

Oral Manifestations of Systemic Diseases: A Literature Review for Dental and General Healthcare Practitioners

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ABSTRACT:

Introduction: The mouth may be a source of information about systemic disease and a number of signs or symptoms may occur prior to any systemic signs or symptoms. It is important to recognise their oral signs for early diagnosis and good patient management.

Aim: The purpose of this literature review was to examine the relationship between systemic disease and oral disease and to highlight the importance of oral disease in order to pave the way for early diagnosis and to promote interprofessional care.

Methods: The review of the literature was performed as a narrative literature review with recent peer reviewed articles from 2022 to 2025. Articles were found on electronic databases, and analysed to assess the oral complications of different systemic diseases.

Findings: The review showed that there are several systemic diseases associated with considerable oral manifestations such as autoimmune, gastrointestinal, infectious and chronic inflammatory diseases. Commonly observed changes were oral ulcers, oral lesions, gingival changes, xerostomia and periodontal abnormalities. The literature also highlighted the importance of dentists to detect disease early, the relationship between oral and

systemic disease and the importance of interdisciplinary collaboration in patient care.

Conclusion: Oral manifestations may also be useful indicators of systemic disease, and can be significant in early diagnosis and treatment of patients. Awareness and advocacy of a multidisciplinary approach to care and of dental and medical providers are essential to maximizing the care that these patients can receive, and to optimize their health outcomes.

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Keywords: Early diagnosis and oral health, oral-systemic health, periodontal disease, oral manifestations, system diseases, oral diagnostics and diagnostics in the context of other specialties (gastrointestinal diseases, auto-immune diseases, teledentistry, interprofessional collaboration). AI-driven marketing; digital real estate; Bangalore; residential housing; market dynamics.

Introduction

The oral cavity is often regarded as a window into the body and many systemic diseases present with oral cavity signs before clinical signs of the disease are seen elsewhere in the body. Oral pathological changes, including the oral mucosa, gums, tongue, salivary glands and periodontal tissues, may be evident, and these changes are a sign of a systemic illness. That makes oral healthcare professionals a unique player in healthcare in that they can, during routine dental visits, become one of the first practitioners to suspect the presence of an undiagnosed systemic disease. Early identification of these signs and symptoms can result in timely referral, diagnosis and management, which can enhance the outcome of the patient and prevent complications of the disease (Ukwas & Porter 2025).

Today, oral health and systemic health are increasingly a part of health care. Medical and dental research has revealed that there are complex relationships between oral and systemic health mediated by bio, immuno, inflammatory and microbial mechanisms. Oral signs and symptoms may be related to diseases of the immune system, gastrointestinal system, endocrine system, hematological system and infectious processes. They can manifest as oral ulceration, inflammation of the oral mucous membranes (erythema), swollen gums (gingivae), dry mouth (xerostomia), destruction of the gums

(periodontia), oral pigmentation, fungal infection (candidiasis) and dysfunction of the salivary glands. In many cases, there may be oral lesions before clinical signs of the disease are evident in the body to enable healthcare providers to make timely intervention (Georges et al., 2022).

Oral manifestations of systemic diseases is one of the most important group of autoimmune diseases. Oral lesions occur with great frequency in systemic immune disorders such as systemic lupus erythematosus, pemphigus vulgaris, mucous membrane pemphigoid, and Sjögren's syndrome and significantly affect the quality of life of the patients. Common early symptoms of these disorders include oral ulcers, desquamative gingivitis, dry mouth (xerostomia) and inflammation of the mucous membranes. But, the timely diagnosis is still required, as dental findings may be confused with dental disease and not systemic disease. These delays can have a detrimental effect on treatment outcomes and disease progression, and highlight the importance of the need for an interprofessional approach to oral care with health care professionals (Petruzzi et al., 2023). For example, oral examination plays a crucial role in systemic lupus erythematosus (SLE) because one of the most prevalent clinical manifestations in these patients is oral lesions (Garcia-Rios et al., 2022).

