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Original Research

Awareness of systemic diseases and oral manifestation among dental students

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ABSTRACT:
Background: Oral manifestations often serve as early indicators of systemic diseases. Dental students' awareness of these associations is critical for timely diagnosis and referral. **Objective:** To assess the knowledge of systemic diseases and their oral manifestations among dental students at a private college in Chennai. **Methods:** A cross-sectional study was conducted among 100 dental students from various academic years. A validated 25-item questionnaire was distributed via Google Forms. Responses were analyzed using IBM SPSS Statistics 26.0. Descriptive statistics, cross-tabulations, and Pearson's chi-square tests were performed to evaluate knowledge levels and associations with academic year (significance: $p < 0.05$). **Results:** Overall awareness was moderate-to-high (55%–75%). Recognition of common conditions like anemia, vitamin deficiencies, and Sjogren's syndrome was good, while understanding of rare or complex conditions (oral lichen planus, Crohn's disease, radiographic lesions) improved with academic seniority. Statistically significant differences were noted for select complex conditions ($p < 0.05$). **Conclusion:** Dental students demonstrate baseline knowledge of oral–systemic links, but targeted curricular reinforcement is needed for complex disease recognition.
Keywords: Dental students, Systemic diseases, Oral manifestations, Awareness, Cross-sectional study

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INTRODUCTION

Oral health is intrinsically linked to systemic health, with many systemic diseases presenting early signs or complications in the oral cavity.Systemic diseases often manifest signs and symptoms in the oral cavity, which can serve as early indicators of underlying health conditions. These oral manifestations include changes in the soft and hard tissues of the mouth and nearby structures such as the tongue, gingiva, and salivary glands. Recognizing these signs is crucial for early diagnosis and appropriate management of systemic illnesses. Common oral manifestations linked to systemic diseases include mucosal ulcerations, xerostomia (dry mouth), gingival inflammation, atrophic glossitis, pigmentation changes, and delayed wound healing.[1] Such manifestations may be related to infectious, autoimmune, genetic, metabolic, or neoplastic systemic diseases. Therefore, the oral cavity often acts as a window to the overall systemic health, making it essential for dental professionals to be knowledgeable and vigilant about these presentations to provide timely interventions and referrals. Conditions such as diabetes mellitus, cardiovascular disorders, hematological abnormalities, autoimmune diseases, and endocrine disorders often manifest orally through symptoms like gingival bleeding, delayed wound healing, mucosal lesions, xerostomia, and periodontal changes. Early recognition of these manifestations by dental professionals can facilitate timely referral, diagnosis, and management, ultimately improving patient outcomes.[2]

Dental students, as future oral healthcare providers, are expected to possess not only clinical skills but also a sound understanding of the interplay between systemic conditions and oral health. Awareness of these associations is critical for accurate diagnosis, treatment planning, patient counseling, and

interprofessional collaboration with medical practitioners.[3] Studies have shown that gaps in knowledge regarding systemic diseases and their oral manifestations among dental students may compromise patient care and delay early detection of serious conditions.Furthermore, advancements in medical-dental integration, including interprofessional education and collaborative practice models, have highlighted the need for dentists to act as frontline observers of systemic disease. Awareness of systemic conditions and their oral manifestations is therefore not just an academic requirement but a clinical necessity for improving patient care outcomes and promoting preventive healthcare strategies.[4]

Despite the growing emphasis on interdisciplinary education in dental curricula, evidence suggests that knowledge regarding systemic disease-related oral manifestations varies significantly across academic years and educational institutions. Assessing dental students' awareness can help identify educational gaps, inform curriculum enhancements, and strengthen the competency of future dentists in providing holistic oral healthcare.[4]

The present study aims to evaluate the level of awareness regarding systemic diseases and their oral manifestations among dental students

MATERIALS AND METHODS

This study employed a cross-sectional design to evaluate the awareness of systemic diseases and their oral manifestations among dental students at a private dental college in Chennai. Participants included students from various academic years, and data were collected using a structured 25-item questionnaire focusing on their knowledge of systemic diseases and associated oral signs. The questionnaire was reviewed and approved by the Department of Oral Medicine and Radiology at the college. Ethical approval was obtained from the Institutional Review Board (IRB), and informed consent was obtained from all participants, ensuring voluntary participation. Participant anonymity and data confidentiality were strictly maintained, with no personal identifiers collected. The questionnaire was distributed through Google Forms via different social media platforms, and a total of 100 dental students responded. Data were compiled in Excel and analyzed using IBM SPSS Statistics (Version 26.0). Descriptive statistics, including frequencies and percentages, were calculated, and comparisons across academic levels were made using cross-tabulations. Pearson's chi-square test was employed to assess statistical significance, with a threshold set at $p < 0.05$.

