JOMDI

Journal of Medical and Dental Investigations

J Med Dent Invest 2025; 6: e250064
https://doi.org/10.5577/jomdi.e250064

Review Article Open Access

Pediatric dental approaches in children with chronic kidney disease

Özlem Beren Satılmış[1], **Akif Demirel**[1], **Nurhan Özalp**[1]

[1] Ankara University, Faculty of Dentistry, Department of Pediatric Dentistry, Ankara, Türkiye

Received: 8 November 2025
Revised: 10 December 2025
Accepted: 15 December 2025
Published: 28 December 2025

Correspondence:

Dr. Özlem Beren SATILMIŞ
Ankara University, Faculty of Dentistry, Department of Pediatric Dentistry, Ankara, Türkiye.
E-mail: obsatilmis@ankara.edu.tr

How to cite this article:

Satılmış ÖB, Demirel A, Özalp N. Pediatric Dental Approaches in Children with Chronic Kidney Disease. J Med Dent Invest 2025;6:e250064. https://doi.org/10.5577/jomdi.e250064

Abstract

Chronic kidney disease (CKD) in childhood is a progressive and irreversible condition that affects multiple organ systems, including the oral and dental structures. This review article provides a comprehensive overview of the oral manifestations of CKD in pediatric patients and discusses appropriate dental management strategies. As the prevalence of CKD in children has increased in recent years, awareness of its oral implications has become increasingly important for pediatric dentists. Children with CKD commonly present with distinct oral findings resulting from metabolic disturbances, uremia, altered saliva composition, and long-term medical treatments. Although these patients often have inadequate oral hygiene and a carbohydrate-rich diet, several studies report a lower prevalence of dental caries compared to healthy peers. This paradox is mainly attributed to increased salivary urea levels, higher buffering capacity, and an alkaline oral environment, which inhibit acidogenic bacteria. However, the same salivary changes contribute to increased dental calculus formation. Additional oral findings include halitosis, gingival and periodontal alterations, oral mucosal pallor due to anemia, bleeding tendencies, and opportunistic infections, particularly in immunosuppressed or transplant patients. Renal osteodystrophy may affect the alveolar and supporting bone, increasing the risk of abnormal bone healing and jaw fractures following dental procedures. Moreover, medications commonly used in CKD management, such as cyclosporine and calcium channel blockers, may induce gingival overgrowth and xerostomia. Early identification of oral manifestations, regular dental follow-up, and preventive care are essential in children with CKD. A multidisciplinary approach involving pediatric dentists and pediatric nephrologists is crucial to ensure safe dental treatment and to improve both oral health outcomes and overall quality of life in this vulnerable population.

Keywords: Chronic kidney disease, nephropathy, oral manifestations, pediatric dentistry, renal failure

1. Introduction

Chronic kidney disease (CKD) is defined in the Kidney Disease Improving Global Outcomes (KIDGO) 2024 Clinical Practice Guideline as an abnormality in kidney structure or function that is present for over 3 months and has health implications. Regardless of the underlying cause, one or more markers of kidney damage (albuminuria, persistent hematuria, urine sediment abnormalities, electrolyte and other abnormalities due to tubular disorders, histologically detected abnormalities, structural abnormalities detected by imaging, history of kidney transplantation) or a decrease in glomerular filtration rate (GFR) <60 mL/min/1.73 m^2 are diagnostic criteria for CKD (1). There are five stages of CKD, with stage 5 representing end-stage renal disease (GFR <15 mL/min/1.73 m^2) and requiring dialysis or transplantation for patient survival. CKD worsens the prognosis of all systemic conditions, such as cardiovascular disease and anemia. It affects many organs, including the heart, lungs, brain, and intestines (1, 2).