Similarly, any inflammatory bowel disease may also develop with oral disease coming before gastrointestinal disease. Cobblestone lesions,

mucosal swelling, linear ulcerations, lip enlargement, and aphthous ulcers and pyostomatitis vegetans have been reported as oral manifestations of Crohn's disease and inflammatory oral lesions associated with UC, respectively. Dentists can help to identify these signs and symptoms and refer patients to a medical specialist earlier, which may help minimize the burden of disease and enhance the long-term outcomes for managing it (Pecci-Lloret et al. 2023; Li et al. 2022). Furthermore, oral changes have been identified in children with gastrointestinal diseases, thus emphasizing the importance of oral examination across the ages (Farid et al., 2022).

Oral pathology is equally affected by infectious diseases. During the COVID-19 pandemic, it has become apparent that the symptoms of the virus systemically can manifest in the mouth. A number of oral changes have been reported in infected patients including taste disturbances, oral ulceration, oral mucous lesions, xerostomia and opportunistic infections. The current results would also lend further support to the oral examination being a useful tool to help identify systemic disease processes and support the general assessment of the patient (Sharma et al., 2022).

As oral microbiology has become more of a science, so has the link between oral and systemic health become more important. Disruption of the normal, healthy oral microbial balance (oral dysbiosis), has been associated with a variety of systemic diseases such as cardiovascular disease, diabetes mellitus, respiratory disease, and autoimmune diseases. Chronic periodontal inflammation may result in spread of microbial products and inflammatory mediators into the blood, causing systemic inflammatory response. Thus, the importance of oral health as a key element of overall disease prevention and health promotion policies and strategies is increasingly acknowledged (Georges et al., 2022; Kalhan et al., 2022).

Oral manifestations are of particular importance, however, there is inconsistent awareness and recognition among health care providers. Dental

students, physicians and other health care providers have been discovered with varying levels of knowledge of the link between oral and systemic diseases. Dentists on the whole can detect pathological changes in the mouth, but there is still room for improvement in the training of dentists in systemic disease and oral manifestations. As well, doctors don't always realize the importance of dental findings or the advantages to be gained from early dental referrals. For this reason, there is potential for better education and interdisciplinary training to better patient care and early detection of the disease (Manju et al., 2025; Al-Habib et al., 2022).

The ability to work together among professions is crucial to providing effective care in the treatment of systemic disease that is associated with oral disease. Interprofessional working between the dental and medical professionals facilitates the incorporation of oral aspects into a wider diagnostic and treatment plan. Patient care will be integrated through referral pathways, sharing clinical information and developing collaborative care strategies, thus improving patient outcomes. Recent evidence shows that IPE between dental and medical practitioners can help enhance awareness for the disease, reduce the time to diagnosis, and facilitate comprehensive, patient-centered care (Guan et al., 2024).

With technological developments, opportunities have also been extended for better identification and management of oral manifestations of systemic diseases. Teledentistry has proven to be a beneficial means of assessing, consulting, and referring, especially with underserved populations or in remote areas. Teledentistry has been shown to attain satisfactory levels of diagnostic accuracy and effectiveness, suggesting that it has a role to play in augmenting the ability to detect early oral signs and symptoms related to systemic disease or to access specialist care (Gurgel-Juarez et al., 2022).

Meanwhile, health systems need to recognise the problems that dental practitioners encounter when they provide preventive and diagnostic oral health services. Workload, limited consultation

time, poor interdisciplinary communication and wellbeing of practitioners may impact practitioners' capacity to effectively detect the signs of systemic disease. Organizational support, continuing professional development, and healthcare integration programs are potential strategies for overcoming these barriers and enhancing the capacity of oral healthcare providers to prevent and identify diseases early (Leggett et al., 2024; Kaki et al., 2022).

