Chronic periodontitis is a very common and prevalent inflammatory disease caused by oral gram-positive bacteria that contribute significantly to the burden of noncommunicable diseases globally[1–3]. Initially, the bacteria form a biofilm of plaque, which leads to gingivitis followed by periodontitis. There exists a known bilateral relationship in between periodontitis and various systemic conditions like CVDs[2,4]Oral microbial pathogens translocated directly or indirectly can cause systemic inflammation potentially leading to atherosclerosis and coronary artery disease (CADs) along with other CVDs[5] .Various factors such as the immune response of the host, social and physical stresses, smoking and nutrition deficit may additionally play a role in the pathogenesis and progression of the disease[5,6].Apart from CVDs, periodontitis has been linked as a potential risk in various other systemic conditions such as Diabetes mellitus (DM), chronic renal diseases, preterm labour and low birth weight[4] Awareness and education on the aetiology, prevention and potential progression of chronic periodontitis to cardiovascular diseases is prerequisite for the successful management and prevention[7]

A Scoring system was developed by Nesse et al. in 2008 to evaluate the systemic burden caused by chronic periodontitis. This system was called the Periodontal inflamed surface area (PISA) score[8] Subsequently, a study conducted in 2018 by Balaji et. al revealed a very high prevalence of periodontal disease in the urban study population of South India (<18 years of age) of up to 42.3%. Their findings demonstrated that Periodontal inflamed surface area (PISA) scores, Oral hygiene index (OHI) scores, Missing or filled teeth score, age, smoking and various other scores were found to have a direct association with periodontitis [9]. Furthermore, Balaji et. al determined that this high prevalence exists in areas with access to oral health care, indicating lack of awareness and lack of education among the urban youth[8,9]

The etiology, management, diagnosis, and treatment of periodontitis, as well as the relationship of periodontitis and CVDs, must be understood by medical and dental students[6].This study aims to evaluate the knowledge and awareness of periodontitis and its potential relationship with CVDs among the undergraduate dental and medical students.

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Materials and Methods

Study Design and Ethical Considerations

A cross-sectional questionnaire survey was conducted among 540 BDS and MBBS students over a duration of 2 months from December 2025 to January 2026. The ethical clearance was obtained from the Internal review board of Adhiparasakthi Dental College and Hospital with the ethical clearance number: 2025/IRB-PERIO-04/APDCH. Informed consent was obtained from all the participants of this study. This study included undergraduate MBBS and BDS students from the 1st year to the final year, including internship.

Inclusion Criteria

Students enrolled in BDS, MBBS and willing to participate in the survey were included in the study.

Exclusion Criteria

Students enrolled in courses other than MBBS and BDS and students unwilling to participate in the questionnaire survey were excluded from the study.

Sample size calculation

The minimum sample size for this study was calculated using the standard formula for comparison of two different proportions. A 95% confidence interval was assumed ($Z_{\alpha/2}$ = 1.96) and an 80% statistical power (Z_{β} = 0.84) and an estimated proportion of 0.41 for the BDS group(p_1)and 0.59 for the MBBS group(p_2) the minimum sample size required for the study was determined to be 116 participants per group, (a total of minimum 232 samples). However to increase the statistical power and the accuracy of the finding a total of 540 students

(290 BDS and 250 MBBS) participated and included in the final study.

Data collection

A Structured Questionnaire comprising 20 questions was formulated by adapting questions from similar previously published studies. To ensure the validity of the questionnaire used as the survey instrument of this research, successful and validated peer-reviewed studies were referred [2,6,7,10]. The questionnaire was distributed anonymously to the participants through a Google Form link.

Questionnaire Description

A set of dichotomous yes/no questions and a 5-point Likert scale (strongly disagree to strongly agree) were employed to evaluate the students' awareness and attitude regarding the role of periodontal pathogens in CVDs, myocardial infarction and the impact of lifestyle modifications. These questions were primarily adapted from the study conducted by Bawankar et al., which uses a similar format and division of sections [2]. The present study comprised two sections: the first section contained the participants' demographic details, and the second section contained questions assessing the knowledge and awareness of the participants regarding gum diseases and their potential to cause CVDs such as atherosclerosis. The selection of the specific study population of medical and dental students for the study was derived from other studies, like Kattel et. al. and Priyanka et.al. [6,10]. These studies validate the need to assess the knowledge and awareness of the periodontitis-CVDs link among medical and dental undergraduate students.

Statistical analysis

The responses collected were analysed using SPSS version 22.0. Descriptive statistical tests were used to calculate the percentages and frequencies of the responses in four sections: Demographic and baseline characteristics of the participants, dichotomous yes/no responses-based questions of the survey which were employed to assess the basic knowledge, primary sources of information were calculated and questions including the 5-point Likert scale responses that assessed the awareness of the potential relationship between periodontitis and CVDs. Inferential statistics, The Chi-square test was used to compare the knowledge and awareness of MBBS and BDS students. (p-value of <0.05).