The most common causes of CKD in childhood in our country are urological problems, cystic diseases of the kidney, and primary glomerulonephritis (3). Loss of the regulatory and excretory functions of the kidneys causes many complications, with oral symptoms and implications for dental care (4). CKD and poor oral health are associated, and their significant impact on each other has been well documented in the literature. Many systematic reviews and meta-analyses have shown a strong association between CKD and poor oral health. Many intraoral findings, such as poor oral hygiene, changes in the composition of saliva, hypoplastic defects in dental hard tissues, halitosis due to metabolite production, gingival and periodontal changes, calculus formation, and oral mucosal changes due to anemia, are observed in many patients with CKD (5-8).

This review aims to provide an up-to-date evaluation of the oral and dental health status, intraoral findings, and necessary dental approaches in children with CKD.

2. Clinical and research consequences

2.1 Dental Caries and Changes in Saliva Composition

The bidirectional relationship between oral health parameters and dental caries in children with CKD remains a topic of debate in the dentistry literature. The results of studies conducted on children with CKD, in particular, show that the prevalence of dental caries is lower in these patients despite poor oral care (9-13). It is expected that children with CKD are more prone to dental caries due to frequent poor tooth brushing habits, dry mouth, and a diet that is unsuitable for the microflora that predisposes them to caries (2, 11, 14-16). Therefore, although there is an increased risk of dental caries due to nutrition in children with CKD who are recommended a relatively low-protein and high-carbohydrate diet, lower rates of caries are detected in these patients. The presence of highly buffered and alkaline saliva due to high urea and phosphate concentrations is reported as a reason for this. In this context, it would not be incorrect to say that the level of caries susceptibility in children with CKD is closely related to saliva characteristics. Many studies have confirmed that individuals with CKD have a more alkaline oral pH and higher salivary buffering capacity than healthy individuals (11, 14, 17). As mentioned, the high pH of the oral environment and the high buffering capacity of saliva in these patients are mostly due to the high ammonia concentration originating from urea hydrolysis in the oral environment (15, 17), which creates an unfavorable environment for acidogenic bacteria in children with CKD, providing a satisfactory explanation for the low caries rate in these patients. However, calcium overload in children with CKD increases as a result of the disorders in the calcium-phosphate mechanism and the use of calcium-based phosphate binders (10, 18, 19). In relation to this, the increase in salivary pH, the decrease in salivary magnesium levels, and probably the decrease in glomerular filtration rate and urinary excretion, and the high salivary urea and phosphate levels in these patients cause calcium phosphate and calcium oxalate crystals to precipitate on the surfaces of dental hard tissues, thus leading to dental calculus accumulation. This situation causes a tendency towards dental calculus accumulation rather than dental caries in these patients (9, 12, 13, 20). In addition, it has been shown that another reason for the lower incidence of dental caries in individuals with CKD is related to the composition of saliva and that bacterial end products in dental biofilms are rapidly neutralized by urea hydrolysis at an increased salivary pH. In this regard, some studies have indicated that the accumulation of Streptococcus Mutans and Lactobacillus strains, which play an important role in the initiation and progression of dental caries, is lower in individuals with chronic renal failure (CRF) (14). When studies on this subject are examined, a study comparing the oral bacterial colonies of children with CKD and their healthy peers found that the levels of S. Mutans and Lactobacillus in the saliva of children with kidney disease were significantly lower. This situation can be shown as another reason that sheds light on the change in the caries balance in children with CKD (11, 14). Although many different indexes are used to detect dental caries in children, indexes such as dmft/s, DMFT/S, and the International Caries Detection and Assessment System II (ICDAS-II) are generally preferred in studies conducted on patients with CKD and the relationship between these diseases and dental caries due to their less complex nature (8, 10, 12, 13). When the studies on this subject in the dentistry literature were examined, Andaloro et al. (10) reported a higher rate of caries-free children with CKD than healthy children without any disease in

