

# PIONEER JOURNAL OF DENTAL RESEARCH & HEALTH SCIENCE

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## ORIGINAL ARTICLES

- ✍ **Knowledge and Awareness of Periodontal Disease Among Patients: A Pilot Study on Malaysian Population** 01  
Vardhan AS, Krishnan A, Kumar DY, Sfiya A, Hakim A
- ✍ **Knowledge and Perception Regarding Impacted Teeth Among Dental and Medical Students in Malaysia: A Comparative Cross-Sectional Study** 06  
Faki B, Nihala FK, Gogula S, Afifah N, Munirah R
- ✍ **Association Between Face Form and Incisive Papilla to Maxillary Central Incisor Distance in Dentate Individuals** 13  
Nahar KN, Shahid H, Ansary JA

## CASE REPORTS

- ✍ **Surgical Management of an Infected Radicular Cyst: A Case Report** 21  
Awal A, Simu NN, Hussain MA
- ✍ **Oral Mucocele: A Case Report** 17  
Amin S, Kabir MA, Mamun MAA, Hossen R, Sikder S

## REVIEW ARTICLE

- ✍ **Halitosis: Aetiology, diagnosis and treatment - A review** 25  
Islam RR, Chowdhury AI, Hasan SM, Alam KM.



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# Knowledge and Awareness of Periodontal Disease Among Patients: A Pilot Study on Malaysian Population

Vardhan AS<sup>1\*</sup>, Krishnan A<sup>2</sup>, Kumar DY<sup>2</sup>, Sfiya A<sup>1</sup>, HakimA<sup>1</sup>

## Abstract

*Periodontal disease is a common chronic inflammatory condition that affects the supporting structures of the teeth and can significantly impact oral and systemic health. This study aimed to assess the knowledge and awareness of periodontal disease among patients attending the Lincoln University College Dental Clinic, Malaysia. A descriptive cross-sectional study was conducted among 112 adult patients using a structured self-administered questionnaire distributed through Google Forms. The questionnaire collected information on sociodemographic characteristics, oral hygiene practices, knowledge of periodontal disease, and awareness of the relationship between periodontal and systemic health. Data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics were used to summarize participant characteristics and response patterns, while Chi-square tests were employed to evaluate associations between demographic variables and periodontal disease awareness. The findings revealed that most participants demonstrated a satisfactory level of knowledge regarding the causes, signs, and prevention of periodontal disease. A high proportion recognized the importance of tooth brushing and regular dental visits in maintaining periodontal health. However, gaps were identified in preventive practices, particularly regarding flossing, professional scaling, and awareness of the association between periodontal disease and systemic conditions. Significant associations were observed between awareness levels and selected demographic factors, including age and employment status. The study highlights the need for continuous oral health education and targeted awareness programs to improve preventive behaviors and promote better periodontal health among dental patients.*

**Keywords:** Periodontal disease, gingivitis, oral hygiene, awareness, knowledge, dental patients, oral health  
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## Introduction

As the main site of entry into the human body, the oral cavity often reflects systemic health issues. Adequate nutrition, efficient communication, increased self-confidence, and a higher quality of life are all influenced by good oral health.<sup>1,2</sup> Periodontal disease continues to be one of the most common chronic oral illnesses and a major global public health concern.<sup>3,4</sup> Inflammatory disorders affecting the gingiva, periodontal ligament, cementum, and alveolar bone are together referred to as periodontal disease.<sup>4</sup>

Gingivitis is the initial and reversible stage of periodontal disease and primarily results from the accumulation of bacterial dental plaque biofilm.<sup>5,6</sup> Clinically, gingivitis is characterized by gingival redness, swelling, bleeding during toothbrushing or probing, and halitosis.<sup>5</sup> Gingivitis can develop into periodontitis, an irreversible disease marked by clinical attachment loss, alveolar bone degradation, periodontal pocket formation, tooth movement, and ultimately tooth loss, if treatment is not received.<sup>3,4</sup> The host immune-inflammatory response and pathogenic bacterial biofilm interact intricately in the pathophysiology of periodontal disease. *Porphyromonas gingivalis* and *Treponema denticola* are examples of periodontal infections that cause inflammation, response and pathogenic bacterial biofilm interact intricately in the pathophysiology of periodontal disease. *Porphyromonas gingivalis* and *Treponema denticola* are examples of periodontal infections that cause



inflammation, which in turn causes connective tissue degradation and alveolar bone resorption.<sup>4</sup> In addition to poor oral hygiene, a number of known risk factors—such as smoking, diabetes mellitus, ageing, psychological stress, poor diet, low socioeconomic position, and restricted access to dental care contribute to the onset and advancement of periodontal disease.<sup>3,7</sup>

There is mounting evidence that periodontal disease is closely linked to systemic disorders such as diabetes mellitus, cardiovascular disease, chronic respiratory diseases, poor pregnancy outcomes, and chronic kidney disease.<sup>3</sup> As a result, preventing and treating periodontal disease early on is crucial for maintaining both dental and general systemic health.<sup>1,3</sup> The prevention of periodontal disease is mostly determined by knowledge and awareness. Effective oral hygiene practices, such as frequent toothbrushing, interdental cleaning, and routine dental visits, are more likely to be practiced by those who possess sufficient knowledge about the causes, symptoms, risk factors, and preventative strategies of periodontal disease.<sup>8</sup> However, a number of studies have shown that awareness by itself does not always lead to suitable preventative measures, suggesting a disconnect between knowledge and real oral health behaviour.<sup>8,9</sup> Surveys conducted in different populations have also revealed insufficient knowledge and awareness regarding periodontal diseases despite relatively acceptable oral hygiene practices.<sup>10,11,12</sup>

In Malaysia, periodontal disease continues to affect a substantial proportion of the adult population despite improvements in oral healthcare services.<sup>2</sup> However, limited studies have specifically investigated the level of periodontal disease knowledge and awareness among patients attending university dental clinics. Therefore, the present study was conducted to assess the level of knowledge and awareness regarding periodontal disease among patients attending the Lincoln University College Dental Clinic and to determine the demographic factors associated with periodontal health awareness.

## Methodology

### Study Design and Setting

This descriptive cross-sectional study was conducted among patients attending the Lincoln University College Dental Clinic, Malaysia, to assess their knowledge and awareness regarding periodontal disease.

### Study Population and Sampling

Adult patients who visited the dental clinic during the study period and were at least eighteen years old made up the study population. Convenience sampling was used to find participants. Participants had to be willing to fill out the questionnaire and give informed consent. The study excluded

patients under the age of 18 and those with medical, cognitive, or communicative disorders that would make it difficult for them to finish the questionnaire. There were 112 participants in all.

### Data Collection Instrument

A systematic self-administered questionnaire that was modified from earlier validated studies on oral health knowledge and periodontal awareness was used to gather data. Google Forms was used to disseminate the survey electronically. The questionnaire was examined before it was sent to make sure it was clear and pertinent to the study's goals.

### The questionnaire comprised four sections:

Age, gender, educational attainment, and work status are examples of sociodemographic data. oral hygiene habits, evaluating participants' regular oral health habits. Understanding of periodontal disease, including its causes, symptoms, indicators, and risk factors. Participants' knowledge of the connection between periodontal disease and systemic illnesses including diabetes and cardiovascular disease was assessed.

### Data Collection Procedure

After learning about the goals and purpose of the study, participants were asked to fill out the online questionnaire. Before the survey started, informed consent was electronically sought, and participation was entirely voluntary. To protect participant privacy, all answers were gathered anonymously.

### Data Analysis

After being informed about the goals and purpose of the study, participants were asked to fill out the online survey. Before the survey began, informed consent was electronically sought, and participation was entirely voluntary. To protect participant privacy, all replies were gathered anonymously.

## Results

### Demographic Characteristics

The questionnaire was completed by 112 individuals in total. With 67.0% (n = 75) of the responders, women made up the majority, while men made up 30.4% (n = 34). A tiny percentage said they would rather not reveal their gender. The majority of participants (65.2%) were between the ages of 18 and 26, followed by those over 35 (17.9%) and those between the ages of 27 and 35 (17.0%). In terms of education, 17.0% had finished high school, 8.0% had postgraduate degrees, and 75.0% had bachelor's degrees. The largest employment

category was made up of students (59.8%), followed by those who did not work in the healthcare industry (25.0%). Table 1 and Figure 1 displayed all of the data.

Table 1: Demographic Characteristics of Participants (N = 112)

| Variable          | Categories                                                                                                                 | N (%) |
|-------------------|----------------------------------------------------------------------------------------------------------------------------|-------|
| Gender            | Female (75; 67.0%), Male (34; 30.4%), Prefer not to say (3; 2.7%)                                                          | 112   |
| Age group         | 18–26 years (73; 65.2%), 27–35 years (19; 17.0%), >35 years (20; 17.9%)                                                    | 112   |
| Education level   | Bachelor (84; 75.0%), High school (19; 17.0%), Higher education (9; 8.0%)                                                  | 112   |
| Employment status | Student (67; 59.8%), Outside healthcare (28; 25.0%), Retired (10; 8.9%), Healthcare sector (5; 4.5%), Unemployed (2; 1.8%) | 112   |

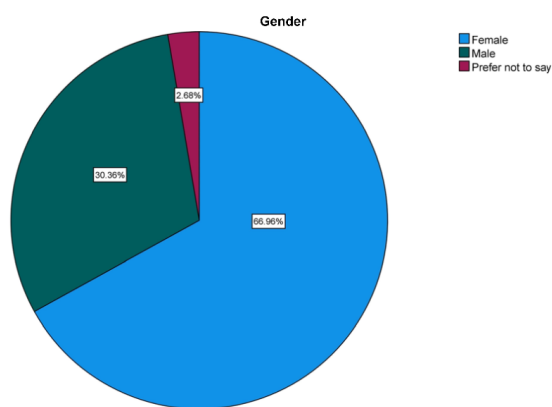


Figure 1(a)

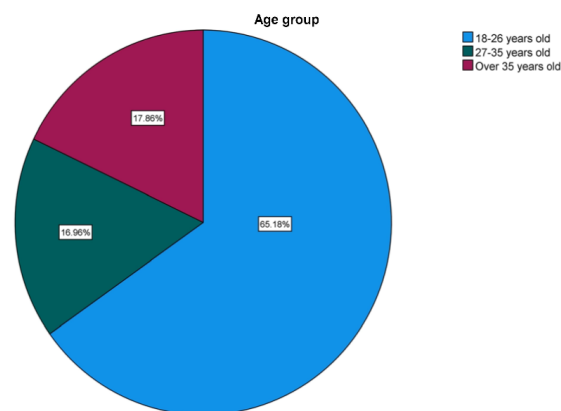


Figure 1(b)

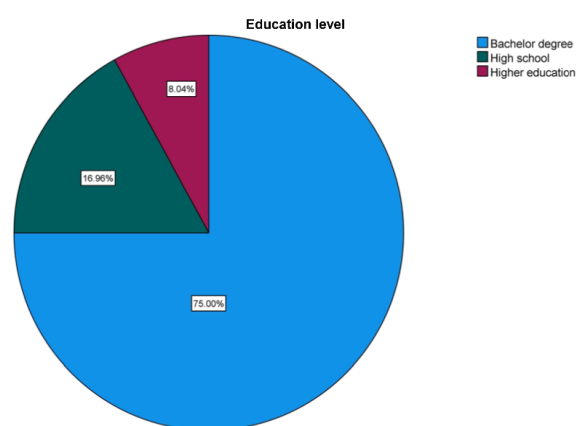


Figure: 1(c)

