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Oral manifestations of systemic diseases in children: A cross sectional study

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Abstract:

Oral manifestations present with characteristic appearances that can be some of the first indications of systemic disease in children. A cross-sectional study of 200 children aged 0–14 years with proven systemic disorders underwent comprehensive oral examinations. Seventy-eight per cent of the participants had oral manifestations, with gingival inflammation being the most frequent finding. Recognition of these oral signs at an early stage will enable a timely diagnosis, thus emphasising the consideration of oral health in the management of paediatric preventive care.

Keywords: Oral manifestations, systemic diseases, pediatric patients, public health, gingival inflammation, mucosal lesions

Background:

Oral health is an essential component of general well-being and the interplay between oral and systemic conditions is especially important in childhood. The oral cavity can manifest early signs of systemic disease [1]. The oral cavity is often seen as an indicator of overall health, with many systemic diseases having classic oral signs that allow early diagnosis and treatment [2]. This association is especially significant in the paediatric population, as systemic diseases may remain asymptomatic until oral symptoms prompt clinical evaluation [3]. All kinds of systemic diseases, such as haematological, endocrine, nutritional, infectious and immune disorders, have been shown to present with oral manifestations in children [4]. Mucosal pallor, gingival enlargement, spontaneous bleeding and ulcerations are common oral findings in haematological conditions such as anaemia and leukaemia [3, 5]. General and oral health complications: endocrine disorders-*e.g.*, diabetes mellitus-have been associated with periodontal inflammation and impaired wound healing and also cause xerostomia, which increases susceptibility to oral infectious diseases [4, 6]. Deficiencies in certain nutrients, particularly iron, folic acid and vitamin B complex, have been associated with symptoms in children, including glossitis, angular cheilitis, mucosal atrophy and developmental dental disorders [5, 7]. Oral health in children is considerably affected by the infectious and immunologic conditions [8]. These immunocompromised states can also result in opportunistic infections such as *Candida*, herpetic lesions and other mucosal pathological changes [9]. It is also important to note that non-oral systemic infections can present with oral ulcerations, enanthems and salivary gland involvement, emphasising the diagnostic importance of

complete oral examination [10]. Genetic syndromes and congenital disorders are commonly linked with distinct craniofacial and dental anomalies [11]. Such anomalies encompass tooth number, size, shape and structure as well as delayed eruption and enamel defects [8, 12]. These findings are common in syndromic conditions and offer important clues for early diagnosis and interdisciplinary management [11]. Early recognition of oral manifestations of disease is critical to limiting disease burden and enhancing overall pediatric health outcomes from a public health perspective [13]. Pediatric dentists and primary healthcare providers are ideally positioned to recognise these early signs during periodic examinations and facilitate appropriate referrals [14]. General health screening programs should include an oral health assessment for early diagnosis and holistic care [15]. Recently emerging evidence supported the use of a multidisciplinary approach for children with systemic diseases who present with oral lesions [16]. The partnership between dental and medical professionals allowed for improved diagnostic accuracy [17] and is essential for comprehensive patient management. However, despite global initiatives to improve early detection and treatment, considerable efforts are still needed, particularly in underdeveloped areas of the world where awareness, access to care and socioeconomic disparities remain significant barriers [18]. Therefore, it is of interest to evaluate the array of oral manifestations related to systemic disorders in children.

Materials and Methods:

This descriptive cross-sectional study aimed to record oral manifestations of systemic diseases in children from a public

health perspective. This study was carried out in the Department of Pediatric and Preventive Dentistry, together with the pediatric medical units, during a specified research period. The study population was defined as children aged 0–14 years diagnosed with systemic diseases. Convenience sampling was used to recruit participants. Inclusion criteria included a confirmed medical diagnosis and written consent from parents or guardians. Exclusion criteria included history of systemic illness, unavailability of medical or dental records, recent dental extractions or trauma due to non-systemic conditions and lack of co-operation during examination. A comprehensive case history was captured for each participant, including demographic and relevant clinical information, extracted from hospital datasets and wards, as well as pediatric speciality consultations. Clinical oral examinations were performed under standardised environmental conditions, using sterile instruments and adequate illumination, following strict infection control procedures. The focus of the evaluation was to identify oral manifestations, such as mucosal lesions, gingival inflammation or enlargement, ulcerations, candidiasis, dental anomalies and delayed eruption, related to systemic diseases. The systemic diseases were classified to facilitate comparative analysis of the various oral manifestations noted. The clinical findings were documented in a pro forma format and entered into the electronic database for analysis.