Aim of the Work

Oral cavity inspection may also reveal a variety of systemic diseases due to clinical signs present in the oral cavity, including the gingiva, tongue, salivary glands, periodontal tissues and other oral tissues. These oral signs may be observed before the onset of systemic signs and diagnosis may be made in a timely fashion to allow timely medical intervention in many instances. Therefore, the importance of recognition of the oral manifestation is increasing for the dental practitioner as well as general health care providers, since it is important in a comprehensive assessment of the patient and in fostering better interdisciplinary care.

The purpose of this literature review is to show that there is a good evidence base which supports a broad overview of the oral manifestation of major systemic diseases and the importance of these oral symptoms in current health care clinical practice. The aim of this review is to address the latest scientific evidence on the link between oral and systemic health and the contribution of oral cavity to the systemic disease processes.

This review will also include the oral manifestations of various classes of systemic disease including autoimmune, gastrointestinal, infectious, metabolic, haematological and other chronic systemic diseases. These manifestations are discussed in particular in terms of pathophysiological mechanisms and implications for diagnosis and the management of the patient.

The other major goal of this review is to evaluate the role of the dentist in the early diagnosis of systemic diseases in a routine checkup. It is

crucial to understand these clinical signs and to be able to diagnose them early, to make good referral and multidisciplinary management as the dentist might be able to recognize the oral signs before the patient asked for medical therapy of systemic signs.

Furthermore, the aim of this review is to discuss the benefits of collaboration between the dental and medical professions to improve patient care. Coordinated and effective communication and care of healthcare providers can reduce time lag between diagnosis and treatment, streamline care management, and enable all health services.

Finally, this literature review seeks to highlight the importance of oral manifestations to the dentist and other health care providers in the diagnosis, and offer practical information to aid in the early diagnosis, prompt treatment, and quality of care given to patients.

Methods

The purpose of this study was to synthesize and critically evaluate the available evidence on oral manifestations of systemic diseases and their implications for dental and general health care practice and this was carried out as a narrative literature review. The aim of the literature review was to identify, analyse and summarise published scientific literature relating to a relationship between systemic disease and oral manifestation of the disease.

PubMed, Scopus, Web of Science, ScienceDirect and Google Scholar were searched extensively for literature. The studies published in the years 2022–2025 were included in the review for ensuring that the reviews are based on the latest studies and evidence in the field. Additional articles were identified by conducting manual searches in selected articles' reference lists.

In the search strategy, both keywords and Medical Subject Headings (MeSH) that are relevant to the oral manifestation and systemic diseases were combined. The words used were: oral manifestations, systemic diseases, oral health, oral lesions, oral-systemic relationship, autoimmune diseases, Crohn's disease, ulcerative colitis, systemic lupus erythematosus, COVID-

19, oral dysbiosis, periodontal disease, interprofessional collaboration, teledentistry and early diagnosis. Logical operators like AND, OR, and NOT were used to narrow down the search results and enhance their precision.

The inclusion criteria included original research articles, systematic reviews, integrative reviews, scoping reviews, evidence-based studies published in peer-reviewed journals that featured oral manifestations associated with a systemic disease or that discussed the role of oral health providers in the diagnosis of systemic disease. Studies that were published in English and full-text were included. The articles included in the review were those that primarily addressed local oral diseases which had no systemic disease component, conference abstracts, editorials, letters to the editor and duplicate publications.

Titles/abstracts were initially searched and then screened for relevance to the goals of the review. After the selection of titles of the eligible articles, full texts of these articles were assessed for the inclusion of the articles. Studies that were found to be eligible for the defined study were chosen to be analyzed.

Oral findings, diagnostic value, clinical implications and recommendations for clinical management were some of the aspects studied information gathered from the studies included in this review. Oral manifestations data was focused in particular as a means of early diagnosis, exchange of information amongst health care workers, patient referral and disease management.

Then the literature selected was themed and classified according to the disease type and its clinical relevance. These included autoimmune diseases, gastrointestinal diseases, infectious diseases, oral dysbiosis and systemic health, periodontal-systemic interaction, professional awareness, interdisciplinary collaboration and emerging technologies such as teledentistry. Results were presented in a narrative synthesis of available evidence, which had the aim of providing a comprehensive overview of the existing evidence, and what further research is required.