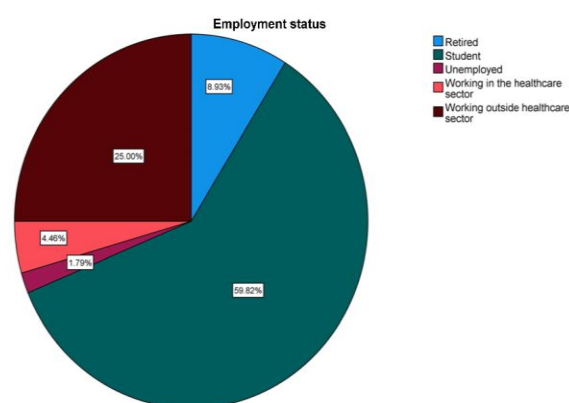


Figure: 1(d)

### Oral Hygiene Practices

The majority of participants (99.1%) reported brushing their teeth every day. Only 11.6% of respondents specifically mentioned brushing twice a day on a regular basis. The majority of respondents (60.7%) changed their toothbrushes

every three months, while some did so every six months or whenever the bristles started to fray. After vertical brushing, roll stroke brushing was the most frequently used technique (55.4%). Some respondents continued to brush horizontally or were ignorant of the best brushing methods. While many participants only rarely used dental floss, only 29.5% of respondents utilised it on a regular basis. In terms of mouthwash use, 35.7% never used it, while others used it sporadically or in accordance with a dental prescription. 35.7% of people went to the dentist every six months, compared to 45.5% who went once a year. All the data were displayed in Figure 2.

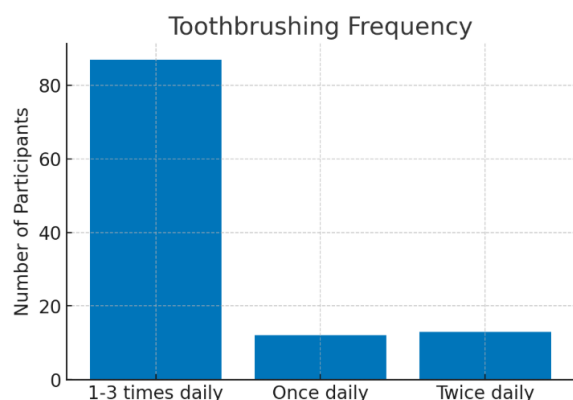


Figure: 2(a)

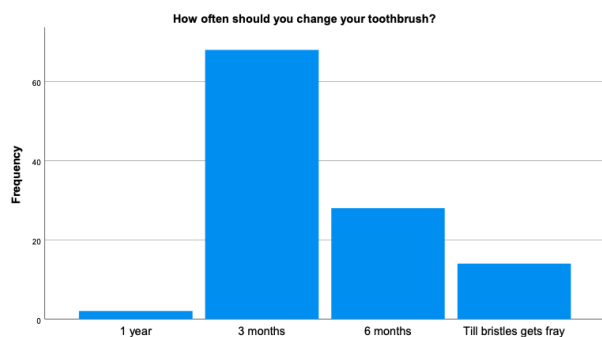


Figure: 2(b)

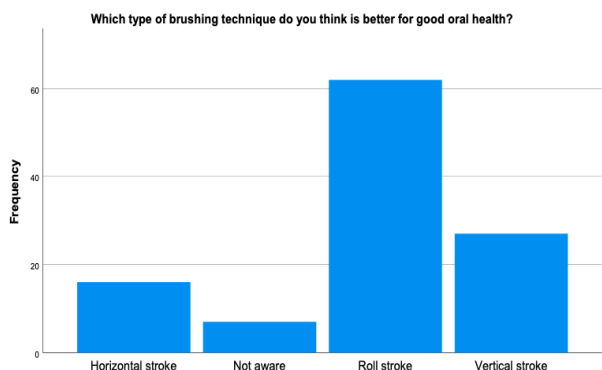


Figure: 2(c)

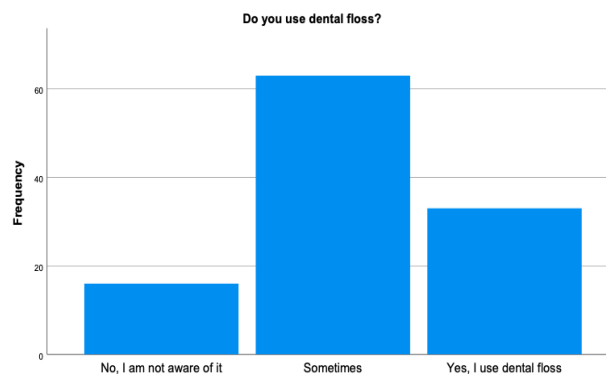


Figure: 2(d)

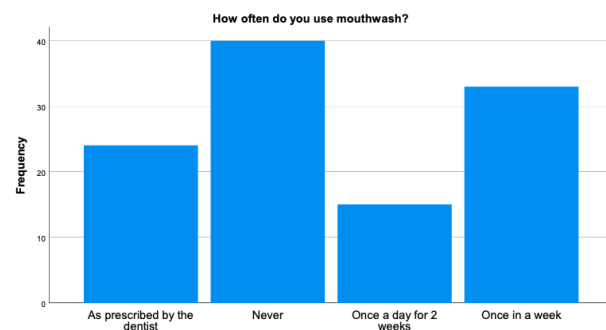


Figure: 2(e)

### Knowledge and Awareness of Periodontal Disease

Most participants showed a high level of awareness about dental hygiene and periodontal disease. Poor dental hygiene was correctly identified by the majority of respondents as the most prevalent cause of bleeding gums (52.7%), loose teeth (70.5%), and bad breath (79.5%). The vast majority (87.5%) acknowledged that one of the main causes of gingival recession was poor brushing technique. Additionally, the majority of respondents thought that: Periodontal disease increases after age 35 (69.6%), poor dental hygiene impacts general health (87.5%), tea and coffee induce tooth staining (83.0%), and tooth sensitivity may be cured (73.2%). Figure 3 displayed all of the data.

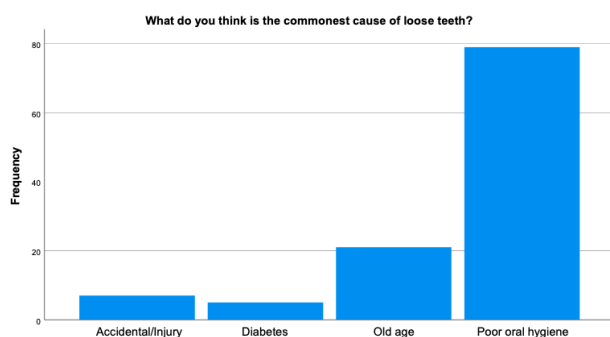


Figure: 3 (a)



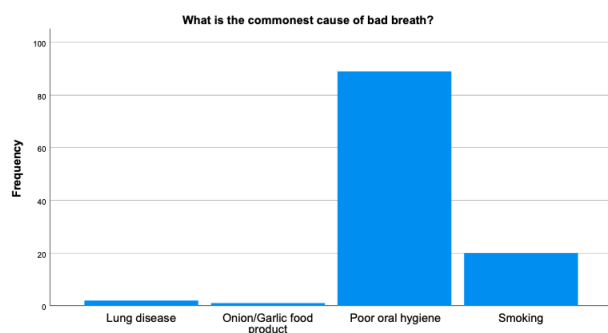


Figure: 3(b)

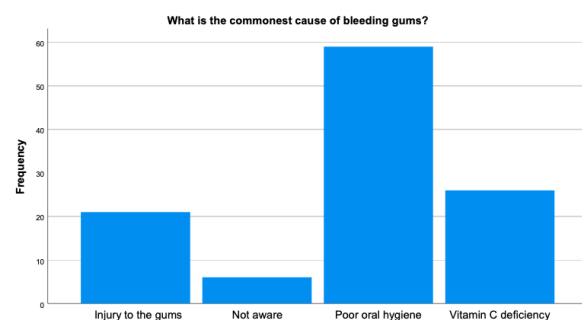


Figure: 3(c)

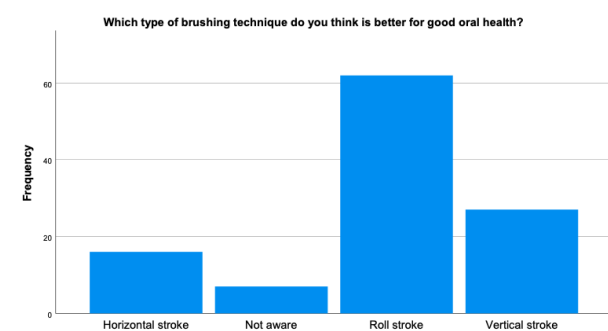


Figure: 3(d)

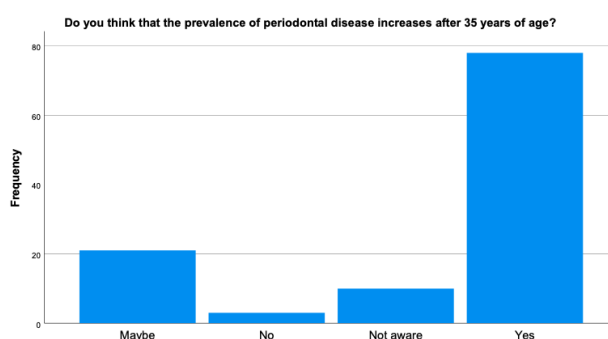


Figure: 3 (e)

### Statistical Associations

Gender and knowledge or awareness ratings did not significantly correlate ( $p = 0.199$ ). Age group and knowledge scores were shown to be statistically significantly correlated ( $p = 0.005$ ). When compared to older responses, younger participants showed greater awareness. There was a nearly

significant correlation between awareness and educational level ( $p = 0.066$ ). In general, those with higher levels of education showed greater awareness of oral health. Knowledge scores were statistically significantly correlated with employment status ( $p < 0.001$ ). Students and healthcare professionals showed the highest levels of awareness.

### Correlation Analysis

Knowledge scores showed a negative connection with age, suggesting that awareness decreased with age. There was a slight positive connection between oral hygiene behaviours and educational attainment. Knowledge and actual oral hygiene behaviour did not significantly correlate, indicating that awareness does not always convert into preventive practice.

### Discussion

This study assessed patients' awareness and understanding of periodontal disease at Lincoln University College Dental Clinic. Overall, respondents' knowledge of periodontal disease and oral health was comparatively high. The majority of participants reported cleaning their teeth every day, indicating a generally good attitude toward oral hygiene. Only a small portion, however, reported regularly brushing twice a day in accordance with global guidelines. Similar results have been documented in earlier research involving people who were aware of the importance of brushing their teeth but did not adhere to the recommended frequency. The majority of participants showed a reasonable level of awareness regarding toothbrush maintenance by replacing their brushes every three months. However, many continued using toothbrushes for longer than was advised, which might have decreased cleaning effectiveness.