their study conducted on children with an average age of 10-11 (range 5-16). Studies have shown the presence of high buffered/alkaline saliva and low salivary flow rate due to high urea and phosphate concentrations in patients with CKD, despite the carbohydrate-rich diet required to reduce the renal workload, as mentioned above. Similarly, Sezer et al. (12) reported that the presence, severity, and activity of dental caries in healthy children were higher than those in patients with CKD (stages 1-3 and 4-5) and kidney transplant recipients. The authors attributed the higher prevalence of caries in systemically healthy children in this study, as in other studies, to the similar reasons mentioned above. However, some studies have investigated the relationship between serum biomarkers and dental caries in children with CKD. Sezer et al. (13) reported that they detected negative and statistically significant correlations between serum hemoglobin and creatinine levels and DMFT index scores in pediatric patients with CKD, and in this context, they emphasized that it is important for both dentists and medical professionals to evaluate serum biomarker levels in terms of oral health during treatment and follow-up sessions.

Oral hygiene training also plays a vital role in defining the relationship between these diseases and dental caries in children with CKD. In fact, it is observed that nephropathic children and their parents/caregivers receive more oral health services and training/information on this subject compared to other pediatric patients and their relatives (10, 21). Accordingly, it is essential and necessary to support and verify with further prospective clinical studies whether the low prevalence of caries in pediatric patients with CKD is due to urea balance and saliva buffering capacity or improved oral hygiene in these patients with special needs.

2.2. Dental Hard Tissue Diseases and Hypoplastic Defects

Developmental defects of enamel vary in clinical appearance, including intrinsic defects (presence of opacity in smooth enamel, lack of translucency, localized patchy areas of enamel, or dark enamel), irregular thin or missing areas of enamel, and malformed dental crowns. The severity of developmental enamel defects is closely related to the timing, degree, and duration of the deterioration during tooth development (22). However, numerous cross-sectional studies in the dental literature have confirmed that children with CKD have higher rates of enamel defects than their healthy peers. The prevalence and severity of enamel defects associated with CKD are directly related to the character of the kidney disease, and both primary and permanent teeth can be affected (10, 11, 22-24). The etiology of enamel defects in patients with CKD is suggested to be hypocalcemia, decreased serum 1,25-dihydroxycholecalciferol levels, and impaired mineralization due to high serum phosphate, parathyroid hormone, and fluoride levels (12, 20).

In contrast, numerous drug effects and metabolic or pathophysiological changes associated with chronic kidney diseases and their treatment also affect the formation, development, and calcification of teeth, and studies on this subject have reported that developmental enamel defects are more common in these patients (10, 14, 24, 25). Koch et al. (26) reported that renal diseases may affect enamel formation of primary teeth in the early postnatal period and that various enamel lesions may also be seen in permanent teeth. Similarly, Al-Nowaiser et al. (9) reported in their studies that the incidence of developmental enamel defects was higher in patients with CKD than in healthy individuals. Sezer et al. (12) reported that the percentage of developmental enamel defects in children with CKD, which is categorized by stages of severity and is in stages 1-3 and 4-5, is higher than in healthy children. Differences in the characteristics of enamel lesions associated with chronic kidney disease have been reported in the dentistry literature. In this regard, Nunn et al. (27) emphasized that diffuse opacities are observed at the highest rate, followed by opacities with defined borders and hypoplasia. Barlak et al. (8) also reported that approximately half of the patients with chronic kidney failure have variable degrees of enamel hypoplasia in at least one of the existing teeth in the mouth.

In individuals with CKD, regarding the presence of enamel defects, Ertuğrul et al. (14) reported that pathological pigments formed due to uremia during tooth development may settle in the dentin matrix and cause brown intrinsic discolorations. In addition, the authors suggested that discoloration and enamel defects may occur as a result of tetracycline administration to hemodialysis patients for infection treatment during the calcification process of the affected teeth. In the same study, ferrous sulfate used in the treatment of anemia was held responsible for the extrinsic brown staining associated with CKD patients (14). Based on this point, it is possible to say that enamel defects observed in children with CKD may be due to both disease-related reasons and agents used in the treatment of these diseases.