With the methodological approach to this article, the goal is to emphasize an integrated and clinically oriented synthesis of the existing state of knowledge in the area of oral manifestation of systemic diseases, and the importance of such manifestations to dental and health care professionals.

Discussion

Oral cavity as a window to systemic health – including the oral microbiome.

The information obtained from the literature reviewed strongly supports the notion that the oral cavity is a useful window into systemic health and disease. The oral cavity is rich in blood vessels, has a high level of immune competence and is readily influenced by systemic diseases. Therefore, oral changes can occur before more specific systemic changes and often are the only sign of systemic disease. This can be significant for clinical practice as dentists are likely to see patients more frequently than medical practitioners and may be able to see early signs of underlying disease. Routine oral examinations can be an important component in early detection of systemic disease: while both Al-Habib et al. (2022) and Ukwas and Porter (2025) pointed out that the oral-systemic relationship between healthcare providers has a great effect on the referral process and interdisciplinary collaboration, respectively. Furthermore, Kalhan et al. (2022) referenced the rising consciousness of mouth and dental health as a whole, not solely dental health care. These results show that oral examination should be regarded as a complement and not a substitute for assessing local dental disease, and should be conducted by a comprehensive health assessment.

The oral-systemic connection is now being acknowledged and is impacting the way healthcare delivery is perceived. Typically, dentistry and medicine have been treated as distinct specialties and the care of the patient has been disjointed, with low rates of early diagnosis. Recent examples, however, show that oral changes can be a powerful tool to help understand immune dysfunction, inflammatory disease, infectious disease and metabolic

abnormalities and gastrointestinal disease. Georges et al. (2022) found that changes to the oral environment often indicate systemic disturbances by inflammatory and microbiological pathways. Similarly, Ukwas and Porter (2025) recommended the use of a systematic oral clinical sign evaluation tool to give early pick-up of serious systemic diseases and Guan et al. (2024) emphasized the importance of the dentist and the medical practitioner working together to maximize the value of oral clinical signs. Therefore the oral cavity can be viewed as a local disease site and a diagnostic window for systemic diseases that can be diagnosed, monitored and treated.

Common oral changes seen in auto-immune conditions. Oral findings associated with auto-immune conditions.

Autoimmune diseases are one of the most important groups of systemic disease with oral complications. The reviewed literature substantiates that oral lesions are the initial or most prominent clinical features of autoimmunity. This is because autoimmune diseases are often associated with abnormalities in the immune system which affect mucous surfaces and epithelial tissues. Autoimmune oral diseases continue to be a diagnostic challenge, and oral lesions often are confused with common oral diseases as opposed to systemic disease, as reported by Petruzzi et al., 2023. Such delays may result in further deterioration of the disease and a delay in care and in the quality of life. Similarly, Garcia-Rios et al. (2022) pointed out oral ulcerations, erythematous lesions, keratotic plaques and mucosal inflammation as commonly reported lesions in SLE and thus possibly as diagnostic markers of the disease. The outcome of this suggests, therefore, that the dental health care provider should have a high index of suspicion when evaluating the persistent or recurrent dental lesions.

The oral manifestations have a significant non-diagnostic utility and may have a significant role in terms of disease activity and prognosis. For example, the oral lesions have been associated with active systemic lupus erythematosus (SLE)

and immune dysregulation. According to Garcia-Rios et al. (2022) oral ulcerations are one of the most common symptoms of the disease in infected patients and can be used as clinical indicators to monitor the disease. Moreover, Petruzzi et al. (2023) reported that oral symptoms are severe in patients with chronic oral symptoms, including pain, eating and swallowing difficulties, speech impairments, and reduced quality of life. Clinical implications of these results are that a full oral examination should be included in the care of autoimmune diseases. Close cooperation between Dentists with Rheumatologists, Dermatologists and other specialists is also important for them to make a timely diagnosis and coordinated care.