Limited interdental cleaning techniques were also found in the study. Just around one-third of individuals said they flossed on a regular basis. This result is in line with research done in other populations where flossing is still one of the least common oral care practices. Poor compliance may be caused by inadequate training, cost, inconvenience, and a lack of understanding about flossing. The majority of participants identified poor dental hygiene as the main cause of halitosis, loose teeth, and bleeding gums. This indicates a reasonable understanding of the aetiology of periodontal disease. Furthermore, a sizable majority recognised the connection between oral and systemic health, which reflects the public's increasing understanding of these relationships. Nonetheless, a few myths were found. Rather than plaque buildup, a percentage of responders linked bleeding gums

mostly to vitamin C insufficiency. Early diagnosis and treatment may be delayed by such beliefs.

According to the survey, younger responders were more aware than older ones. Younger individuals might be more exposed to oral health information via digital platforms, social media, and educational institutions. Previous research has shown similar results, with younger persons exhibiting more oral health knowledge. Another important factor influencing awareness was employment status. Students and healthcare professionals scored higher on knowledge tests than people who were unemployed or retired. This could be linked to increased access to healthcare resources, educational opportunities, and health information. Participants with greater educational credentials often showed improved awareness, even if education level did not reach statistical significance. It is commonly acknowledged that educational attainment plays a significant role in determining health literacy and preventive behaviour.

It's interesting to see that gender and awareness did not significantly correlate. This result implies that men and women may now have comparable access to oral health information. The limited correlation between awareness and real oral hygiene practices was one of the study's key findings. Even though many respondents were aware of periodontal disease, they did not follow recommended preventive practices including flossing and routine dental checkups. This shows that changing one's behaviour requires more than just awareness. Thus, in addition to increasing awareness, oral health promotion initiatives should promote motivation and long-term behavioural change.

## Conclusion

This study evaluated the knowledge and awareness of periodontal disease among patients attending Lincoln University College Dental Clinic. Overall, participants demonstrated good awareness of periodontal disease causes, oral hygiene practices, and the importance of professional dental care. However, preventive behaviors such as regular flossing, mouthwash use, and professional cleaning attendance were relatively inadequate. Age and employment status were significantly associated with awareness levels, while gender showed no significant influence. These findings emphasize the need for enhanced oral health education programs to improve both knowledge and preventive oral health practices.

**Ethical Approval:** The study was conducted in accordance with the ethical approval obtained by ethical committee Lincoln University College, Malaysia (LUCFD2024RPA22).

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# Knowledge and Perception Regarding Impacted Teeth Among Dental and Medical Students in Malaysia: A Comparative Cross-Sectional Study

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## Abstract

*Impacted teeth are common developmental dental conditions that may cause pain, pericoronitis, dental caries, periodontal disease, root resorption, and odontogenic cysts. Early diagnosis and referral depend partly on healthcare professionals' knowledge and perceptions. This study compared knowledge and perception regarding impacted teeth among dental and medical students in Malaysian universities. A comparative cross-sectional survey was conducted among 202 undergraduates, including 101 dental and 101 medical students. Data were collected using a structured self-administered questionnaire and analyzed with IBM SPSS version 22.0. Frequencies and percentages were calculated, and associations were assessed using the Chi-square test, with significance set at  $p < 0.05$ . Dental students demonstrated significantly better knowledge of the definition, clinical features, eruption age of third molars, associated pathology, and treatment options than medical students. Both groups generally recognized the importance of early diagnosis and appropriate management, although misconceptions were more common among medical students. The findings indicate that dental students possess greater knowledge because of broader undergraduate oral health training. Strengthening oral health education within medical curricula may improve early recognition, referral practices, interdisciplinary collaboration, and patient care.*

**Keywords:** impacted teeth, oral health knowledge, perception, dental students, medical students, cross-sectional study  
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## Introduction

Impacted teeth are defined as teeth that fail to erupt into their normal functional position within the dental arch because of physical obstruction, abnormal eruption pathways, insufficient arch space, or developmental disturbances.<sup>1</sup> Third molars are the teeth most frequently affected, followed by maxillary canines, premolars, and supernumerary teeth. Although many impacted teeth remain asymptomatic for prolonged periods, others may produce significant oral complications that negatively affect oral health and quality of life.<sup>2</sup> The prevalence of impacted teeth varies considerably among different populations because of genetic, environmental, and anatomical factors. Previous epidemiological studies have reported that third molar impaction affects approximately 20–30% of young adults worldwide, making it one of the most common developmental dental anomalies.<sup>3</sup> In Malaysia, impacted third molars are frequently encountered in routine dental practice, particularly among adolescents and young adults, emphasizing the need for early diagnosis and appropriate management.<sup>4</sup> These findings highlight the need for healthcare professionals to possess adequate knowledge regarding the diagnosis, complications, and treatment of impacted teeth.

Failure to recognize impacted teeth may result in numerous pathological consequences. Common complications include recurrent pericoronitis, dental caries involving adjacent teeth, periodontal destruction, root resorption, odontogenic cyst formation, and, less frequently, odontogenic tumors.<sup>5</sup>

Delayed diagnosis may increase treatment complexity and contribute to unnecessary morbidity. Consequently, early clinical assessment supported by appropriate radiographic examination, particularly panoramic radiography and cone-beam computed tomography (CBCT) when indicated, plays an essential role in identifying impacted teeth and facilitating appropriate treatment planning.<sup>6</sup> Healthcare professionals serve as the first point of contact for many patients seeking medical or dental care. While dentists are directly involved in diagnosing and managing impacted teeth, medical practitioners also encounter patients presenting with facial pain, swelling, infection, or other oral complaints that may require dental referral. Therefore, both professions should possess sufficient knowledge to recognize common oral diseases and appreciate the importance of timely referral to dental specialists. Interprofessional collaboration between medical and dental practitioners has been shown to improve patient outcomes through earlier diagnosis, coordinated management, and enhanced health promotion.<sup>7</sup>

Despite their complementary roles, dental and medical students receive substantially different levels of oral health education during undergraduate training. Dental curricula provide comprehensive instruction in oral anatomy, tooth development, oral pathology, radiographic interpretation, and oral surgery, whereas medical curricula generally allocate limited teaching time to oral diseases.<sup>8</sup> These educational differences may influence students' knowledge, confidence, and clinical decision-making regarding impacted teeth. Previous studies investigating oral health knowledge among healthcare students have consistently demonstrated superior performance among dental students compared with medical students, although significant knowledge gaps have been identified in both groups.<sup>9,10</sup> Knowledge and perception are important determinants of future professional behavior. Adequate knowledge enables healthcare professionals to identify clinical abnormalities, provide accurate patient education, and facilitate timely referral when specialist intervention is required. Conversely, misconceptions regarding impacted teeth may contribute to delayed diagnosis, inappropriate reassurance, or unnecessary postponement of treatment. Improving oral health literacy among future healthcare providers therefore represents an important strategy for enhancing interdisciplinary healthcare delivery and reducing preventable oral complications.<sup>11</sup>

Although several studies have examined general oral health awareness among healthcare students, relatively few have specifically investigated knowledge and perception regarding impacted teeth, particularly within the Malaysian context. Moreover, comparative evidence between dental and medical

students remains limited. Identifying educational differences between these two groups may help educators evaluate existing curricula and identify opportunities for strengthening oral health education within medical training.

Therefore, the present study aimed to compare the knowledge and perception regarding impacted teeth among dental and medical students enrolled in Malaysian universities. It was hypothesized that dental students would demonstrate significantly greater knowledge because of their more comprehensive oral health education, while both groups would maintain generally positive perceptions regarding the importance of early diagnosis and appropriate management. The findings of this study may provide valuable evidence for curriculum development and support greater interdisciplinary collaboration between future dental and medical practitioners, ultimately contributing to improved patient care and oral health outcomes.

## **Materials and Methods**

This comparative cross-sectional study was conducted to assess and compare the knowledge and perception regarding impacted teeth among undergraduate dental and medical students enrolled in Malaysian universities. A cross-sectional design was chosen to evaluate participants' current knowledge and perceptions at a single point in time without intervention. Undergraduate dental and medical students from recognized Malaysian universities were eligible to participate. Students who provided informed consent were included, whereas those not enrolled in the respective programmes, submitted incomplete questionnaires, or had received additional formal training in impacted tooth management beyond the standard undergraduate curriculum were excluded. The minimum sample size was calculated according to the recommendations of Israel (1992), assuming a 95% confidence level and a 5% margin of error. Based on an estimated undergraduate dental and medical student population of approximately 33,000, the minimum required sample size was 194 participants. To account for possible non-response, 202 students were recruited, comprising 101 dental and 101 medical students.

Data were collected using a structured, self-administered online questionnaire developed following an extensive literature review. The questionnaire consisted of three sections: demographic information, knowledge regarding impacted teeth (definition, clinical features, complications, diagnosis, and management), and perception towards their treatment and management. Participation was voluntary, anonymous, and confidential. Ethical approval was obtained

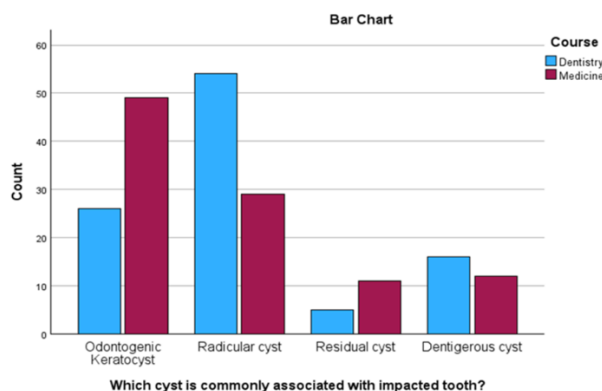
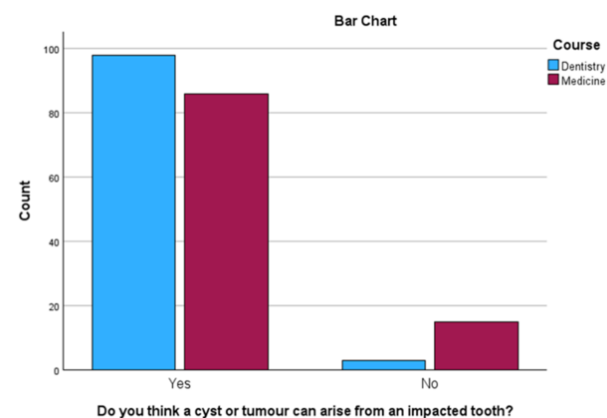
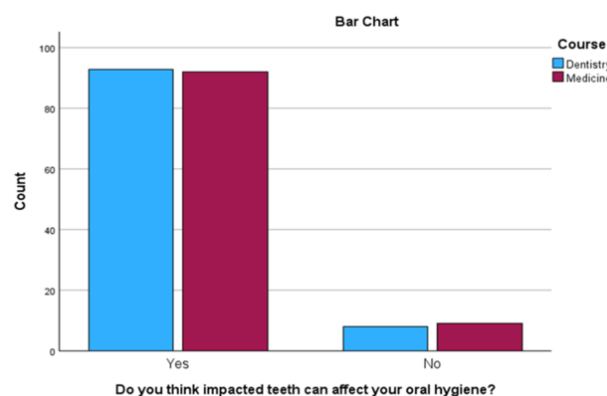
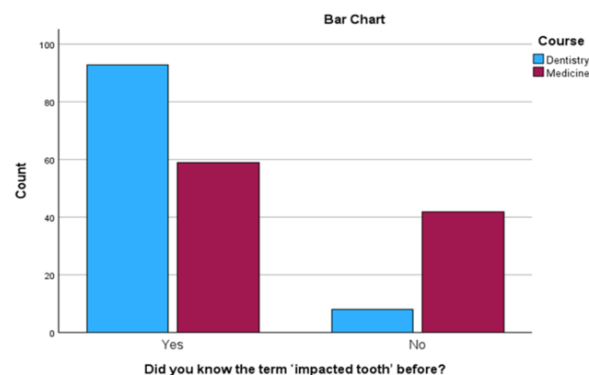
before data collection, and informed consent was secured electronically from all participants. Completed questionnaires were screened for completeness before data entry. Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as frequencies and percentages. Associations between the participants' field of study and their responses were evaluated using Pearson's Chi-square test. A p-value of <0.05 was considered statistically significant.