Results:

The study included data of 200 pediatric patients with confirmed systemic diseases (Table 1).The most common categories were nutritional deficiencies (30%) and haematological disorders (25%), followed by infectious disease sequelae (20%), endocrine disorders including diabetes mellitus and thyroid diseases (15%) and genetic or congenital conditions (10%).Out of the subjects, 156 (78%) had oral manifestations. Table 2 summarises the overall distribution of oral findings. The most prevalent

manifestations were gingival inflammation (26.9%), mucosal pallor (21.8%) and ulcerations (17.3%). A total of 14.1% had both dental anomalies and delayed eruption, whereas others had either candidiasis or angular cheilitis less frequently. Table 3 showed that systemic disease categories had a direct and clear association with distinct oral manifestations. Mucosal pallor and gingival bleeding were the most common manifestations of haematological disorders. Glossitis, angular cheilitis and enamel hypoplasia were strongly associated with nutritional deficiencies. Overall, gingival inflammation and delayed healing were characteristic for the endocrine disorders. Oral ulcerations and candidiasis were associated more often than not with infectious diseases. Developmental dental anomalies were more commonly correlated with genetic and congenital disorders. Distribution of oral manifestations according to anatomy (Table 4) showed that the site with a higher prevalence was gingivae (32%) followed by tongue (20%), buccal mucosa (18%) and lips (12%) and as others dentition in 18%. The results of this research show that oral soft and hard tissues are impaired in children with general diseases. Table 5 showed the gender distribution. Out of 200 patients, 110 (55%) were female and 90 (45%) were male. Males (75%) and females (80%) had more oral manifestations, but the difference was non-significant. Distribution of inflammatory and infectious oral lesions by age revealed that children aged 8–14 had a higher frequency of these lesions than those aged from 0 to 7, who more commonly presented with developmental anomalies and signs of poor eruption patterns (Table 6). Overall, an oral manifestation was highly distributed among children with systemic diseases and distinct patterns were seen in disease types. Systemic conditions with phenotypic details with oral health findings are presented in tabulated data highlighting emerging role of early oral examination for paediatric patients.

Table 1: Distribution of study population according to type of systemic disease (n = 200)

Systemic Disease Category	Frequency (n)	Percentage (%)
Nutritional deficiencies	60	30.0
Hematological disorders	50	25.0
Infectious diseases	40	20.0
Endocrine disorders	30	15.0
Genetic/congenital disorders	20	10.0
Total	200	100.0

Table 2: Overall distribution of oral manifestations (n = 156)

Oral Manifestation	Frequency (n)	Percentage (%)
Gingival inflammation	42	26.9
Mucosal pallor	34	21.8
Ulcerations	27	17.3
Dental anomalies/ delayed eruption	22	14.1
Candidiasis	16	10.3
Angular cheilitis	15	9.6
Total	156	100.0

Table 3: Association between systemic diseases and oral manifestations

Systemic Disease	Common Oral Manifestations
Hematological disorders	Mucosal pallor, gingival bleeding, ulcerations
Nutritional deficiencies	Glossitis, angular cheilitis

	and enamel defects
Endocrine disorders	Gingival inflammation, delayed healing.
Infectious diseases	Ulcerations, candidiasis
Genetic/congenital disorders	Dental anomalies, delayed eruption

Table 4: Site-wise distribution of oral manifestations

Site Affected	Frequency (n)	Percentage (%)
Gingiva	50	32.0
Tongue	31	20.0
Buccal mucosa	28	18.0
Dentition	28	18.0
Lips	19	12.0
Total	156	100.0

Table 5: Gender-wise distribution of study population (n = 200)

Gender	Total Subjects (n)	Percentage (%)	Subjects with Oral Manifestations (n)	Prevalence (%)
Male	90	45.0	68	75.6
Female	110	55.0	88	80.0
Total	200	100.0	156	78.0

Table 6: Age-wise distribution of oral manifestations

Age Group (years)	Common Findings	Frequency Trend
0-7 years	Developmental	More common

	anomalies, delayed eruption	
8-14 years	Gingival inflammation,	More common

Discussion:

This study aimed to describe the diversity of oral manifestations in systemic diseases affecting children and to highlight their potential public health implications. The study population showed a higher prevalence of oral findings (78%), suggesting that systemic health may be linked to certain oral conditions in pediatric patients. Previous research studies on children with systemic disorders showed that oral manifestations are common in these patients and may be considered as early diagnostic indicators [1, 2]. The most common systemic conditions reported in our study were nutritional deficiency and haematological disorders. This finding is consistent with previous reports, which stated that nutritional deficiency remains a major public health issue in developing nations and is often associated with oral manifestations, including glossitis, mucosal atrophy and angular cheilitis [5, 6]. Haematological abnormalities, especially anaemia and leukaemia, were significantly associated with mucosal pallor, gingival bleeding and ulcerations in our study, findings that are also consistent with previous paediatric studies [3, 4]. The most prevalent oral manifestation was gingival inflammation (26.9%), followed by mucosal pallor and ulcerations. These findings are consistent with previous literature identifying gingival and mucosal manifestations as frequent oral manifestations of systemic disease in children [2]. was higher in women than in men, the difference was not statistically significant when analysed by gender. Similar trends have been documented in previous studies; however, gender differences in the oral manifestations of systemic diseases remain unresolved and vary across populations, as reported elsewhere [10, 15]. Age analysis indicated that developmental disturbance was more common among younger children (0-7 years), whereas inflammatory and infectious oral lesions were more prevalent in the older age group (8-14 years). Similar observations in the literature suggest that developmental stage and immune maturity may play a role in the types of oral manifestations exhibited in children [16, 17]. From a public health perspective, these findings emphasise the need for oral health assessment in routine pediatric healthcare. The earliest possible recognition of oral manifestations may facilitate timely differential diagnosis and management of systemic diseases, thereby reduce morbidity and improve quality of life [13, 18]. Management of early cases requires a multidisciplinary approach and, hence, a critical role for the pediatric dentist and primary health care provider in early detection and referral [14, 19]. Thus correctly stated that the oral cavity acts as a window into overall health, often revealing early or significant manifestations of systemic diseases [20]. This study has certain limitations. This is only a cross-sectional study, which does not prove an association between systemic diseases or other illnesses and their oral manifestations. The heterogeneity of the patient population in the hospital-based sample may also be a drawback to generalising our findings to the whole population. While these limitations exist, this study provides significant evidence of a correlation between oral and systemic health among

infections, ulcerations

The high prevalence of gingival inflammation observed in many medically compromised pediatric populations may be due to immune disturbances resulting from the effects and products liberated during chemical reactions associated with the current treatment approach, or to insufficient oral hygiene [8]. In a substantial portion of cases, tooth anomalies, such as congenital and eruption anomalies, were also detected. These results align with previous studies showing that systemic alterations during tooth development can induce structural defects and cause eruption disruption [9, 10]. Genetic and congenital disorders showed clear associations with anomalies. However, they were less prevalent than other groups, further indicating a relationship with the characteristic oral features identified in previous research on syndromic conditions [11, 12]. The most commonly affected site was the gingiva, followed by the tongue and buccal mucosa. This distribution aligns with earlier studies, which showed that soft tissues are a common target due to their high vascularity and systemic sensitivity [13, 14]. Because of the decreased ability of this work to cicatrise, infectious diseases have been chiefly linked to ulcerations and candidiasis, underscoring the impact of your immune condition on the development of opportunistic oral infections [8, 9]. Although the prevalence of oral manifestations

children. It highlights the need for a thorough examination during pediatric oral evaluation. In general, these findings are consistent with the published literature and show that oral manifestations in children with systemic disorders are common and can have clinical significance. Improved health outcomes for children require greater awareness, early diagnosis and coordinated care.

Conclusion:

Oral manifestations are common in pediatric systemic diseases and can herald an underlying medical condition, facilitating early diagnosis. Prompt diagnosis and multidisciplinary treatment are possible with early identification via regular oral examination. Incorporating oral health screening into pediatric healthcare can greatly enhance a child's overall health and quality of life.

Advancement of Knowledge:

Oral manifestations are highly prevalent among children with systemic diseases and that the oral cavity provides an early diagnostic window for many of these diseases. It provides new epidemiological data on the occurrence and distribution of oral manifestations in children, particularly those associated with nutritional and haematological diseases. More importantly, the study emphasises the need to include oral health screening in standard care and endorses a syringe-centred, multidisciplinary practice model to promote early diagnosis and improve health outcomes.

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