Oral cavity and GI tract diseases.

There is a very strong, clinically relevant relationship between gastrointestinal disorders and oral diseases as demonstrated by available data reviewed. Oral symptoms are common in the inflammatory bowel diseases, especially in Crohn's disease and ulcerative colitis, and can occur many months or even years before gastrointestinal symptoms occur. Pecci-Lloret et al. (2023) report that oral changes associated with Crohn's disease include cobblestone appearance of the oral mucosa, linear ulcerations, recurrent aphthous lesions, lip enlargement and mucosal swelling. Oral changes often mirror those changes that would occur with chronic inflammation in the gastrointestinal tract, and may provide valuable insights into disease activity. Similarly, Li et al. (2022) found that oral changes are also likely to be early signs of UC as they are often noted prior to the onset of definitive signs in the intestine. The early detection of these signs and symptoms may therefore aid in the earlier diagnosis and management of the disease.

This is especially noticeable when looking at the diagnostic problems of inflammatory bowel diseases. Systemic inflammatory process can have subtle, periodic or unknown gastrointestinal signs, and be first diagnosed by oral lesions. Both Pecci-Lloret et al (2023) and Li et al (2022) emphasized that patients may suffer and/or delay

diagnosis if oral manifestations are not appreciated. Furthermore, Farid et al. (2022) expanded these results into children noting that oral conditions in children with gastrointestinal diseases are frequently associated with impaired nutrition, growth and can have a negative effect on children's social, emotional and physical health. Findings from this study further support the importance of oral examination for a multi-disciplinary strategy for the management of gastrointestinal diseases and for dental practitioners to be involved in early diagnosis.

Infections and Oral Conditions due to COVID-19

COVID-19 pandemic has brought a strong link between systemic infections and oral health to the fore. Significant proportion of COVID-19 patients presented with oral manifestation such as xerostomia, dysgeusia, ageusia, oral ulceration, candida and inflammatory lesions of the oral mucosa as reported by Sharma et al. 2022. Oral tissues were the focus of much scientific attention, as reflected in the hypothesis that oral tissues are directly or indirectly implicated in systemic viral infections. The results demonstrated the possibility of using oral exams as a means to help with the stages of a disease, immune status of the patient and overall patient health during an outbreak of an infectious disease.

The etiology of COVID-19 associated oral changes is probably complex. As suggested by Sharma et al. (2022), there are several mechanisms which may be involved in the development of oral lesions such as direct infection by the virus, immune dysregulation, effect of medication, opportunistic infections and psychological stress. The observations are in line with the general findings on the effect of systemic infections on the oral tissues. Furthermore, Georges et al. (2022) added that when the oral microbial flora is not balanced, it can lead to an increase in the inflammatory response, and this imbalance may play a role in systemic diseases that cause oral illness. The overall findings reinforce the concept that oral disease processes often reflect systemic disease processes and that

oral assessment is a major component of the patient's assessment.

The mechanisms of interaction between Oral Dysbiosis and Systemic Disease.

Oral dysbiosis is one of the most significant topics discussed in literature recently in relation to the onset and development of systemic diseases. Oral dysbiosis is a change in the structure and activity of the oral microbiome, resulting in an imbalance in the ratio of beneficial to pathogenic microorganisms. According to Georges et al. (2022), oral dysbiosis was defined as a biological mechanism capable of linking oral diseases to a variety of systemic diseases such as cardiovascular diseases, diabetes mellitus, autoimmune diseases and respiratory diseases. Oral dysbiosis may contribute to chronic inflammation, and may be a factor in the development of disease in other organs due to microbial toxins, inflammatory mediators and bacterial products entering the systemic bloodstream.

These results are corroborated by the evidence on the connection between periodontal disease and systemic health. Kalhan et al. (2022) found that chronic periodontal inflammation is linked to an increase in systemic inflammatory burden, and may play a role in the pathogenesis of chronic diseases. The oral dysbiosis and systemic inflammation have a bidirectional relationship whereby systemic diseases can change the oral microbial community, and oral infections can worsen systemic diseases. Therefore Georges et al. (2022) and Kalhan et al. (2022) recognized that oral health care can have an impact on the oral cavity and other areas of the body. The observations are consistent with the increasing awareness that oral health care is a key element in preventative medicine and public health approaches.