## Results

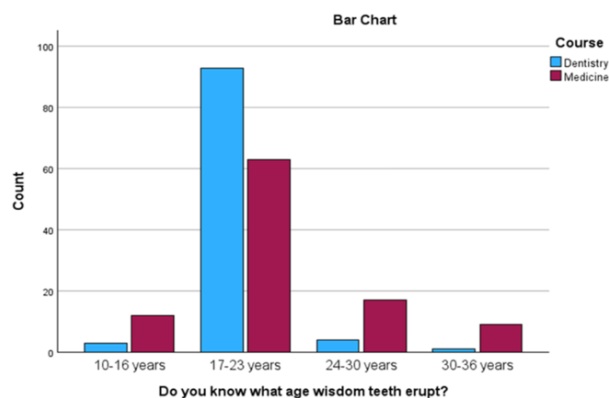
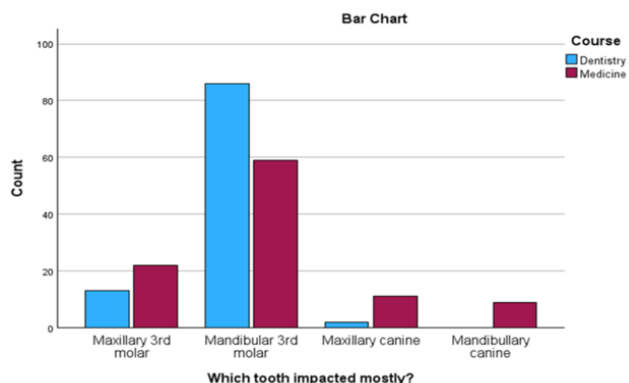
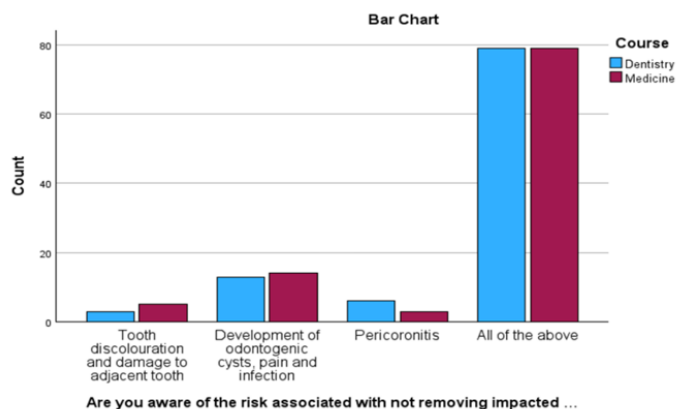
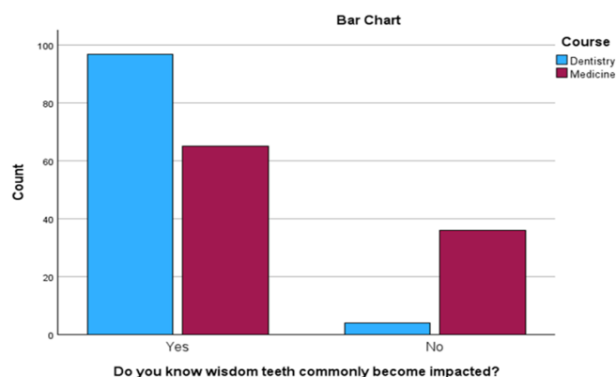
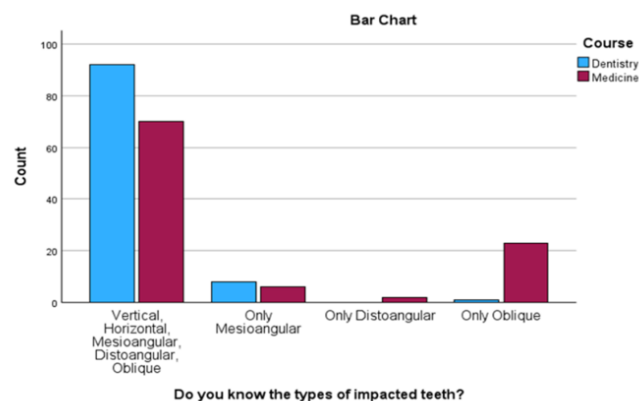
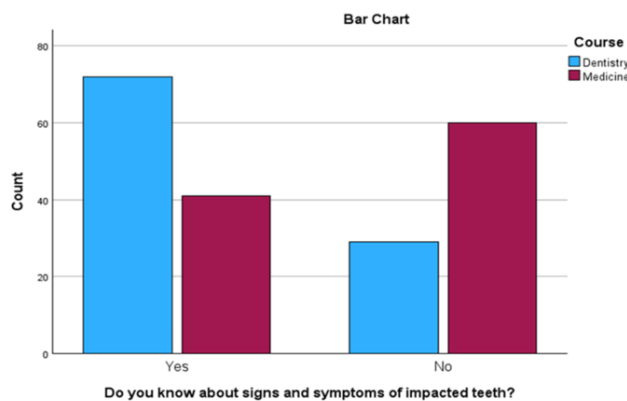
A total of 202 undergraduate students participated in the study, including 101 dental students and 101 medical students, providing an equal representation from both disciplines. The response rate was satisfactory, and all completed questionnaires fulfilled the study inclusion criteria.

### Knowledge Regarding Impacted Teeth

Dental students demonstrated significantly higher levels of knowledge regarding impacted teeth than medical students across most questionnaire items. Nearly all dental students reported familiarity with the term "impacted tooth," whereas substantially fewer medical students recognized the term. This difference was statistically significant ( $p < 0.001$ ). Most participants from both groups correctly recognized that impacted teeth could adversely affect oral hygiene, and no statistically significant difference was observed between the two groups ( $p = 0.800$ ). This finding suggests that awareness of the relationship between impacted teeth and oral hygiene is generally well established among healthcare students regardless of academic programme. Dental students also demonstrated superior knowledge regarding the pathological consequences of impacted teeth. A significantly larger proportion correctly recognized that impacted teeth may give rise to cystic or tumorous lesions compared with medical students ( $p = 0.003$ ). Furthermore, dental students showed better understanding of the signs and symptoms associated with impacted teeth, while many medical students reported uncertainty regarding these clinical manifestations ( $p < 0.001$ ). Regarding eruption characteristics, dental students more accurately identified mandibular third molars as the teeth most frequently affected by impaction and correctly recognized the usual eruption age of wisdom teeth. These differences were statistically significant ( $p < 0.001$ ), indicating a stronger understanding of tooth development among dental students.





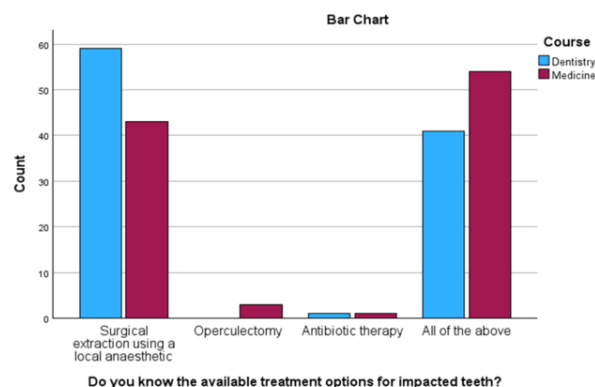
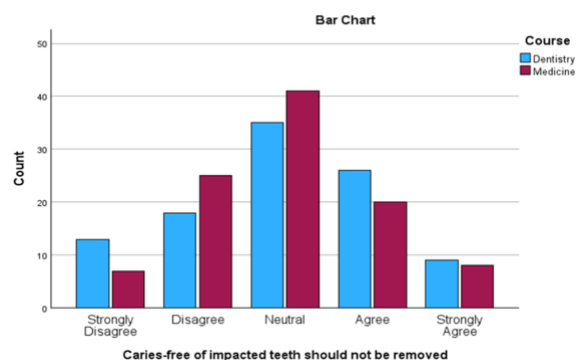
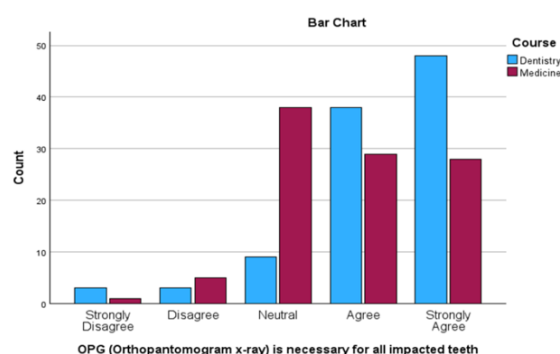
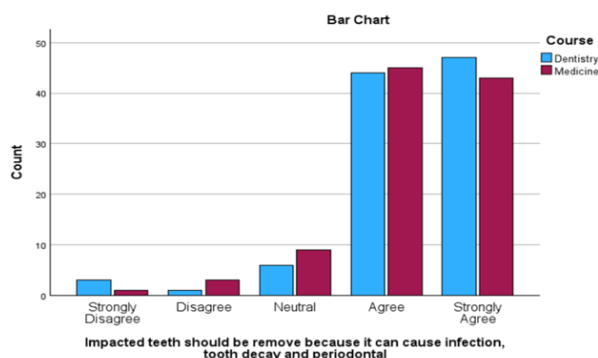


Overall, the findings consistently demonstrated that undergraduate dental students possessed significantly greater knowledge regarding impacted teeth than medical students, reflecting differences in undergraduate educational exposure and clinical training.

### Perception Regarding Impacted Teeth

Although knowledge differed considerably between the two groups, participants generally demonstrated positive perceptions regarding the importance of appropriate management of impacted teeth. Most respondents agreed that impacted teeth should be managed appropriately to prevent complications such as infection, dental caries, and periodontal disease. The majority also acknowledged the importance of radiographic examination in treatment planning and accepted that symptomatic impacted teeth require professional assessment rather than delayed treatment. These findings indicate a generally favourable attitude toward early diagnosis and intervention among both groups. Nevertheless, several misconceptions remained more common among medical students. A greater proportion believed that asymptomatic impacted teeth never require removal or that maintaining good oral hygiene alone eliminates the need for treatment. These perceptions may

reflect limited exposure to oral surgery and oral pathology during undergraduate medical education.



Overall, dental students demonstrated more evidence-based perceptions regarding impacted teeth, although both groups

recognized the importance of timely diagnosis and interdisciplinary management. The observed differences support the need for strengthening oral health education within undergraduate medical curricula to improve awareness, facilitate appropriate referral, and promote collaborative patient care.

