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Oral Manifestations And Salivary Changes In Chronic Kidney Disease (CKD) Patients- A Review

Review Article

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Abstract

This article reviews the current understanding of the oral and dental aspects of chronic kidney disease. As the number of people suffering from CKD increases worldwide, dentists are expected to encounter more patients with CKD who need oral care. CKD can elicit a wide spectrum of oral manifestations in the hard and soft tissues. Bleeding, altered drug metabolism, impaired immune function, and an increased risk of dentally induced bacterial endocarditis are some important features that require attention. Dental management of patients with CKD requires that clinicians appreciate that multiple systems can be affected by the disease. Dentists should consult with nephrologists regarding the specific precautions required for each patient. Medical treatments in these patients may need to be postponed due to an unfavourable oral health status or potential risk of life-threatening infection after surgery. Improving oral hygiene and performing necessary dental and oral treatment before hemodialysis or transplantation may prevent endocarditis and septicaemia in these patients. Hence, treatment plans should be formulated to restore the patient's dentition and protect them from potentially severe infections of dental origin.

Keywords: Oral Manifestations; Chronic Kidney Diseases; Salivary Manifestations; Dialysis; ESRD.

Introduction

The parietal bone foramina is usually minor. Two of them are loThere are about 1.8 million patients with end stage renal disease (ESRD) in the world that need to treatment, including hemodialysis, peritoneal dialysis, or transplantation [1]. According to study in 2006, about 12,500 Iranian patients with ESRD (48.5%) received haemodialysis [2]. Dialysis treatment leads to systemic changes, oral complications, and changes in salivary flow rate and saliva composition [3]. The importance of saliva as a diagnostic fluid has attracted interest in recent years. The advantages of using saliva, which include its easy availability, non-invasiveness, and the close relationship between saliva and serum parameters, have attracted the interest of researchers in saliva as a unique fluid for diagnosing various diseases [4].

In research carried out to study oral and salivary changes among hemodialysis patients, it was found that 65% of the patients exhibited at least one of the oral manifestations. The mean stimulated and non-stimulated salivary flow rates in these patients were significantly lower than those of the control group [5] conducted a study to compare prevalence of oral lesions in kidney transplant and hemodialysis patients and noticed there was at least one intraoral lesion (including xerostomia, aphthous ulcers, squamous papilloma, gingival inflammation, and candidiasis) in 32.2% of kidney transplant and in 8.6% of dialysis patients. The most prevalent manifestation was xerostomia (4.3%) in dialysis patients, while gingival inflammation (1.1%), and candidiasis (2.2%) were of lower prevalence.

It is necessary to have a thorough knowledge of oral manifestations in hemodialysis patients to take necessary precautions for

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preventing bacteraemia and the consequent complications. Considering the increase in the number of dialysis patients in Iran , and since no research had been conducted on hemodialysis patients in Zahedan to simultaneously study salivary markers and oral manifestations, it was decided to investigate oral manifestations and some salivary markers (urea, calcium, and pH) in haemodialysispatients.Increases in urea compounds have been mentioned as one of the findings in most studies carried out on renal patients [6]. Based on a research, salivary pH values in hemodialysis patients were significantly higher compared to the healthy group (8.41±0.76 versus 7.01±0.31), and these results are in agreement with that found in research conducted by Al Nowaiser et al. . Salivary urea is decomposed into ammonium ions and carbon dioxide by urease and, hence, may raise salivary pH to critical values [7].

Gingival bleeding in 16.7% of the members in the patient group was another finding of this study, but no cases of it in the control group. Unnatural bleeding is one of the problems associated with dialysis. Intrinsic platelet abnormalities and impaired plate-let-vessel wall interaction are factor responsible for bleeding tendencies in ESRD. Anaemia, dialysis, the accumulation of medications due to poor clearance, and anticoagulation used during dialysis have some role in causing bleeding in ESRD patients .Our research experience has prompted us in pursuing this study [8-17].

Halitosis

Moreover, high salivary urea levels and decomposition of urea into ammonia increase halitosis in people with kidney diseases. In a research, 53.3% of the patient group and 20% of the control group also suffered from halitosis. Keles et al.reported 34% of the patients in their study were afflicted with halitosis. Another reason for increased rates of halitosis could be negligence in oral hygiene because of the chronic nature of the disease in these people [18].

Decrease in Calcium levels

Some studies have referred to reduced calcium levels in hemodialysis patients [19]. Chronic uraemia is characterized by decreased levels of active metabolites of vitamin D synthesized in the kidneys. The consequence is an increased synthesis and secretion of parathyroid hormone (secondary hyperparathyroidism) causing to the low levels of calcium [20].

Xerostomia

Xerostomia may be caused by reduced salivary flow rate secondary to atrophy and fibrosis of the salivary glands, taking special drugs, and limited intake of liquids, increasing age, and oral breathing secondary to Pulmonary conditions [21].

Other Oral Manifestations

Some of the hemodialysis patients experienced changes in the sense of taste . Changes in the sense of taste may have various reasons such as increased levels of salivary urea and dimethyl and trimethylamine levels, metabolic disorders, taking medications, reduced number of taste buds, changes in salivary flow rate and saliva composition in uremic patients [22].

Pale mucosa was another manifestation observed in the patients

Pale mucosa results from anaemia mainly developed following the inability of the failing kidneys to secrete erythropoietin, loss of red blood cells through dialysis, increased brittleness of red blood cells and their early destruction and, in some cases, from malnutrition [23].

Findings of research indicate that hemodialysis patients are at greater risk of developing oral manifestations, and that it is necessary that these patients be under careful supervision with respect to oral and dental hygiene and mucosal manifestations. Moreover, timely diagnosis and treatment of oral manifestations will substantially help improve their life satisfaction.Several studies have reported the connection of the salivary flow with periodontal, dental and oral status in CKD patients [21].