Professional Awareness and Collaboration and Future Directions

All the studies reviewed have demonstrated the importance of health care professionals' knowledge of the oral-systemic connection as an important determinant of patient outcomes.

Despite the overall positive knowledge about systemic disease and oral manifestations among dental students it seems that there are some gaps, states Manju et al. (2025). Similarly, Al-Habib et al. (2022) showed that the physicians' knowledge on the oral-systemic relationship also varied, and this was correlated with the level of interdisciplinary collaboration and the level of referral activity. The findings suggest that there is a need to enhance education, both in curriculum and continuous CPD, to enable better detection of the disease at an early stage and better management of patients.

Guan et al. (2024) also emphasized the importance of collaboration among health professionals, particularly the effective communication between dentists and physicians, which is crucial for effective patient care. Successful collaboration means that oral information can be integrated into a holistic diagnostic process, diagnostic delay can be reduced, and the treatment outcomes will be improved. Further, the new technologies like teledentistry can further bolster interdisciplinary care. Gurgel-Juarez et al. (2022) identified the level of diagnostic accuracy of teledentistry in the study as acceptable and the ability to improve access to specialised consultation, particularly in areas with less access. But challenges around workload and wellbeing of the workforce and organizational structure are still to affect clinical practice. Leggett et al. (2024) and Kaki et al. (2022) highlighted that it is essential to have a supportive healthcare system to enable practitioners to provide comprehensive preventative and diagnostic care. Addressing these challenges will become critical to future efforts to optimally engage oral health care professionals in disease detection and to deliver integrated health care.

Issues and Ethical Concerns.

There are many ethical and professional issues which emerge when encountering oral signs and symptoms in patients with systemic disease that may directly impact the provision of oral care and the health of the patient. The healthcare professional has a role in performing

comprehensive oral examinations and identifying abnormalities which could lead to further investigation as the lesions could be the first visual signs of a systemic disease. If there aren't significant oral findings, then they can delay diagnosis and sometimes even result in unnecessary suffering of patients due to the progression of the disease. Therefore, it is highly significant that dental practitioners understand that oral symptoms may be related to systemic health problems, and should not be attributed solely to oral disease.

Professional competency is one of the important ethical issues. Healthcare workers are tasked with giving safe and effective care to patients and need to stay up to date with their knowledge and skills. The knowledge of the oral-systemic link is constantly evolving and oral health care professionals need to carry out continuous education to keep up with the latest evidence. When oral manifestations of systemic diseases are not known, there can be missed opportunities to diagnose and manage patients' health and a drop in the quality of their care. Therefore, lifelong learning and professional education play an integral part in ethical health care practice.

In the management of oral manifestation of systemic disease patient autonomy and informed consent are also important. The patient will receive correct and comprehensible information regarding his/her oral status, possible systemic aetiology, possible investigations and the type of treatment options available. It is important to have clear and respectful communication from the health care provider to ensure the significance of the oral abnormality and why a referral or further evaluation was provided. Respecting patient autonomy means respecting patient's right to make informed decisions and being transparent and honest with patient throughout the diagnostic/treatment process.

Confidentiality is another main principle of ethics. To diagnose and manage systemic diseases, multiple health care professionals must communicate with each other: dentists, physicians, specialists and allied health care professionals. Patients' information should be

kept confidential, shared only as needed for the patient's care, and there should be teamwork and collaboration to ensure effective patient care. Guarding personal health data fosters trust and respect between patients and health care providers, and ensures ethical and legal standards.

In addition, there are numerous ethical matters related to equity and access to health care services. However, there are many factors that stop people from obtaining dental and healthcare, such as monetary issues, location, awareness and lack of professionals. These barriers can postpone the diagnosis and treatment, especially for people in underserved communities. Healthcare systems need to work towards closing service gaps, and provide equitable access for all to timely and adequate services, no matter their socioeconomic status.