## Discussion

This study compared the knowledge and perception regarding impacted teeth among undergraduate dental and medical students in Malaysia. Dental students demonstrated significantly greater knowledge than medical students across most domains, whereas both groups generally exhibited positive perceptions regarding early diagnosis and management. These findings highlight the influence of discipline-specific education on oral health knowledge and support the study hypothesis. Dental students showed superior understanding of the definition, clinical manifestations, complications, and management of impacted teeth. This finding is expected because dental curricula provide extensive training in oral anatomy, pathology, radiology, and oral surgery, whereas medical curricula offer comparatively limited exposure to oral health. Similar findings have been reported by,<sup>8,9</sup> who concluded that comprehensive dental education significantly enhances oral health knowledge and clinical decision-making.

The present study also found that dental students were more knowledgeable about complications associated with impacted teeth, including cyst formation, tumors, and periodontal disease. Early recognition of these complications is clinically important, as delayed diagnosis may result in extensive bone loss, root resorption, and more complex surgical procedures.<sup>2,5</sup> Furthermore, dental students more accurately identified mandibular third molars as the most commonly impacted teeth and correctly recognized their usual eruption age. These findings agree with previous epidemiological studies demonstrating that mandibular third molars are the most frequently impacted teeth because they erupt last and often lack sufficient space within the dental arch.<sup>3,4</sup> Interestingly, no significant difference was observed regarding awareness that impacted teeth can adversely affect oral hygiene, indicating that this concept is generally recognized by both groups. Despite differences in knowledge, participants from both disciplines demonstrated positive perceptions toward timely diagnosis and treatment. However,

misconceptions regarding the management of asymptomatic impacted teeth were more common among medical students.

Current clinical guidelines recommend individualized assessment because pathological changes may develop even in asymptomatic impacted teeth.<sup>13</sup>

These findings underscore the need to strengthen oral health education within undergraduate medical curricula to improve early recognition, appropriate referral, and interdisciplinary collaboration. Better oral health literacy among future healthcare professionals may enhance patient education, facilitate timely intervention, and ultimately improve oral health outcomes.<sup>7,11</sup> This study benefited from equal representation of dental and medical students and the use of a standardized questionnaire. Nevertheless, its cross-sectional design and reliance on self-reported responses may limit causal inference and introduce response bias. Additionally, the findings may not be generalizable beyond Malaysian universities. Future multicenter and longitudinal studies are recommended to evaluate the effectiveness of educational interventions in improving knowledge and perceptions regarding impacted teeth.

## Conclusion

This study demonstrated that dental students possessed significantly greater knowledge regarding impacted teeth than medical students, particularly in relation to diagnosis, complications, eruption patterns, and management, reflecting their more comprehensive dental education. Although both groups showed positive perceptions toward early diagnosis and appropriate management, misconceptions were more common among medical students. These findings highlight the need to strengthen oral health education within undergraduate medical curricula to improve awareness, early recognition, and timely referral of patients with impacted teeth. Enhanced interdisciplinary collaboration between dental and medical professionals may ultimately improve patient care. Further multicentre studies are recommended to validate these findings.

**Ethical Approval:** The study was conducted in accordance with the ethical approval obtained by ethical committee Lincoln University College, Malaysia (LUCFD2024RPA27).

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# Association Between Face Form and Incisive Papilla to Maxillary Central Incisor Distance in Dentate Individuals

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## Abstract

**Background:** The incisive papilla is a stable landmark commonly used to guide the position of the maxillary central incisors in complete denture fabrication, but the extent to which its relationship to the central incisors varies with facial form remains incompletely defined. This study aimed to evaluate the association between face form and the incisive papilla-to-maxillary central incisor distance in dentate individuals.

**Methods:** This descriptive cross-sectional study included 100 dentate adults aged 20-40 years attending the Department of Prosthodontics, Bangladesh Medical University. Face form was clinically classified as square, tapering, or ovoid, maxillary casts were obtained and the papilla-incisor distance was measured on a cast surveyor using a calibrated protractor and a digital caliper. Data were analyzed in SPSS using one-way ANOVA, with  $p < 0.05$  considered significant. **Results:** Tapered face form was most common (52.0%), followed by square (39.0%) and ovoid (9.0%). The mean papilla-incisor distance differed significantly across face forms, being highest in the tapered group ( $12.49 \pm 0.44$  mm) and lowest in the square group ( $9.99 \pm 0.58$  mm) ( $P = 0.001$ ). Age and sex showed no significant association with the distance across the overall sample.

**Conclusion:** Face form is significantly associated with the incisive papilla-to-maxillary central incisor distance and should be incorporated into papilla-based guides for anterior tooth positioning.

**Keywords:** Incisive papilla, face form, maxillary central incisor, complete denture.

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## Introduction

Selecting and positioning the maxillary anterior teeth so that they harmonize with a patient's facial morphology remains one of the more subjective steps in complete denture fabrication. Since Williams first proposed that the outline of the face corresponds to the shape of the maxillary central incisor, face form has been classified into square, tapering and ovoid categories and used as a guide for anterior tooth selection and arrangement.<sup>1</sup> More recent geometric and photographic analyses have refined this classification and confirmed that face form can be assessed reproducibly using standardized reference lines and angles.<sup>1</sup> Beyond tooth selection, several studies have shown that facial measurements correlate with underlying dental arch and tooth dimensions: Jassim et al. found that intercondylar and intercanine distances varied significantly across square, tapering and ovoid facial forms, Chunhabundit et al. derived equations predicting anterior tooth size from two-dimensional facial measurements and Alshamri et al. confirmed significant correlations between maxillary anterior tooth dimensions and common facial landmarks.<sup>2,3,4</sup>

Separately, the incisive papilla has been established as a reliable intraoral landmark for locating the maxillary central incisors after tooth loss, because its posterior border undergoes comparatively little positional change during the transition to the edentulous state.<sup>5</sup> Multiple population-based studies have measured the horizontal papilla-incisor distance and proposed reference values for prosthodontic use, including Sapkota et al. in a Nepalese population and Sunila and Maria across three South Indian states.<sup>6,7</sup> However, these papilla-incisor studies have generally

reported a single pooled estimate for the study population rather than examining whether the distance itself varies systematically with face form. If face form genuinely reflects underlying arch morphology, as suggested by the tooth-selection and facial-measurement literature, then the papilla-incisor distance, which depends directly on the anteroposterior position of the central incisors relative to a fixed palatal landmark, would be expected to differ meaningfully between square, tapering and ovoid face forms. Testing this hypothesis directly has clinical value: if face form predicts the papilla-incisor distance, clinicians could apply face-form-specific reference ranges rather than a single average value when positioning artificial anterior teeth for edentulous patients, potentially improving denture esthetics and function. Data addressing this specific association are limited, particularly in South Asian populations. The present study therefore evaluated the association between face form and the incisive papilla-to-maxillary central incisor distance in a cohort of dentate Bangladeshi adults.

## Objective

To evaluate the association between face form and the incisive papilla-to-maxillary central incisor distance in dentate individuals.

## Materials and methods

This descriptive cross-sectional study was conducted in the Department of Prosthodontics, Bangladesh Medical University (BMU), Shahbag, Dhaka, over a six-month period and enrolled 100 dentate adults aged 20 to 40 years who attended the outpatient department for treatment of the lower arch. Participants were recruited through non-probability convenience sampling and were required to have an intact, periodontally sound maxillary dental arch with an Angle's Class I relationship and no history of orthodontic treatment, maxillary surgery, anterior restorations, incisal attrition, crowding, midline diastema, or soft-tissue pathology involving the incisive papilla. After a brief structured interview, each participant's face form was clinically classified as square, tapering, or ovoid using two imaginary reference lines drawn from a point approximately 2.5 cm anterior to the tragus to the angle of the mandible, with parallel, converging and diverging line relationships corresponding respectively to the three forms. A maxillary alginate impression was recorded using standardized powder-liquid ratios, rinsed, disinfected and poured in dental stone within 15 minutes to produce a standardized cast. The posterior border of the incisive papilla was outlined on the cast with a hard lead pencil and the cast was mounted on a surveyor; a calibrated transparent protractor referenced to the surveyor's vertical analyzing pin and the papilla's posterior border was used to guide measurement of the horizontal distance to the labial embrasure of the maxillary central incisors with a digital vernier caliper accurate to 0.01 mm. Ethical approval was obtained from the Institutional Review Board of BMU and written informed consent, confidentiality

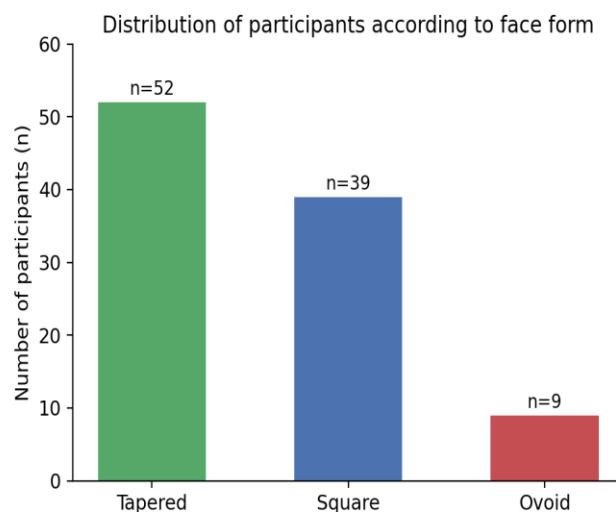
safeguards and coded data storage were maintained throughout. Data were analyzed in SPSS as mean  $\pm$  standard deviation for continuous variables and frequencies for categorical variables; one-way analysis of variance (ANOVA) was used to compare the papilla-incisor distance across face-form, age and sex categories, with  $p < 0.05$  considered statistically significant.

## Result:

**Table 1: Demographic characteristics of the study participants**

| Characteristic    |             | Frequency (n) | Percentage (%) |
|-------------------|-------------|---------------|----------------|
| Age group (years) | 20–30 years | 70            | 70             |
|                   | 31–40 years | 30            | 30             |
| Gender            | Male        | 59            | 59             |
|                   | Female      | 41            | 41             |
| Total             |             | 100           | 100            |

Table 1 shows the baseline demographic characteristics of the study participants. The study population comprised 100 dentate individuals aged 20 to 40 years, including 70 participants (70.0%) aged 20-30 years and 30 (30.0%) aged 31-40 years; 59 participants (59.0%) were male and 41 (41.0%) were female.



**Figure 1. Distribution of participants according to face form**

Figure 1 shows the distribution of participants according to face form. Tapered face form was the most common, accounting for 52.0% of participants, followed by square face form (39.0%) and ovoid face form (9.0%).



**Table 2: Incisive papilla-to-maxillary central incisor distance according to face form**

| Face form | Range (mm)  | Mean $\pm$ SD (mm) | P-value |
|-----------|-------------|--------------------|---------|
| Tapered   | 12.00–13.50 | 12.49 $\pm$ 0.44   | 0.001   |
| Square    | 9.50–11.00  | 9.99 $\pm$ 0.58    | 0.001   |
| Ovoid     | 10.50–12.50 | 11.39 $\pm$ 0.69   | 0.001   |

The mean incisive papilla-to-maxillary central incisor distance differed significantly across the three face-form groups (Table 2). Participants with a tapered face form showed the highest mean distance (12.49  $\pm$  0.44 mm), followed by those with an ovoid face form (11.39  $\pm$  0.69 mm) and a square face form (9.99  $\pm$  0.58 mm); one-way ANOVA confirmed that this difference was statistically significant ( $P = 0.001$ ).