Enamel defects in patients with CRF can also be a risk factor for dental caries, and rough or cavitated surfaces can facilitate bacterial/plaque accumulation. In this context, plaque removal is prevented, providing an environment for the development of caries lesions. Moreover, in patients with kidney disease, the enamel hardness of teeth severely affected by enamel defects decreases, and the probability of abrasion by forces generated during normal biting and chewing is higher (22). CKD negatively affects the enamel structures of developing teeth, and the most severe enamel defects are caused by renal dysfunctions that exist at a young age (11, 27).

In this context, it is recommended that both dentists and medical professionals regularly monitor patients with CKD and that necessary medical and dental measures are taken in a timely manner (11).

2.3 Halitosis

Poor oral hygiene decreases salivary flow, increases the pH of plaque, and causes ammonia odor due to uremia, which may affect the levels of volatile sulfur compounds (VSC) in patients with CKD (28, 29). In addition to high salivary urea concentration, increased salivary phosphate and protein concentrations and changes in salivary pH are the causes of halitosis and metallic taste in patients with CKD (7).

2.4. Gingival and Periodontal Changes

Regardless of the medications used in patients with CKD, gingival enlargement due to lack of oral hygiene and plaque accumulation or gingival hyperplasia-like conditions may be observed during tooth eruption periods (27, 30). Oral hygiene should be maintained to reduce inflammation associated with this condition (20, 30). There are different opinions regarding the incidence of gingivitis in patients with CKD. Some studies have reported that the incidence of gingival inflammation is low or the same as that in the healthy group (9, 20). It has been suggested that gingivitis in patients with CKD is reduced due to immunosuppression and uremia, which may alter the inflammatory response to bacterial plaques in the gingival tissue. It has also been suggested that decreased hemoglobin levels may lead to pallor and mask inflammatory signs in the gingiva (9, 20, 27). In contrast, some studies have reported increased levels of gingivitis in these patients (10, 16). These studies concluded that chronic uremia does not affect the defense of periodontal tissues against microbial plaque (31, 32). High gingival scores in CRF patients may be attributed to high plaque levels that may occur due to general medical conditions and prolonged hospitalization and to increased inflammation in the tissues due to systemic conditions that alter local tissue homeostasis (10, 16). In these patients, increased ammonia levels in saliva are potentially cytotoxic to gingival tissues. Ammonia causes gingival inflammation by increasing the permeability of the sulcular epithelium to other toxic or antigenic substances (5, 33, 34).

A two-way relationship between CKD and periodontal disease has been reported (4, 9, 15, 35). Immunosuppression in patients with CKD contributes to the development of a maladaptive, uncontrolled, and persistent inflammatory state in patients. Bacteria responsible for periodontal disease escape the immune system and cause prolonged inflammation, contributing to systemic inflammation and exacerbating the progression of CKD and its complications. Furthermore, the immune impairment caused by CKD leads to bacterial colonization and persistent, long-term inflammation of the periodontium (5, 33, 34). Periodontal treatment in children with chronic kidney disease should be performed in cooperation with pediatric nephrologists and, if necessary, with the participation of periodontologists.

2.5 Oral Mucosal Changes

One of the most common oral manifestations of chronic kidney diseases in children is oral mucosal pallor due to anemia. This is due to a decrease in erythropoietin levels and related anemia (36). Platelet aggregation changes with uremia observed in CKD. Uremia is a term that includes all abnormalities caused by CRF and is used synonymously with CRF (8). Intraoral soft tissues become prone to ecchymosis, petechiae, and bleeding, especially in patients who use heparin and other anticoagulants for hemodialysis treatment in the last stages of the disease (37).