Results

A total number of 540 participant responses were collected from the questionnaire survey out of which 290 students were from the BDS course and 250 students were from the MBBS course. The demographic baseline characteristics of the respondents are summarised in **Table 1**. The majority were between the ages of 17 and 21 (61.4%), especially BDS students. There exists an overall female predominance of 66.7% in which BDS students have a higher female representation in comparison to MBBS. The BDS students were mostly from the 3rd and 4th year (33.1% and 32.4%), where MBBS students were more evenly distributed.

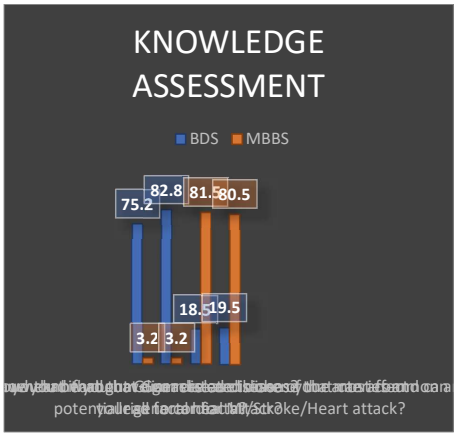
Table/Fig 1 Demographic and Baseline Characteristics

Characteristic	Category	BDS (n=290)	MBBS (n=250)	Total (N=540)
Age Group	17-21	178 (61.4 %)	120 (48.0 %)	298 (55.2 %)
	22-25	110 (37.9 %)	115 (46.0 %)	225 (41.7 %)
	26 above	2 (0.7%)	15 (6.0%)	17 (3.1%)
Gender	Male	70 (24.1 %)	110 (44.0 %)	180 (33.3 %)
	Female	220 (75.9 %)	140 (56.0 %)	360 (66.7 %)
Year of Study	I year	46 (15.9 %)	45 (18.0 %)	91 (16.9 %)
	II year	36 (12.4 %)	48 (19.2 %)	84 (15.6 %)
	III year	96 (33.1 %)	52 (20.8 %)	148 (27.4 %)
	IV year	94 (32.4 %)	55 (22.0 %)	149 (27.6 %)
	Internship	18 (6.2%)	50 (20.0 %)	68 (12.6 %)

n: number of participants in the specific group; N: Total number of participants; BDS: Bachelor of Dental Surgery; MBBS: Bachelor of Medicine and Bachelor of Surgery

The responses of the dichotomous yes/no style questions to assess the baseline knowledge and general awareness of the students are graphically represented in **Figure 2.** All of the questions in this section showed a significant difference between BDS and MBBS students. ($P<0.01$). MBBS students consistently showed a higher awareness regarding the existence of a link between periodontal and CVDs.

Figure 2: Knowledge Assessment: Comparison of General Awareness Between BDS and MBBS Students



A statistically significant difference was observed in the primary sources of information from which BDS and MBBS students gathered their knowledge about Gum diseases. ($p < 0.001$). BDS students primarily obtained their information from dentists, whereas the responses of MBBS students regarding their primary source of information about gum diseases was more diverse including, dentists, cardiologists, mass media and others (graphically represented in **Figure 3**).

Figure 3: Source of Information About Gum Disease: Comparison Between BDS and MBBS Students

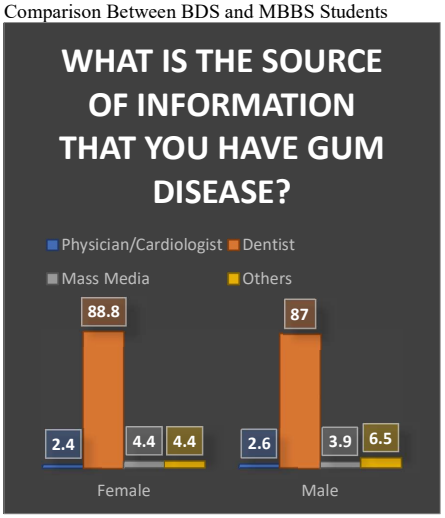


Table 4 summarises the data about the assessment of awareness based on the responses obtained from the 5-point Likert scale-based questions. There was a statistically significant difference in the level of awareness between the two groups across all the responses (exact p- values ranging from 0.001 to 0.004). A larger percentage of MBBS students strongly agreed to most statements in comparison to BDS students, indicating a greater awareness regarding the systemic sequelae of periodontitis and potential risk of cardiac diseases.