**Table 3: Incisive papilla-to-maxillary central incisor distance according to age group and sex**

| Variable  | Category    | Mean $\pm$ SD (mm) | Mean difference (mm) | P-value |
|-----------|-------------|--------------------|----------------------|---------|
| Age group | 20–30 years | 11.35 $\pm$ 1.17   | 0.14                 | 0.574   |
|           | 31–40 years | 11.49 $\pm$ 1.12   | 0.14                 | 0.574   |
| Sex       | Female      | 11.31 $\pm$ 1.18   | 0.13                 | 0.584   |
|           | Male        | 11.44 $\pm$ 1.14   | 0.13                 | 0.584   |

Table 3 shows the incisive papilla to maxillary central incisor distance according to age and sex. The mean distance was not statistically significant among the age and sex group ( $p > 0.05$ ).

## Discussion

The present study found a statistically significant association between face form and the incisive papilla-to-maxillary central incisor distance, with the tapered face form showing the greatest distance, followed by the ovoid and square forms. This pattern parallels the geometric relationship originally proposed by Williams and later refined by Ashok and Ganapathy, who demonstrated that tapering face forms are associated with narrower, more elongated dental arches, whereas square face forms correspond to broader, more compactly proportioned arches.<sup>1</sup> A narrower, more tapering arch configuration would be expected to project the central incisors further forward relative to the stable posterior border of the incisive papilla, which is consistent with the higher mean distance recorded in the tapered group in the present study. Jassim et al. similarly reported that intercondylar and intercanine distances varied significantly across square, tapering and ovoid facial forms, with the tapering form showing distinct proportional relationships compared with the other two forms,<sup>2</sup> while Chunhabundit et al. and Alshamri

et al. both demonstrated that anterior tooth dimensions can be reliably predicted from facial measurements, reinforcing the biological basis for a face-form-dependent papilla-incisor relationship.<sup>3,4</sup>

The magnitude of the present findings, particularly the markedly smaller mean distance in the square face-form group (9.99  $\pm$  0.58 mm) compared with the tapered group (12.49  $\pm$  0.44 mm), extends earlier papilla-incisor literature that largely reported single pooled estimates without face-form stratification. Shin and Kim reported an overall papilla-incisor distance close to the classical 12 to 13 mm range in a Korean sample,<sup>5</sup> a value that corresponds closely to the tapered face-form subgroup in the present cohort but considerably overestimates the distance recorded for participants with a square face form. Sapkota et al., working in a Nepalese population and Sunila and Maria, who studied three South Indian states, likewise reported papilla-incisor values within a comparable overall range but did not examine face-form-specific variation.<sup>6,7</sup> The wide range identified here, spanning from below 10 mm to above 12 mm depending on face form, suggests that a single universal papilla-incisor estimate may be insufficiently precise for clinical use and that face-form-specific reference values, as generated in the present study, could improve the accuracy of anterior tooth positioning during complete denture fabrication.

In contrast to the strong face-form effect, neither age group nor sex showed a statistically significant association with the papilla-incisor distance when the sample was analyzed as a whole. This finding should be interpreted alongside the broader odontometric literature, which consistently demonstrates sexual dimorphism in dental and arch dimensions when face form is not accounted for. Pandey and Ma, Mehta et al., Shetty et al. and Sireesha et al. each reported statistically significant male-female differences in canine and molar dimensions in South Asian populations,<sup>8–11</sup> Bhargava et al. documented sex-related differences extending to the mesiodistal width of the maxillary anterior teeth and Mazumder et al. found consistently greater arch perimeter in males across four ethnic groups.<sup>12,13</sup> Outside South Asia, Salem et al. confirmed that intercanine width remained a reliable sex indicator in an adult Egyptian sample.<sup>14</sup> The apparent discrepancy between this literature and the non-significant sex difference observed in the present aggregate analysis is most plausibly explained by the fact that face form was not held constant when age and sex were examined; sex-related differences in the papilla-incisor distance may become apparent once face form is controlled for, particularly within the square face-form category. Rai et al. similarly noted that sex-related differences in arch dimensions can vary depending on the underlying arch configuration<sup>15</sup> and Karim and Baban's machine-learning-based sex-estimation model performed best when multiple craniodental parameters were combined rather than analyzed individually,<sup>16</sup> supporting the interpretation that face form functions as an important effect modifier that should not be ignored when evaluating age- or sex-related variation in the papilla-incisor distance.

## Conclusion

This study demonstrates a statistically significant association between face form and the horizontal distance between the incisive papilla and the maxillary central incisors, with the tapered face form showing the greatest distance and the square face form the smallest. Age and sex showed no significant association with this distance when analyzed across the overall sample, indicating that face form is the dominant determinant of papilla-incisor variation in this population. These findings support the use of face-form-specific reference values, rather than a single universal estimate, when the incisive papilla is used to guide the horizontal positioning of maxillary anterior teeth in complete denture fabrication.

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# Surgical Management of an Infected Radicular Cyst: A Case Report

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## Abstract

*Radicular cysts represent an important category of inflammatory odontogenic cysts and are generally associated with teeth affected by pulpal necrosis. They develop in response to persistent periapical inflammation and are characteristically located around the root apex of the causative tooth. Although many lesions remain clinically silent, progressive enlargement may produce swelling, discomfort, tooth displacement, or mobility. On radiographic examination, these lesions commonly present as well-circumscribed, unilocular radiolucencies surrounding the affected root apex. This report describes the clinical and surgical management of a large infected radicular cyst involving the maxillary anterior region. The lesion was managed by endodontic treatment of the associated teeth followed by surgical enucleation, apicoectomy and retrograde root-end restoration. Histopathological assessment subsequently confirmed the diagnosis of an infected radicular cyst. The patient was followed periodically after treatment, with satisfactory healing and no reported recurrence.*

**Keywords:** Radicular cyst, surgical enucleation, apicoectomy, endodontic treatment.

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## Introduction

A cyst is generally characterized as a pathological cavity enclosed by an epithelial lining and containing fluid, semisolid material, or other intracavitary contents. Odontogenic cysts arise from epithelial components associated with tooth development and may originate at different stages of odontogenesis. Their epithelial sources include remnants of the tooth germ, epithelial rests of Malassez, reduced enamel epithelium, residual dental lamina and, in some circumstances, components of the basal oral epithelium.<sup>1</sup>

Among inflammatory odontogenic lesions, radicular cysts are particularly common. They generally arise in association with teeth affected by longstanding caries, pulpal necrosis and subsequent periapical inflammation.<sup>2</sup> Radicular and residual cysts have been reported to constitute approximately 60% of jaw cysts.<sup>3</sup> Clinically, these lesions may remain undetected for an extended period because they are frequently asymptomatic. With continued enlargement, however, they may produce expansion of the surrounding bone, displacement of adjacent teeth, or root resorption. Radiographically, a radicular cyst typically appears as a well-demarcated, round or ovoid unilocular radiolucency associated with the apex of a non-vital tooth.<sup>4</sup>

Management depends on several clinical and anatomical considerations. Small and localized lesions may respond to conventional nonsurgical root canal treatment, whereas larger lesions may require an adjunctive surgical procedure. Enucleation, marsupialization and decompression are among the surgical approaches used according to the size and extent of the lesion.<sup>5</sup> The present case describes the successful surgical management of a large infected radicular cyst associated with endodontic treatment of the involved maxillary anterior teeth.

## Case Report

A 25-year-old man presented to the outpatient department of

Kumudini Women's Medical College and Hospital with a swelling in the anterior maxillary region that had been gradually increasing in size over approximately two months. He recalled experiencing pain in the same area about one year earlier, for which he had taken medication. He reported no known systemic illness. The patient also noticed mobility involving both maxillary central incisors. At presentation, his general health was considered satisfactory, although his dietary intake was described as somewhat inadequate.

Extraoral examination demonstrated a smooth, localized swelling measuring approximately  $3 \times 2.5$  cm. The swelling extended across the upper anterior region from the left lateral incisor toward the right incisor. It was firm and tender when palpated. Intraoral examination revealed poor oral hygiene, generalized plaque and calculus accumulation and chronic gingival inflammation. Missing teeth were noted in the posterior regions of both arches. Marked attrition was also observed involving the posterior teeth of the upper and lower arches.

Orthopantomography and periapical radiographs of the maxillary anterior teeth were subsequently obtained. Imaging demonstrated a large, well-circumscribed radiolucent lesion involving the periapical region of both maxillary central incisors and the left lateral incisor.

Aspiration of the swelling using a fine needle yielded a mixture of purulent and bloody material. Based on the clinical history, examination findings, aspiration results and radiographic appearance, a provisional diagnosis of bilateral radicular cyst was established. The treatment plan, including surgical enucleation under local anesthesia, was discussed with the patient and informed consent was obtained.

Endodontic treatment was initiated during the same treatment session under rubber dam isolation. Working length was established, followed by thorough biomechanical preparation of the involved root canals. Calcium hydroxide was placed as an intracanal medicament and maintained for one week. At the subsequent appointment, root canal treatment was completed.

Surgical management was then undertaken, consisting of cystic enucleation, apical resection and retrograde restoration of the affected teeth. A crevicular incision was extended from the distal aspect of the maxillary right canine to the distal aspect of the maxillary left canine. Following elevation of the mucoperiosteal flap, the cystic lesion was exposed and carefully separated from the surrounding tissues. The cyst and associated root fragments involving the maxillary central and lateral incisors were removed.

The apical portions of the involved roots were subsequently resected and retrograde restoration was performed using glass ionomer cement. Thorough curettage of the surgical cavity was carried out to eliminate residual cystic and granulation tissues. After achieving adequate hemostasis, the flap was repositioned and secured with 3-0 silk sutures.

The excised tissue was preserved and submitted for histopathological evaluation. Microscopic examination supported the diagnosis of an infected radicular cyst. Following surgery, appropriate postoperative instructions and ability to cooperate with treatment.<sup>14</sup> Nonsurgical root canal therapy may be sufficient for appropriately selected

were provided and the patient was prescribed antibiotics and analgesics. Follow-up examinations were scheduled at 1 day, 7 days, 3 months, 6 months and 1 year after treatment to monitor healing and detect any evidence of recurrence.

## Discussion

Radicular cysts, also referred to as periapical or root-end cysts, are inflammatory odontogenic lesions that develop in association with non-vital teeth. Their formation is linked to inflammatory stimulation of the epithelial rests of Malassez within the periodontal ligament, most often following pulpal necrosis and chronic periapical inflammation.<sup>6</sup> These cysts have been reported in approximately 0.5% to 3.3% of individuals across primary and permanent dentitions. They are encountered predominantly during the third to fifth decades of life and show a modest male predominance. The anterior region of the maxilla is also recognized as a frequent site of occurrence.<sup>7</sup> The demographic and anatomical characteristics of the present patient were consistent with these commonly reported patterns.

The development of a radicular cyst is generally described as a sequential process involving epithelial initiation, subsequent cyst formation and progressive enlargement.<sup>8</sup> In many patients, the lesion remains clinically silent and is discovered incidentally during routine dental radiography. In other cases, particularly when the lesion persists or becomes secondarily infected, patients may develop clinical manifestations such as localized swelling, discomfort, tooth mobility, or displacement of adjacent teeth.<sup>9</sup> The tooth associated with a radicular cyst is typically non-vital and may occasionally exhibit discoloration.<sup>10</sup>

The clinical appearance depends partly on the anatomical location and extent of the lesion. In the maxilla, expansion may occur toward the buccal or palatal aspect, whereas mandibular lesions more commonly produce buccal expansion and less frequently lingual involvement. Small lesions may feel firm because they remain surrounded by relatively intact cortical bone. As enlargement progresses, the cortical plate may become progressively thinner, producing a resilient or fluctuant consistency. In the present case, the extensive lesion produced a clinically detectable swelling in the anterior maxilla.