RESULTS

A total of 100 dental students participated in the study, and their awareness regarding the oral manifestations of various systemic diseases was evaluated across 25 structured questions. Overall, the accuracy of responses indicated a moderate-to-high level of knowledge, with most correct response rates ranging between 55% and 75%. For instance, 76% of students correctly identified *Sjogren's syndrome* as the systemic condition presenting with dry eyes, dry mouth, and arthralgia, while 70% correctly recognized the importance of obtaining a detailed medical and medication history during diagnosis. Awareness of nutritional deficiencies was relatively strong, with 68% and 70% identifying vitamin B complex deficiency and pernicious anemia, respectively, as causes of cheilitis, glossitis, or "beefy red tongue." Students also demonstrated sound understanding of common disease presentations, as 63% knew that systemic diseases often first present with oral lesions, and 67% correctly identified iron deficiency anemia in cases of mucosal pallor, atrophic tongue, and angular cheilitis. Across these questions, however, chi-square analysis showed no statistically significant association with year of study (all $p > 0.05$), suggesting that knowledge was distributed relatively uniformly across academic levels.

Regarding immunological and mucocutaneous disorders, 62% correctly associated lacy white striae and painful erosions with *oral lichen planus*, and 61% identified hyperpigmentation as an oral feature of Addison's disease. A moderate proportion (55%–61%) correctly answered items related to necrotizing ulcerative gingivitis in HIV, oral candidiasis in immunocompromised patients, lupus-associated ulcers, and premature tooth loss in hypophosphatasia. Although these findings reflect acceptable levels of awareness, most of these items again did not show statistical significance ($p > 0.05$). Only one question within this clusteroral lichen planus featuresrevealed a statistically significant association with academic year ($\chi^2 = 21.139$, $p = 0.048$), indicating that senior students performed better than juniors.

Awareness related to gastrointestinal and autoimmune conditions also showed varied trends. For Crohn's disease, 61% of students recognized cobblestoning and linear ulcers as its oral manifestations, while 58% correctly identified aphthous-like ulcers and mucosal tags as common presentations. Importantly, oral manifestations are associated with thrombocytopenia demonstrated a highly significant association with year of study ($\chi^2 = 31.192$, $p = 0.002$), suggesting that years of clinical exposure substantially enhanced understanding of inflammatory bowel disease–related oral changes. Knowledge on GERD was moderate, with 59% associating water brash, halitosis, and dental erosion with reflux disease. Similarly, associations between liver, hematologic, and endocrine disorders and oral changes showed fair awareness levels, such as 64% identifying thalassemia as the condition showing a "step-ladder" trabecular pattern, 63% identifying amyloidosis as a cause of macroglossia, and 68% linking vitamin B deficiency to glossitis and angular cheilitis. All these, however, revealed no significant difference across years of study ($p > 0.05$).

Radiographic interpretation showed the most striking variation. While 71% correctly linked the “salt and pepper” appearance to hyperparathyroidism and 42%–36% associated “moth-eaten” radiolucencies with conditions like Paget disease or Langerhans cell histiocytosis, Moth eaten" radiolucencies in jaw bone with oral ulcers and loose teeth demonstrated the highest level of statistical significance ($\chi^2 = 39.159$, $p = 0.000$). This indicates that recognition of destructive radiolucent jaw lesions varied significantly across academic years, with senior students showing considerably better diagnostic interpretation abilities. Other radiographic knowledge questions, such as those on “step-ladder” trabeculation in thalassemia and “salt-and-pepper” appearance in hyperparathyroidism, despite good response percentages, did not show significant variation across academic levels ($p > 0.05$).

DISCUSSION

The findings of our study, which demonstrated moderate-to-high awareness among dental students regarding the oral manifestations of systemic diseaseswith correct response rates typically ranging between 55% and 75%are broadly consistent with previous literature, though important differences emerge when comparing depth of knowledge and variability across domains. For instance, Hassona et al. reported that dental students exhibited significantly higher knowledge scores on both normal oral structures (20.9 ± 4 out of 22) and oral manifestations of systemic diseases (30.8 ± 7 out of 40) compared with medical students, who scored substantially lower ($p = 0.029$ and $p = 0.031$, respectively). This aligns with our observation that the dental curriculum equips students with baseline competency in recognizing common oral signs of systemic disease such as anemia, nutritional deficiencies, and immunocompromised states. However, similar to Hassona’s findings where medical students reported inadequate training (only 24.3%), our results also revealed that knowledge was unevenly distributed, with statistically significant differences noted only for complex conditions such as oral lichen planus, Crohn’s disease, and “moth-eaten” radiolucencies suggesting that deeper diagnostic insight develops only with senior-level clinical exposure.[5]