Another complication associated with uremia is uremic stomatitis, which occurs in advanced renal failure with increased blood urea nitrogen (BUN) levels (7). Stomatitis, mucositis, and glossitis may cause pain and inflammation of the tongue and oral mucosa. Changes in taste sensation bacterial and candidiasis infections may develop depending on the underlying renal disease (7, 38). In CKD, especially in transplant patients, Candida infection may be observed due to the loss of resistance ability against infections due to the drugs used and dry mouth (11, 39). Rezvani et al. (40) showed an increased risk of oral opportunistic infections such as candida, hairy leukoplakia, and cytomegalovirus (CMV) infection as a result of immunosuppressant treatment in adults with kidney transplantation. In another study conducted in children and adolescents who underwent kidney transplantation, the mentioned opportunistic infections were not found (41). In the same study, HPV-induced warts, which are frequently observed in organ transplant recipients, were observed on the upper lip of one of the patients participating in the study. These lesions spread through autoinoculation, and the mother of the patient reported that her child constantly touched the lesion (41). Based on the reasons mentioned, oral mucosa examination is quite important and essential in children with chronic kidney disease. In this regard, pediatric dentists should cooperate with pediatric nephrologists, and patients should be managed with a multidisciplinary approach and take precautions in terms of the treatment of oral mucosal lesions.

2.6. Changes in Alveolar and Supporting Bone

As mentioned earlier, in children with CKD, the production of the vitamin D metabolite necessary for calcium absorption may be inhibited. This disorder is compensated for by hyperactivity of the parathyroid gland, which leads to increased urinary phosphate excretion, decreased urinary calcium excretion, and increased calcium release from the bone. The resulting manifestations of renal osteodystrophy include demineralization of the mandible and maxilla, loss of trabeculation, decreased bone thickness, partial or complete loss of lamina dura, giant cell lesions, “ground glass” appearance of bone, metastatic soft tissue

calcification, and abnormal bone healing after tooth extraction (socket sclerosis) (7, 20, 23). An increased risk of jaw fracture has been reported in patients who experience trauma or undergo intraoral surgery (42). In these patients, a detailed anamnesis should be obtained before dental procedures are performed, and treatments should be performed after consultation with a pediatric nephrologist.

2.7. Conditions Caused by Medications and Medical Treatments

CKD or the medications used to treat it can have a negative impact on oral and dental health. These effects vary depending on the severity, stage, and duration of the disease.

Studies have concluded that nifedipine, a calcium channel blocker used in patients with CKD, causes gingival enlargement (9, 20). Cyclosporine used in patients undergoing organ transplantation has also been reported to cause gingival enlargement (16, 43, 44). It was reported that the prevalence of hyperplasia was lower in patients treated with tacrolimus after organ transplantation than in cyclosporine users (15, 27). In children treated with cyclosporine and nifedipine together, a higher rate of gingival overgrowth was observed than in those treated with only one of them. A decrease in gingival overgrowth was observed after the discontinuation of nifedipine and correction of oral hygiene (45).

In a study conducted with pediatric and adolescent patients who underwent renal transplantation, oral ulcers were observed in children who used everolimus, an immunosuppressant, and it was stated that the relationship between this drug and oral ulcers had been previously described in other studies (41).

In addition, anticholinergic drugs used in patients with

CKD have been reported to cause dry mouth. Therefore, patients are advised to reduce their intake of dietary products that may lead to decreased saliva production (23).

Patients with chronic renal disease who use medication should be consulted with a pediatric nephrologist before dental treatment. After a comprehensive evaluation, dental treatment should be initiated, and the patient should be managed using a multidisciplinary approach.

3. Conclusion

In addition to systemic involvement, chronic kidney diseases have various oral manifestations. Oral hygiene care in these patients may be inadequate due to prolonged treatment, hospitalization, and general health status. The oral health status of patients should be evaluated early, and necessary treatments should be planned in detail in consultation with a pediatric nephrologist. In addition, careful evaluation of relevant oral findings during routine examinations is important in terms of referring undiagnosed patients for early diagnosis. Pediatric dentists should inform and support the parents/caregivers of patients to ensure the best level of oral hygiene.