With the increasing use of digital technology and teledentistry, there have been new ethical issues. Nevertheless, considering the advantages that virtual consultations and digital communications can bring to access to health services, they may also present privacy, data security, informed consent and the accuracy of virtual assessments concerns. Application of technological solutions should be responsible and respect patient rights that are used through these solutions. The confidentiality and safe handling of EHI should be discussed.

Other ethical concerns in the context of interdisciplinary work. Interprofessional working is essential when dealing with systemic diseases with oral involvement for diagnosis and management. Communication problems or care that is not organized can result in incomplete or partial assessments, late referrals and poor outcomes for patients. Thus, health workers should be multi-professional with others and cooperative with others for the benefit of their patients.

Lastly, ethical concerns are relevant to research with oral manifestations of systemic disease. Scientific studies should be done in ethical ways that include: respect for the subject, informed consent, confidentiality, fairness and scientific integrity. Ethical research practices bring forth

trustworthy evidence which can originate enhancements in clinical practice and progress in health care. All practitioners that deliver oral-systemic health care and research should maintain high ethical standards that will help to support patient well-being and growth of the profession.

Conclusion

The oral cavity is an important means of assessing the health of the person and is often an indicator of a systemic condition. Many systemic diseases can initially present with changes in the mouth. They can be observed on oral mucosa, the gingiva, tongue, on the oral structures and on the salivary glands, and they may be important indicators of dental health for health care providers. The symptoms should be recognised so that the disease can be diagnosed early, the treatment started at the right time and the disease controlled appropriately.

Through this literature review, it is evident that there is a strong relationship between oral and systemic health. Oral manifestations can be seen in many autoimmune, gastrointestinal and infectious diseases as well as chronic inflammatory diseases and may cause debilitating problems for patients. In many instances, these oral changes can be the first signs of a condition that can have other effects on the body, and prompt diagnosis and treatment can result in better health. In this sense, the oral examination could be considered part of a comprehensive approach to the children and adolescents' health.

This review also offers further proof of the complex biological, immunological, inflammatory and microbial interactions between oral and systemic health. Oral diseases are not diseases by themselves, but can be associated with and/or occur because of the systemic diseases. This two-way relationship highlights the need to keep a good oral health in the context of overall disease prevention and health promotion strategies. Wellness and overall health can be a benefit from preventive oral care, routine check-ups and successful treatment of oral diseases.

A key theme that has surfaced from the literature is the significant contribution that dental workers

can make in detecting systemic diseases by oral signs and symptoms. One of the first healthcare professionals to notice abnormalities that could be signs of underlying medical problems is the dentist. In addition to cleaning the teeth and oral tissues, they may check patients for disease and educate them about oral health and the need for other health care providers as necessary. The role highlights the clinical awareness, diagnosis and learning for life.

In addition, the importance of interdisciplinary team working is highlighted between dental and medical and health systems are highlighted. Fostering good communication and collaboration can provide holistic care and support, and facilitate the precise diagnosis and treatment of complex health issues. Systemic disease has multiple facets and likewise, the management of systemic disease and its oral manifestations has multiple facets and the integrated approach to healthcare is becoming increasingly important.

New health care technologies, such as teledentistry and digital health communication technologies, provide innovative ways to catch disease at an earlier stage, to increase access to health care and to actively enhance interdisciplinary care. But, these innovations need to be adopted with proper training, ethical care and suitable health care systems.

The literature overall indicates that oral signs may be valuable clinical indicators for systemic disease, and should be considered when examining patients. Patient's lives could be enhanced with an education of health care providers, interdisciplinary cooperation and continued research into oral-systemic relations with a preventive approach. Future focus should be on improving education, research and developing the link between oral-systemic health, and integrated health care management. These endeavors will contribute to provide improved health services and improve the life of the patients across the world.

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