The study by Silva et al. further reinforces the trends observed in our data. Their participants demonstrated relatively low overall performance (median = 67% accuracy) in identifying lesions associated with systemic diseases, comparable to our findings where certain categories, particularly rare presentations, scored below average. Importantly, Silva et al. reported that neither professional category nor perceived preparedness significantly influenced knowledge levels, a pattern reflected in our results, where most chi-square associations were non-significant, indicating similar performance across academic years for most items.[6] Furthermore, Silva’s observation that only 37% of participants felt adequately trained, while 97% expressed a strong need for further education, resonates with the gaps identified in our study, particularly the inconsistencies seen in recognizing oral manifestations of gastrointestinal and autoimmune disorders. These similarities underscore a universal challenge across dental education systems: while common lesions and deficiencies are well recognized, more subtle or rarer systemic presentations remain inadequately understood.

Comparative evidence from literature on disease-specific awareness highlights additional parallels. For example, Padmashri. et al. reported that dental students often struggle to recognize early oral signs of sarcoidosis due to their rarity, consistent with our finding of moderate accuracy in questions involving uncommon granulomatous conditions.[7] Similarly, Alrajhi et al. found that only 43.9% of dental students were aware of oral symptoms associated with COVID-19, suggesting that awareness of emerging systemic conditions is variablean issue that also surfaced in our study for rapidly evolving or less commonly taught disease profiles.[8] When examining the periodontal–systemic disease connection, Alade et al reported that although 89.9% of students acknowledged the importance of oral health to systemic health, only 50.5% recognized the specific link between periodontal disease and diabetes.[9] This matches our findings, where students generally demonstrated good conceptual awareness of systemic health but inconsistencies in translating this knowledge to specific diagnostic patterns. Likewise, Mani et al. (2023) reported that only 44.17% of postgraduate students demonstrated adequate awareness of oral–systemic relationships, and even fewer were able to apply this knowledge clinicallyan issue mirrored in our dataset, where knowledge was adequate but depth of diagnostic reasoning varied significantly across items.[10]

The broader literature emphasizes persistent gaps in understanding systemic risk factors, such as obesity and cardiovascular disease, as demonstrated by Dimitrov et al., who noted insufficient knowledge despite high general awareness of periodontal disease. Our results similarly suggest that while students possess fundamental knowledge of common systemic associations, awareness is weaker for less commonly emphasized systemic conditions.[11] Studies involving practicing clinicians provide further perspective. R.R. George et al. found that clinicians showed good awareness of oral manifestations of diabetes and nutritional deficiencies but limited understanding of gastrointestinal disorders like ulcerative colitisclosely reflecting our findings, in which gastrointestinal conditions such as Crohn’s disease demonstrated both moderate knowledge levels and significant variations across academic years.[12] Nazir et al. reported exceptionally high awareness among dentists regarding the oral–systemic connection (93%), with

strong recognition of links to diabetes (84.4%), heart disease (70.2%), and adverse pregnancy outcomes. While our study did not assess clinician perspectives, the relatively high student awareness in our dataset for common systemic conditions suggests that foundational knowledge aligns with the trends observed among practicing dentists. However, Nazir also highlighted gender differences and the influence of private–public practice settings on awareness factors not assessed in our study but relevant for future research.[13]

Taken together, these comparisons suggest that our findings fit within a broader global pattern: dental students generally exhibit strong awareness of common systemic disease manifestations but show variability and noticeable gaps when encountering complex, rare, or less emphasized conditions.The collective evidence highlights the need for structured curricular reinforcement, interdisciplinary teaching modules, and increased clinical emphasis on systemic–oral interactions to ensure that dental students graduate with robust diagnostic proficiency capable of supporting early detection of systemic disease.[14,15]

CONCLUSION

Our study shows that dental students have good baseline awareness of common oral manifestations of systemic diseases but exhibit gaps in recognizing complex or less common conditions. Only a few domains showed significant improvement with academic level, highlighting the role of clinical exposure. Comparisons with existing literature reveal similar global deficiencies in diagnostic depth despite general awareness of oral–systemic links. Strengthening curriculum and targeted training is essential to improve early identification of systemic diseases through oral findings.

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