Disclosures

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – Ö.B.S.; Design – Ö.B.S.; Supervision – Ö.B.S.; Materials – Ö.B.S., A.D., N.Ö.; Data collection &/or processing – A.D.; Analysis and/or interpretation – N.Ö.; Literature search – Ö.B.S.; Writing – Ö.B.S.; Critical review – A.D., N.Ö.

Conflict of Interest: There is no any conflict of interest.

Funding: There is no any funding.

References

1. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024;105(4s):S117-s314. https://doi.org/10.1016/j.kint.2023.10.018
2. Davidovich E, Schwarz Z, Davidovitch M, Eidelman E, Bimstein E. Oral findings and periodontal status in children, adolescents and young adults suffering from renal failure. J Clin Periodontol. 2005;32(10):1076-82. https://doi.org/10.1111/j.1600-051X.2005.00812.x
3. Bek K, Akman S, Bilge I, Topaloğlu R, Calişkan S, Peru H, et al. Chronic kidney disease in children in Turkey. Pediatr Nephrol. 2009;24(4):797-806. https://doi.org/10.1007/s00467-008-0998-4
4. Lütfioğlu M, Sakallıoğlu EE, Özkaya O, Açıkgöz G. The Journal of Gazi University Faculty of Dentistry. 2008;25(1):13-8.
5. Kamel DE, Elghazawy RK, Khattab NMA, Hassan AH. Oral Manifestations of Children with Chronic Kidney Disease: A Review Article. ACDJ. 2024;3(1):42-54. https://doi.org/10.21608/acdj.2024.273233.1016