On radiographic examination, radicular cysts are generally characterized by a well-defined, round or ovoid radiolucency centered around the root apex of the involved tooth.<sup>12</sup> Although radiographic findings alone cannot establish a definitive histopathological diagnosis, increasing lesion size may increase the likelihood that a periapical radiolucency represents a radicular cyst rather than a chronic periapical inflammatory lesion. This distinction has been particularly discussed for lesions exceeding approximately 2 cm in diameter.<sup>13</sup>

Selection of treatment should be individualized according to the dimensions and anatomical extension of the lesion, its relationship to adjacent anatomical structures, presumed origin, clinical presentation and the patient's general health

localized lesions because elimination of intracanal infection can permit resolution of the associated periapical pathology.



Larger lesions, however, may require surgical intervention. Available surgical approaches include complete enucleation, marsupialization, decompression and combinations of these procedures with endodontic treatment.

In the present case, the considerable size of the lesion, its anterior maxillary location, the presence of infection and involvement of several adjacent teeth supported a combined endodontic and surgical approach. Root canal therapy was first completed to address the presumed endodontic source, followed by surgical removal of the cystic lesion. Enucleation allowed direct removal of the pathological tissue, while apicoectomy and retrograde filling provided additional management of the involved root ends. The procedure was completed without an intraoperative complication and histopathological examination confirmed the clinical diagnosis.

Histologically, the majority of radicular cysts are lined, either partially or throughout their circumference, by non-keratinized stratified squamous epithelium. Keratinized epithelial lining is uncommon and has been reported in approximately 2% of lesions. When keratinization occurs, orthokeratinization is generally reported more frequently than parakeratinization.<sup>15</sup>

Several therapeutic strategies have been described for radicular cysts, including nonsurgical endodontic treatment, surgical endodontic procedures, extraction of the causative

tooth, complete cyst enucleation with primary closure and decompression or marsupialization followed by definitive enucleation. The appropriate approach should be selected according to the clinical circumstances rather than applying a single treatment method to all lesions. In this patient, surgical enucleation combined with endodontic treatment and apical surgery was selected because of the lesion's size, infection and relationship with the affected anterior teeth. The treatment was completed uneventfully and subsequent follow-up was satisfactory.

## Conclusion

The present case demonstrates the successful management of a large infected radicular cyst through a combined endodontic and surgical approach. Because the optimal management of radicular cysts depends on factors such as lesion size, anatomical location, infection status and the condition of the associated tooth, treatment should be individualized. Nonsurgical endodontic therapy may provide satisfactory resolution in appropriately selected smaller lesions, whereas extensive lesions may require surgical intervention. In the present case, endodontic treatment followed by cyst enucleation, apicoectomy and retrograde restoration provided effective management of the lesion



Fig: 1 Shows extension of Flap



Fig: 2 Shows removable of infected Cyst



Fig:3 Shows Repositioning of flap with suture



Fig: 4 Shows the Obturation of the Root Canal



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## Oral mucocele: A case report

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### Abstract

*Oral mucocele is a frequently encountered lesion associated with the minor salivary glands and is characterized by localized accumulation of mucin following disruption or obstruction of salivary gland ducts. Based on its underlying mechanism, it is generally classified as either an extravasation or retention type. These lesions may develop at several intraoral sites, including the lips, buccal mucosa and floor of the mouth, although the lower lip is the predominant location, particularly for extravasation mucoceles. They may occur at any age but are encountered more often among younger individuals. Clinically, a mucocele commonly presents as a painless, soft, fluctuant swelling that may appear translucent or bluish. Some lesions undergo spontaneous rupture and temporary disappearance, followed by recurrent filling with mucus. The diagnosis is usually established from the clinical history and characteristic appearance. For persistent lesions, complete surgical excision remains a commonly used treatment because it removes the lesion and reduces the likelihood of recurrence.*

**Keywords:** diagnosis, excision, lower lip, mucocele, mucous cyst.

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### Introduction

A mucocele is a localized collection of mucus within the oral tissues that most commonly develops in association with minor salivary glands. Similar mucus-filled lesions may also occur in other anatomical locations, including the appendix, gallbladder, paranasal sinuses and lacrimal sac.<sup>1,2</sup> The designation “mucocele” refers to a cavity or space containing mucus.<sup>3</sup> Within the oral cavity, mucoceles represent a relatively common type of salivary gland lesion.<sup>4</sup>

The lesion develops when normal salivary secretion accumulates within or adjacent to a minor salivary gland because of ductal disruption or obstruction.<sup>5</sup> Clinically, it usually appears as a well-defined, rounded swelling that may be translucent or bluish and can vary considerably in size. The consistency is generally soft and fluctuant on palpation. Most mucoceles are asymptomatic, although recurrent enlargement and rupture may occur.<sup>6,7</sup>

From a pathological perspective, oral mucoceles are broadly divided into two categories. The extravasation type develops when mucus escapes from an injured salivary duct or acinar structure into the surrounding connective tissue. Trauma, including repetitive lip biting, is a recognized precipitating factor. In contrast, a retention mucocele develops when mucus accumulates because the duct of a minor or accessory salivary gland becomes obstructed.<sup>1,8,9</sup>

Intraoral examination may reveal an asymptomatic vesicular or dome-shaped lesion with a pink, translucent, or bluish appearance. The size may range from approximately 1 mm to several centimeters and both sexes and a wide range of age groups may be affected.<sup>10</sup> A greater frequency has been reported among individuals between 10 and 20 years of age.<sup>1</sup> The lower labial mucosa is the site most frequently involved. Less commonly, mucoceles may occur on the buccal mucosa, tongue, palate, or floor of the mouth. When a mucus-filled lesion develops in the floor of the mouth and is associated with the sublingual gland, it is commonly termed a ranula.<sup>1</sup> A mucocele may become evident shortly after a minor traumatic event and may subsequently reach

a relatively stable size. Some lesions remain unchanged for prolonged periods, whereas others show intermittent enlargement and reduction. This fluctuation is usually related to rupture of the lesion followed by renewed accumulation of mucin. The present case report describes the clinical presentation and surgical management of a lower-lip mucocele using a straightforward excisional technique, with the aim of highlighting relevant clinical considerations for general dental practitioners.

## Case Report

A 26-year-old man presented to the dental clinic with a painless swelling involving the right side of the lower lip. According to the history, the lesion had been noticed on the inner surface of the lower lip approximately 2 months earlier. It was initially small but gradually increased to its present size. The patient reported sustaining trauma to the lower lip approximately 3 months before presentation. He did not report pain, fever, malaise, or other relevant systemic symptoms.

Clinical examination revealed an oval, soft, fluctuant swelling of the lower lip. There was no local increase in temperature and the lesion was readily palpable. Intraoral examination also demonstrated generalized soft deposits and calculus, particularly in the lower anterior region. Routine hematological investigations were performed and showed values within the normal reference range.

Considering the history of preceding trauma together with the characteristic clinical findings, a provisional diagnosis of oral mucocele was established. The proposed treatment was discussed with the patient's accompanying family members and the planned intervention was subsequently undertaken. Scaling was performed during the initial dental visit.

Surgical excision of the lesion was selected as the definitive treatment. A vertical incision was made through the overlying mucosa to gain access to the lesion, followed by careful separation and removal of the mucocele. The involved tissue was excised as completely as possible to minimize the possibility of recurrence. The surgical site was closed with sutures [Figure 3], which were removed after 7 days. The patient was advised to attend scheduled follow-up appointments. Clinical reviews were conducted at 3-month intervals for more than 15 months, during which no evidence of recurrent swelling was observed.

## Discussion

Oral mucocele is a relatively common benign lesion that develops as a consequence of altered salivary flow within the minor salivary glands. Accumulation of mucus following ductal injury or obstruction produces the characteristic localized swelling.<sup>5</sup> Yamasoba et al. identified trauma and salivary duct obstruction as important etiological factors in the development of mucocoeles.<sup>11</sup> Mucocoeles arising from minor salivary glands are generally superficial and are seldom large in diameter. In an extravasation-type lesion, disruption of a duct or acinar structure permits salivary material to escape into the surrounding connective tissue.

Minor trauma is therefore considered an important mechanism, particularly when it results in leakage of salivary secretion into the submucosal tissues.

In most cases, diagnosis can be established clinically. The anatomical location, history of previous trauma, relatively rapid development, changes in lesion size, bluish or translucent appearance and fluctuant consistency may collectively provide important diagnostic clues.<sup>3,12</sup> Repetitive oral habits, particularly lip biting or sucking, have also been implicated in the development of mucocoeles and other trauma-related lesions of the oral mucosa.<sup>13</sup>

Additional investigations are not routinely necessary for an uncomplicated lesion with a typical clinical presentation. However, imaging may become useful when the possibility of an associated salivary calculus or a deeper lesion is considered, particularly in cases involving oral or cervical ranulas. Fine-needle aspiration may demonstrate mucus within the lesion and can provide supportive cytological information. Analysis of the aspirated material may reveal protein and elevated amylase concentrations.<sup>11</sup> In lesions where the anatomical extent or origin is uncertain, computed tomography or magnetic resonance imaging can provide further information.

Palpation is also useful when distinguishing a mucocele from other soft-tissue lesions. Lesions such as lipomas and some minor salivary gland tumors are typically non-fluctuant, whereas cystic lesions, mucocoeles, abscesses and certain vascular lesions may demonstrate fluctuation.<sup>14</sup> Therefore, the combination of history, visual examination, palpation and lesion location is important when establishing the clinical differential diagnosis.

Management depends on the size, location, duration and clinical characteristics of the lesion. Simple incision and drainage may temporarily empty the mucus-filled cavity, but this approach does not eliminate the underlying source and may therefore be followed by reformation of the lesion after healing.<sup>15</sup> For persistent mucocoeles, surgical excision of the lesion together with the associated minor salivary gland tissue is generally preferred because it addresses the source of mucus accumulation.

Marsupialization alone may be associated with recurrence in some cases.<sup>16</sup> When tissue is surgically removed, submission of the specimen for histopathological assessment is important, particularly when the clinical findings are atypical, because microscopic examination can confirm the diagnosis and exclude other salivary gland lesions. In the present case, the excised tissue was submitted for pathological examination to support confirmation of the clinical diagnosis.

Alternative treatment modalities have also been described. These include carbon dioxide laser ablation, cryosurgical treatment and electrocautery. Their reported effectiveness may vary according to lesion characteristics and treatment technique.<sup>11</sup> For a localized lower-lip lesion such as that described in this case, conventional surgical excision provides a relatively straightforward approach and permits the removed tissue to undergo histopathological assessment.



Figure 1: (a and b) Mucocoele in lower lip.