Table 4: Awareness Assessment: Comparison of Knowledge Statements Between BDS and MBBS Students

Statement	Response	BDS (n=290)	MBBS (n=250)	Total (N=540)	p-value
Patients with cardiovascular disease are more prone to gum infections than normal persons.	SA	21(7.2%)	58(23.2%)	79(14.6%)	<.001
	A	184(63.4%)	152(60.8%)	336(62.2%)	
	NAND	55 (19.0%)	28 (11.2%)	83 (15.4%)	
	D	16 (5.5%)	8 (3.2%)	24 (4.4%)	
	SD	14 (4.8%)	4 (1.6%)	18 (3.3%)	
Bleeding gums and loose teeth requires immediate dental management.	SA	103(35.5%)	112 (44.8%)	215(39.8%)	<.001
	A	150(51.7%)	118 (47.2%)	268(49.6%)	
	NAND	11 (3.8%)	12 (4.8%)	23 (4.3%)	
	D	5 (1.7%)	4 (1.6%)	9 (1.7%)	
	SD	21 (7.2%)	4 (1.6%)	25 (4.6%)	
Microorganisms in Oral cavity play a significa	SA	35 (12.1%)	68 (27.2%)	103(19.1%)	<.001
	A	193(66.6%)	142 (56.8%)	335(62.0%)	

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nt role in the initiation and progression of atherosclerosis.	NAND	37 (12.8 %)	28 (11.2 %)	65 (12.0 %)	
	D	14 (4.8%)	8 (3.2%)	22 (4.1%)	
	SD	11 (3.8%)	4 (1.6%)	15 (2.8%)	
Increased load of pathogenic oral microorganism is associated with Myocardial infarction.	SA	36 (12.4 %)	62 (24.8 %)	98 (18.1 %)	<.001
	A	180(62.1%)	138 (55.2 %)	318(58.9%)	
	NAND	46 (15.9 %)	32 (12.8 %)	78 (14.4 %)	
	D	21 (7.2%)	12 (4.8%)	33 (6.1%)	
	SD	7 (2.4%)	6 (2.4%)	13 (2.4%)	
Drugs prescribed for Hypertension can cause gingival overgrowth.	SA	48 (16.6 %)	72 (28.8 %)	120(22.2%)	<.001
	A	182(62.8%)	138 (55.2 %)	320(59.3%)	
	NAND	38 (13.1 %)	24 (9.6%)	62 (11.5 %)	
	D	11 (3.8%)	10 (4.0%)	21 (3.9%)	
	SD	11 (3.8%)	6 (2.4%)	17 (3.1%)	
Treatment of periodontal disease help improve your biochemical parameters in case of cardiovascular diseases.	SA	37 (12.8 %)	58 (23.2 %)	95 (17.6 %)	<.001
	A	194(66.9%)	148 (59.2 %)	342(63.3%)	
	NAND	38 (13.1 %)	28 (11.2 %)	66 (12.2 %)	
	D	11 (3.8%)	10 (4.0%)	21 (3.9%)	
	SD	10 (3.4%)	6 (2.4%)	16 (3.0%)	
There is a relationship between gum disease and cardiovascular disease and other systemic diseases like diabetes, chronic kidney disease.	SA	50 (17.2 %)	82 (32.8 %)	132(24.4%)	<.001
	A	185(63.8%)	138 (55.2 %)	323(59.8%)	
	NAND	37 (12.8 %)	18 (7.2%)	55 (10.2 %)	
	D	7 (2.4%)	8 (3.2%)	15 (2.8%)	
	SD	11 (3.8%)	4 (1.6%)	15 (2.8%)	

SA: Strongly Agree; A: Agree; NAND: Neither Agree nor Disagree; D: Disagree; SD: Strongly Disagree; n: number of participants in the specific group; N: Total number of participants; BDS: Bachelor of Dental Surgery; MBBS: Bachelor of Medicine and Bachelor of Surgery; p-value: Indicates statistical significance ($p < 0.05$) derived from the Chi-square test.

Discussion

A cross-sectional questionnaire-based survey was used in this study to assess participants' awareness and knowledge of periodontitis and its link to systemic diseases like CVDs.among 540 Dental and Medical Students. The study's most significant finding was that, when compared to BDS students, MBBS students consistently showed a higher degree of knowledge and awareness regarding a relationship between periodontitis and cardiovascular disease ($p<0.01$). A comprehensive understanding of gum diseases and their etiopathogenesis and most importantly their potential to cause systemic complications, is essential especially, in students in the medical professions such as dentistry and medicine to ensure early and accurate diagnosis, interprofessional coordination and patient-centred care[10].

Although the general baseline knowledge regarding periodontitis was comparable in between the two populations, there was a significant variation in the knowledge of the systemic effects of periodontitis. 83.2% MBBS students were aware of the potential risk of MI/Stroke in comparison to only 62.8% of BDS students. A study by Kattel et al. conducted in undergraduate medical students from Nepal showed 95.9% students were aware of gum diseases such as periodontitis out of which only 32.1% students were

aware about its relationship with CVDs in contrast to the present study which displays a more encouraging result[6].