6. Vacariu SM, Adumitroaie AE, Şipoteanu MM, Anistoroaei D, Toma CM, Toma V. Correlation Between Oral Health Status And Chronic Kidney Disease in Children. RJOR. 2023;15(2).
7. Gupta M, Gupta M, Abhishek. Oral conditions in renal disorders and treatment considerations - A review for pediatric dentist. Saudi Dent J. 2015;27(3):113-9. https://doi.org/10.1016/j.sdentj.2014.11.014
8. Barlak DP, Koruyucu DM, Bayram DM, Tokgöz Dİ, Seymen PDf. Kronik böbrek yetmezliği olan olgularda ağız diş bulgularının incelenmesi. J Dent Fac Ataturk Univ 2013;23(3):342-9.
9. Al Nowaiser A, Lucas VS, Wilson M, Roberts GJ, Trompeter RS. Oral health and caries related microflora in children during the first three months following renal transplantation. Int J Paediatr Dent. 2004;14(2):118-26. https://doi.org/10.1111/j.1365-263X.2004.00534.x
10. Andaloro C, Sessa C, Bua N, Mantia I. Chronic kidney disease in children: Assessment of oral health status. Dent Med Probl. 2018;55(1):23-8. https://doi.org/10.17219/dmp/81747
11. Velan E, Sheller B. Oral health in children with chronic kidney disease. Pediatr Nephrol. 2021;36(10):3067-75. https://doi.org/10.1007/s00467-020-04913-9
12. Sezer B, Kaya R, Kodaman Dokumacıgil N, Sıddıkoğlu D, Güven S, Yıldız N, et al. Assessment of the oral health status of children with chronic kidney disease. Pediatr Nephrol. 2023;38(1):269-77. https://doi.org/10.1007/s00467-022-05590-6
13. Sezer B, Kodaman Dokumacıgil N, Kaya R, Güven S, Türkkan Ö N, Çiçek N, et al. Association between serum biomarkers and oral health status in children with chronic kidney disease: A cross-sectional study. Clin Oral Investig. 2023;27(7):3731-40. https://doi.org/10.1007/s00784-023-04989-1
14. Ertuğrul F, Elbek-Cubukçu C, Sabah E, Mir S. The oral health status of children undergoing hemodialysis treatment. Turk J Pediatr. 2003;45(2):108-13.
15. Davidovich E, Davidovits M, Eidelman E, Schwarz Z, Bimstein E. Pathophysiology, therapy, and oral implications of renal failure in children and adolescents: an update. Pediatr Dent. 2005;27(2):98-106.
16. Martins C, Siqueira WL, Guimarães Primo LS. Oral and salivary flow characteristics of a group of Brazilian children and adolescents with chronic renal failure. Pediatr Nephrol. 2008;23(4):619-24. https://doi.org/10.1007/s00467-007-0718-5
17. Kho HS, Lee SW, Chung SC, Kim YK. Oral manifestations and salivary flow rate, pH, and buffer capacity in patients with end-stage renal disease undergoing hemodialysis. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1999;88(3):316-9. https://doi.org/10.1016/S1079-2104(99)70035-1
18. Davidovich E, Davidovits M, Peretz B, Shapira J, Aframian DJ. The correlation between dental calculus and disturbed mineral metabolism in paediatric patients with chronic kidney disease. Nephrol Dial Transplant. 2009;24(8):2439-45. https://doi.org/10.1093/ndt/gfp101
19. Andrade MR, Antunes LA, Soares RM, Leão AT, Maia LC, Primo LG. Lower dental caries prevalence associated to chronic kidney disease: a systematic review. Pediatr Nephrol. 2014;29(5):771-8. https://doi.org/10.1007/s00467-013-2437-4
20. Lucas VS, Roberts GJ. Oro-dental health in children with chronic renal failure and after renal transplantation: a clinical review. Pediatr Nephrol. 2005;20(10):1388-94. https://doi.org/10.1007/s00467-005-1929-2
21. Stein RE, Silver EJ. Comparing different definitions of chronic conditions in a national data set. Ambul Pediatr. 2002;2(1):63-70. https://doi.org/10.1367/1539-4409(2002)002<0063:CDDOCC>2.0.CO;2
22. Salanitri S, Seow WK. Developmental enamel defects in the primary dentition: aetiology and clinical management. Aust Dent J. 2013;58(2):133-40; quiz 266. https://doi.org/10.1111/adj.12039
23. Olczak-Kowalczyk D, Gozdowski D, Pawłowska J, Grenda R. The status of dental and jaw bones in children and adolescents after kidney and liver transplantation. Ann Transplant. 2012;17(4):72-81. https://doi.org/10.12659/AOT.883697
24. Andrade MR, Mendes PC, Primo LG. Dental findings in a child with chronic renal failure secondary to cystinosis. Gen Dent. 2013;61(2):16-7; quiz 8.
25. Limeira FIR, Yamauti M, Moreira AN, Galdino TM, de Magalhães CS, Abreu LG. Dental caries and developmental defects of enamel in individuals with chronic kidney disease: Systematic review and meta-analysis. Oral Dis. 2019;25(6):1446-64. https://doi.org/10.1111/odi.12993
26. Koch MJ, Bührer R, Pioch T, Schärer K. Enamel hypoplasia of primary teeth in chronic renal failure. Pediatr Nephrol. 1999;13(1):68-72. https://doi.org/10.1007/s004670050566
27. Nunn JH, Sharp J, Lambert HJ, Plant ND, Coulthard MG. Oral health in children with renal disease. Pediatr Nephrol. 2000;14(10-11):997-1001. https://doi.org/10.1007/s004670050061
28. Gulsahi A, Evirgen S, Öztaş B, Genç Y, Çetinel Y. Volatile sulphur compound levels and related factors in patients with chronic renal failure. J Clin Periodontol. 2014;41(8):814-9. https://doi.org/10.1111/jcpe.12280
29. Eigner TL, Jastak JT, Bennett WM. Achieving oral health in patients with renal failure and renal transplants. J Am Dent Assoc. 1986;113(4):612-6. https://doi.org/10.14219/jada.archive.1986.0251
30. Chabria D, Weintraub RG, Kilpatrick NM. Mechanisms and management of gingival overgrowth in paediatric transplant recipients: a review. Int J Paediatr Dent. 2003;13(4):220-9. https://doi.org/10.1046/j.1365-263X.2003.00465.x
31. Naugle K, Darby ML, Bauman DB, Lineberger LT, Powers R. The oral health status of individuals on renal dialysis. Ann Periodontol. 1998;3(1):197-205. https://doi.org/10.1902/annals.1998.3.1.197
32. Kitsou VK, Konstantinidis A, Siamopoulos KC. Chronic renal failure and periodontal disease. Renal failure. 2000;22(3):307-18. https://doi.org/10.1081/JDI-100100874
33. Baciu SF, Mesaroş A, Kacso IM. Chronic Kidney Disease and Periodontitis Interplay-A Narrative Review. Int J Environ Res Public Health. 2023;20(2):1298. https://doi.org/10.3390/ijerph20021298
34. Parsegian K, Randall D, Curtis M, Ioannidou E. Association between periodontitis and chronic kidney disease. Periodontol 2000. 2022;89(1):114-24. https://doi.org/10.1111/prd.12431
35. Wahid A, Chaudhry S, Ehsan A, Butt S, Ali Khan A. Bidirectional Relationship between Chronic Kidney Disease & Periodontal Disease. Pak J Med Sci. 2013;29(1):211-5. https://doi.org/10.12669/pjms.291.2926
36. Alamo S, Esteve C, Pérez MG. Dental considerations for the patient with renal disease. J Clin Exp Dent. 2011;3:e112-e9. https://doi.org/10.4317/jced.3.e112
37. Seraj B, Ahmadi R, Ramezani N, Mashayekhi A, Ahmadi M. Oro-dental health status and salivary characteristics in children with chronic renal failure. J Dent (Tehran). 2011;8(3):146-51.
38. Thomas C. The Roles of Inflammation and oral care in the overall wellness of patients living with chronic kidney disease. Dent Econ. 2008;98:111-20.
39. Olivas-Escárcega V, Ruiz-Rodríguez MdS, Fonseca-Leal MdP, Santos-Díaz MÁ, Gordillo-Moscoso A, Hernández-Sierra JF, et al. Prevalence of oral candidiasis in chronic renal failure and renal transplant pediatric patients. JOCPD. 2008;32(4):313-7. https://doi.org/10.17796/jcpd.32.4.f53343t742150l73