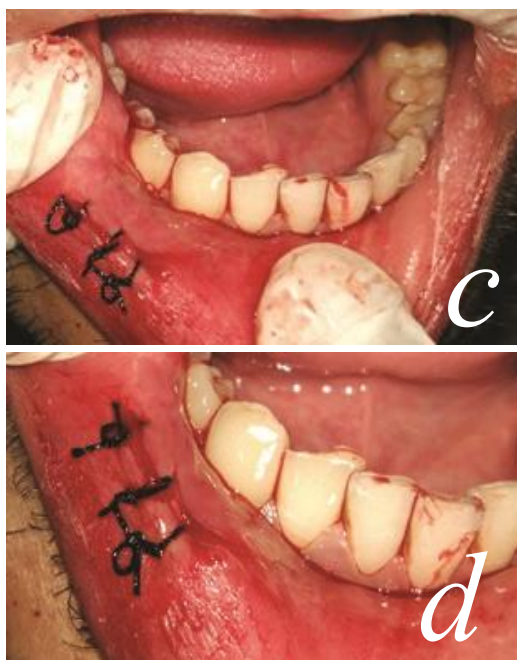


Figure 2. After excision

## Conclusion

Oral mucocoeles are benign lesions that may resolve spontaneously but can persist or recur when the underlying source of mucus accumulation remains. In most uncomplicated cases, the diagnosis can be made from the clinical history and characteristic appearance, while histopathological examination of excised tissue provides definitive confirmation and helps exclude other lesions.

Previous trauma and repetitive habits such as lip biting are frequently reported in association with their development. Preventive education may be useful in children and adolescents who demonstrate repetitive oral habits. School-based oral health education and periodic reinforcement of habit-interruption strategies may help reduce trauma-related mucosal lesions. Children receiving orthodontic treatment should also be examined periodically for areas of persistent mucosal irritation caused by appliances or other local factors. For persistent or symptomatic lesions, complete surgical excision is an effective treatment option. Incomplete removal may permit recurrence because residual glandular tissue can continue to contribute to mucus accumulation. In the present case, follow-up was performed at 3-month intervals and the patient remained clinically free of recurrence during the reported follow-up period. The postoperative course was favorable, with an excellent clinical outcome and no evidence of lesion recurrence.

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# Halitosis: Aetiology, diagnosis and treatment: A review

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## Abstract

*Halitosis refers to an unpleasant odour of the breath produced by volatile compounds arising from either pathological or physiological processes. The condition may originate within the oral cavity or from an extra-oral source and represents a frequent concern in the general population. Although its aetiology is multifactorial, approximately 90% of cases are associated with oral conditions, including inadequate oral hygiene, periodontal disease, tongue coating, food retention, poorly maintained dentures, defective restorations, oral malignancy and infections of the throat. Persistent malodour can adversely influence social interactions and psychological well-being. While many individuals seek professional care because of perceived bad breath, some patients report halitosis despite the absence of objectively detectable malodour. Several clinical and instrumental approaches are available for assessing halitosis. Successful management depends primarily on establishing the underlying cause and identifying the anatomical source through an appropriate clinical examination. Intraoral management may involve periodontal debridement, reinforcement of oral hygiene practices, mechanical tongue cleaning and the appropriate use of mouth rinses.*

**Keywords:** Halitosis, poor oral hygiene, scaling & root planning.

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## Introduction

Human breath contains a complex mixture of substances, some of which may produce an unpleasant odour. The term halitosis is derived from the Latin word halitus, referring to exhaled air and is used clinically to describe an objectionable odour originating from the oral or respiratory breath. The condition has also been described using terms such as foetor oris, oral malodour, mouth odour, bad breath and unpleasant oral odour.<sup>1</sup>

Halitosis can occur in individuals of either sex and across different age groups. Beyond its physical manifestation, persistent oral malodour may have considerable social and psychological consequences. Individuals who experience the condition may become self-conscious during interpersonal communication, which can subsequently influence their relationships and routine social activities.<sup>2</sup>

## Prevalence

Halitosis is considered a frequent condition, with previous reports suggesting that it affects more than half of the general population. The oral cavity accounts for approximately 90% of identified sources. Extra-oral causes, including disorders involving the respiratory, gastrointestinal and urinary systems, have been reported in approximately 9% of cases. A smaller proportion, estimated at about 1%, may be associated with dietary factors or medication use.<sup>3</sup>

## Most likely causes of halitosis:

An unpleasant odour immediately after waking is a common physiological finding and is not necessarily considered pathological halitosis. In contrast, persistent oral malodour is more commonly associated with disease affecting the oral cavity and, less frequently, the nasopharyngeal region. One of the principal mechanisms responsible for oral malodour is the retention of food particles and bacterial plaque on the teeth and

tongue. Inadequate oral hygiene promotes the accumulation of these deposits and may contribute to gingival and periodontal inflammation. Both gingivitis and periodontitis can be associated with unpleasant oral odour. Among the periodontal conditions, acute necrotizing ulcerative gingivitis is particularly notable for producing pronounced malodour. Adult periodontitis, in which plaque-associated periodontal attachment is progressively lost, may also produce varying degrees of oral malodour.<sup>2</sup>

Aggressive forms of periodontitis may produce a more pronounced odour because of the rapid destruction of periodontal supporting tissues and associated tooth mobility.

### Impact on daily life

Because communication and close interpersonal contact are integral parts of everyday life, persistent halitosis may interfere substantially with social functioning. Some individuals are unaware that they have an unpleasant breath odour, particularly when repeated exposure has resulted in olfactory adaptation or when an underlying alteration in smell perception is present.<sup>4,6</sup> Consequently, the problem may first be brought to their attention by a spouse, family member, friend, or another person with whom they have close contact. Awareness of oral malodour can cause considerable embarrassment and emotional distress. Some affected individuals may therefore reduce their participation in social activities or deliberately avoid close conversations and interpersonal encounters.

### Self-care products

The social consequences of halitosis frequently lead individuals to use readily available products intended to reduce or conceal unpleasant breath. Such products, however, generally provide symptomatic rather than definitive treatment because they do not address the underlying cause of malodour. Commonly used options include chewing gum, mints, toothpastes, mouth rinses and oral sprays, many of which temporarily reduce perceived odour by introducing a more pleasant fragrance.

Chewing gum may provide additional benefit by stimulating salivary flow, thereby contributing to oral clearance and temporary reduction of malodour. Certain mouth rinses containing chlorine dioxide or zinc compounds may also reduce the release or perception of unpleasant volatile compounds.<sup>5,6</sup> These measures can be particularly useful for temporarily controlling odour associated with dietary substances such as onion and garlic or with cigarette use.

Nevertheless, these products should primarily be regarded as short-term measures for improving breath freshness and patient comfort. They should not replace professional assessment and treatment when persistent or clinically significant halitosis is present.

### Professional treatment

Effective management of halitosis begins with accurate identification of its underlying cause. A detailed clinical assessment is therefore essential for determining whether the odour originates from the oral cavity or from an extra-oral source. Although intraoral conditions account for most cases,

respiratory and other systemic disorders may occasionally contribute to the problem. Failure to establish the correct aetiology may result in inappropriate management and persistence of the condition.

When the oral cavity is identified as the source, reducing the bacterial burden is a central component of treatment. Periodontal therapy should be considered an important initial intervention.<sup>7</sup> Conditions such as necrotizing ulcerative gingivitis, conventional gingivitis, adult periodontitis, aggressive periodontitis and deep periodontal pockets can provide favourable sites for bacterial accumulation and consequently contribute to malodour. Maintaining periodontal health is therefore important in controlling bacteria-associated halitosis.

Initial periodontal management commonly involves scaling and root planing. These procedures can reduce periodontal pocket depth, decrease gingival inflammation and remove bacterial deposits that contribute to unpleasant breath.<sup>4</sup>

Antiseptic mouth rinses may be used as an adjunct during periodontal treatment to further reduce the oral bacterial burden. Chlorhexidine is an effective antiseptic agent; however, prolonged use may result in adverse effects such as staining of the teeth and oral mucosal surfaces.<sup>5</sup> Therefore, its use should be appropriately supervised.

Reinforcement of effective oral hygiene practices is another essential component of management. Patients should receive appropriate instruction regarding toothbrushing, dental flossing and the use of interdental brushes. Even in patients with satisfactory periodontal health, however, the tongue may remain an important reservoir of microorganisms associated with halitosis. The dorsal surface of the tongue provides a favourable environment for bacterial retention, particularly when a substantial tongue coating is present.

Tongue coating may be more pronounced in individuals with a fissured or geographic tongue. Mechanical removal of deposits from the dorsal tongue using a toothbrush, tongue scraper, or dedicated tongue cleaner can therefore be incorporated into the management plan. One reported study demonstrated reductions in volatile sulfur compound levels following mechanical tongue cleaning, with reductions of approximately 33% using a toothbrush, 40% using a tongue scraper and 42% using a tongue cleaner.<sup>6</sup>

Other oral conditions may also contribute to halitosis and should be identified during examination. These include xerostomia, pericoronitis, oral ulceration and malignant lesions. Xerostomia can occasionally be overlooked when the clinical examination is superficial. Reduced salivary flow removes an important protective mechanism because saliva contributes both antimicrobial activity and mechanical cleansing of the oral cavity. The cause of reduced salivary secretion should therefore be investigated rather than treated only symptomatically.

When xerostomia is associated with previous radiotherapy involving the head and neck or with salivary gland disorders, artificial saliva preparations may be considered to improve oral moisture and patient comfort. A careful medical history can also provide important clues regarding possible systemic contributors to halitosis. When the suspected source lies outside the oral cavity, the dentist should recognize the

possibility of respiratory, gastrointestinal, hepatic, renal, endocrine, or other systemic causes. In such circumstances, the dentist's role includes explaining the suspected source to the patient and arranging appropriate referral to the relevant medical specialist for further assessment.

#### Halitophobia and Non-Detectable Halitosis

A comprehensive assessment is particularly important because the perception of having bad breath does not always correspond to objectively detectable halitosis. Some individuals remain convinced that they have an unpleasant breath odour despite the absence of measurable evidence. This condition is commonly referred to as halitophobia and may occur in association with a monosymptomatic delusional disorder, sometimes described as delusional halitosis, or as part of olfactory reference syndrome.

Management of perceived halitosis without objective evidence may be more challenging than treatment of genuine oral malodour. Concern about breath odour can lead affected individuals to withdraw from social interaction and avoid conversations with others. Appropriate management is therefore important not only for the perceived symptom but also for its psychological and social consequences.

Before initiating treatment directed at halitosis, the absence or presence of objectively detectable malodour should be established using an appropriate assessment method. When an individual remains excessively preoccupied with the belief that they have bad breath despite negative objective findings, psychological assessment and professional counselling should be considered.

## Conclusion

Halitosis is a common oral health concern with potentially important social and psychological consequences. Although disorders of the oral cavity represent the predominant source, extra-oral conditions may also produce or contribute to unpleasant breath and should not be overlooked. Persistent halitosis may occasionally be associated with clinically significant systemic disease, including serious conditions such as malignancy, making appropriate evaluation important. Assessment of halitosis may involve organoleptic examination and instrumental techniques such as a halimeter and gas chromatography. Each diagnostic approach has specific advantages and limitations and the selection of an appropriate method should take into account the characteristics of the patient, available equipment and the purpose of the assessment.

When an extra-oral cause is suspected, collaboration with relevant specialists, including an otorhinolaryngologist, periodontologist, or gastroenterologist, may be necessary to establish the underlying diagnosis. In patients with prominent psychological features, including depressive characteristics or persistent concern despite the absence of measurable malodour, psychiatric or psychological evaluation may also be appropriate.

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