The present study shows a varying primary source of information. The BDS students heavily rely on dental professionals for their information (90.7%), whereas the MBBS students show more diversity in their primary source of information, gaining their knowledge not only from dentists (39.2%) but physicians/cardiologists(23.2%),and mass media(16.8%).From this difference in responses it can be inferred that a diverse source of information allows for a more comprehensive and multidisciplinary approach to oral diseases and relying on a single primary source for their information as in case of BDS students in the present study can cause a compartmentalised view on oral health[10,11].

The awareness of the potential relationship between periodontitis and cardiovascular diseases was assessed in the present study using a 5-point Likert scale. MBBS students were more likely to select "Strongly agree" as a response to most questions indicating a broader awareness regarding oral health and systemic diseases. For instance; 23.2% of MBBS (vs. 7.2% BDS) strongly agreed that cardiovascular patients are more susceptible to gum infections. 27.2% of MBBS (vs. 12.1% BDS) strongly agreed that oral microorganisms play a role in atherosclerosis. 32.8% of MBBS (vs. 17.2% BDS) strongly agreed that gum diseases are linked to systemic diseases such as diabetes and chronic kidney disease. In contrast, BDS students had higher proportions of "Disagree" or "Strongly Disagree" responses, suggesting less certainty or lower awareness.

These responses are similar to a study conducted by Priyanka et.al,[10] who observed a positive attitude towards periodontal health among medical students. In contrast, a study conducted by Gowri et al.,[12] reports a low understanding of periodontal health among professional students.

Limitations of the study: The data was collected using a self-administered questionnaire distributed through Google Form which may be at risk of response bias [6] As this study was based on an electronic form, the participants may have faced technical or accessibility issues. Future longitudinal, multicentric studies with a wider study population can provide a deeper insight on the interprofessional knowledge gap between medical and dental students.

Conclusion

This study highlights a significant number of respondents possessed the baseline knowledge and awareness regarding gum diseases and the relationship between periodontitis and CVDs however, MBBS students displayed a higher awareness in comparison to the BDS students demonstrating the importance of a diverse primary source of information and less reliance on only dental professionals for gaining knowledge as it can cause a singular and unidirectional approach to diagnosis and treatment of oral diseases. Awareness and knowledge regarding a potential relationship between periodontitis and CVDs can help in the early diagnosis, management and treatment of periodontitis and avoid its potential cardiovascular complications [10]

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Conflict of Interest: None declared.

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Appendix 1: Study Questionnaire

AMONG DENTAL AND MEDICAL STUDENTS: A CROSS-SECTIONAL QUESTIONNAIRE-BASED SURVEY

Section A: Demographic Details

1. Name of the Course: [ ] BDS [ ] MBBS [ ] Others
2. Age: [ ] 17-21 [ ] 22-25 [ ] 26 and above
3. Gender: [ ] Male [ ] Female
4. Year of Study: [ ] I year [ ] II year [ ] III year [ ] IV year [ ] Internship

Section B: Baseline Knowledge Assessment

5. Do you know about gum-related diseases? (Yes / No)
6. Do you know that if you have a gum-related disease that can affect your general health? (Yes / No)
7. Have you heard that gum diseases can thicken your arteries and can lead to a cardiac attack? (Yes / No)
8. Have you heard that gum disease is one of the most common and potential risk factors for MI†, stroke, or heart attack? (Yes / No)
9. What is the source of information that you have gum disease? (Physician or Cardiologist / Dentist / Mass media / Others)

Section C: Awareness and Attitude Assessment

Please indicate your level of agreement with the following statements using the 5-point scale below: (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree)‡

1. Patients with cardiovascular disease (heart disease) are more prone to gum infections than normal persons.
2. Bleeding gums and loose teeth require immediate dental management.
3. You have to be extra cautious about your oral health and visit a dentist regularly because you have cardiovascular problems.
4. It is necessary to inform your dentist if you have cardiovascular disease and regarding the medications that you are taking.
5. A change in your lifestyle, diet, and exercise can help improve heart health and also gum health.
6. Patients with periodontal disease have an increased prevalence and incidence of coronary heart disease.
7. Microorganisms in the oral cavity play a significant role in the initiation and progression of atherosclerosis.
8. An increased load of pathogenic oral microorganisms is associated with myocardial infarction.
9. Drugs prescribed for hypertension can cause gingival overgrowth.
10. Treatment of periodontal disease helps improve your biochemical parameters in case of cardiovascular diseases.
11. There is a relationship between gum disease and cardiovascular disease, and other systemic diseases like diabetes and chronic kidney disease.

Footnotes:

- CVDs: Cardiovascular Diseases † MI: Myocardial Infarction ‡ Evaluated using a standard 5-point Likert scale.