40. Rezvani G, Davarmanesh M, Azar MR, Salehipour M, Sedaghat R, Karimi F, et al. Oral manifestations of allograft recipients before and after renal transplantation. Saudi J Kidney Dis Transpl. 2014;25(2):278-84. https://doi.org/10.4103/1319-2442.128505
41. Tuma M, Silva Andrade N, Correia Aires R, Cristelli MP, Medina Pestana JO, Gallottini M. Oral findings in kidney transplant children and adolescents. Int J Paediatr Dent. 2022;32(6):894-902. https://doi.org/10.1111/ipd.12965
42. Proctor R, Kumar N, Stein A, Moles D, Porter S. Oral and dental aspects of chronic renal failure. J Dent Res. 2005;84(3):199-208. https://doi.org/10.1177/154405910508400301
43. Guzeldemir E, Toygar HU, Tasdelen B, Torun D. Oral health-related quality of life and periodontal health status in patients undergoing hemodialysis. J Am Dent Assoc. 2009;140(10):1283-93. https://doi.org/10.14219/jada.archive.2009.0052
44. Allman SD, McWhorter AG, Seale NS. Evaluation of cyclosporin-induced gingival overgrowth in the pediatric transplant patient. Pediatr Dent. 1994;16(1):36-40.
45. Bökenkamp A, Bohnhorst B, Beier C, Albers N, Offner G, Brodehl J. Nifedipine aggravates cyclosporine A-induced gingival hyperplasia. Pediatr Nephrol. 1994;8(2):181-5. https://doi.org/10.1007/BF00865474