Salivary Changes

It has been also reported that in CKD patient's saliva has important protective properties, participating in the maintenance of oral mucosa and hard tissues integrity, that is in the physiological balance within normal condition. Any deviation may influence the condition of the tissues in the oral cavity . Salivary buffer capacity is an important parameter in maintaining pH of saliva, thereby reflecting on the integrity of soft and hard tissue in the oral cavity [3, 21].

Osiak et al. [18] registered a high prevalence of oral lesions, such as xerostomia and coated tongue in hemodialysis and renal transplant patients. Our experience showed that xerostomia and thirst are the most common oral discomforts, which patients in pre- dialysis phase and patient undergoing haemodialysis face. [3, 20-23]

The reduced salivary flow affects the vulnerability of oral mucosa, making it too sensitive, thereby emphasizing the symptom of burning sensation. Additionally, the dry and vulnerable mucosa, insufficient humidity in mouth and lost elasticity, make the oral mucosa to be easily traumatized, which is clinically manifested by occurrence of petechiae and ecchymoses.Uremic fetor, an ammoniacalodour typical of uremic patients is caused by high concentration of urea in the saliva which is broken down to ammonia by urease. in addition, oral malodor can also result from neglected oral health due to the chronic nature of the illness.

Dry mouth (xerostomia) can be observed in renal patients due to restriction in fluid intake, the side effects of drugs (fundamentally antihypertensive agents), possible salivary gland alteration and oral breathing secondary to lung perfusion problems. The significantly reduced mean flow rate of unstimulated as well as stimulated whole saliva in ESRD patients can be a contributory factor to xerostomia.

ESRD can give rise to altered taste sensation, and some patients may complain of an unpleasant and metallic taste. High levels of urea and dimethyl and trimethylamines, and low level of zinc might be associated with decreased taste perception in uremic patients. These taste disturbances could also be caused by metabolic disturbances, the use of medication, a diminished number of taste buds, and changes in salivary flow rate and composition. Sour and sweet tastes can be more seriously affected than bitter and salty tastes.

Reduced caries prevalence has been reported in ESRD patients.

This is attributed to the protective effect of metabolism of urea in saliva, which inhibits bacterial growth and neutralizes bacterial plaque acids. In the current study, DMFT index has revealed an increased prevalence of caries which can be correlated to poor oral hygiene, diminished saliva production, and an increase in the number of cariogenic Streptococcus mutans.

Gingival enlargement secondary to drug treatment is one of the most widely documented oral manifestations in patients with renal failure. Such enlargement can be induced by cyclosporine, which is used as immunosuppressant in transplant patients, and/or calcium channel blockers (nifedipine, amlodipine, diltiazem, verapamil) used in pre-dialyzed and dialyzed patients for management of hypertension. The condition in turn is aggravated by the deficient oral hygiene.

A great majority of end stage renal disease (ESRD) patients present with dental calculus possibly due to high salivary urea and phosphate levels. Other important risk factors for the development of dental calculus and dark brown staining of teeth are the ingestion of large quantities of calcium carbonate (used as a phosphate binder to maintain phosphorus homeostasis), extrinsic staining secondary to liquid ferrous sulphate therapy given for the management of anaemia and deficient oral hygiene. Diminished cleansing action due to reduced salivary production can also lead to greater incidence of calculus formation.

Gingival bleeding, petechiae, and/or ecchymosis can result from platelet dysfunction and the effects of anticoagulants like heparin used to maintain the patency of AV fistulae required for regular vascular access. Uremic toxins and anaemia can also play a role.

The accumulation of ammonia might irritate the oral mucosa, resulting in mucosal inflammation. A decrease in the salivary mucin coating over the oral mucosa makes it vulnerable to infections, inflammation, and tissue damage leading to tongue and mucosal pain. Uremic frost, an uncommon clinical observation associated to azotaemia and uraemia may occasionally be present in the renal patients. Uremic frost is a condition when urea and urea derivatives are secreted through the saliva in oral cavity and sweat in skin, which evaporates away and may leave solid uric compounds, resembling a frost.

Candidiasis and increased vulnerability to human herpes virus is common among haemodialyzed as well as transplant patients due to longer durations of immunosuppression. Due to diminished salivary flow, the salivary defence can be compromised in these patients, and a shift in the composition of the oral microflora can occur toward more virulent gram-negative species.Mucosal lesions, particularly white lesions have been reported in ESRD patients. Common observations are drug induced lichenoid lesions, an increased susceptibility to epithelial dysplasia and carcinoma of the lip. The increased risk of malignization in ESRD patients probably reflects the effects of iatrogenic immune suppression.

The lower flow rates of both unstimulated and stimulated whole saliva can be attributed to direct uremic involvement of the salivary glands leading to decreased parenchymatous and excretory functions, and as a result of dehydration due to restriction in fluid intake. Acute stress levels in these patients may also possibly reduce the salivary flow rate. [24, 25]

The higher pH of unstimulated whole saliva in ESRD patients can be contributed to a higher concentration of ammonia in saliva due to the hydrolysis of urea by the enzyme urease. pH of stimulated whole saliva does not reveal any significant difference because sodium and bicarbonate concentrations increase with increased flow rates, resulting in a higher salivary pH. This effect might mask the changes that are due to the disease condition. The higher buffer capacity of unstimulated whole saliva in ESRD patients can be correlated to the elevated salivary phosphate concentration. [26, 27]

Conclusion

Patients with chronic kidney disease (CKD) often present systemic complications such as anaemia, coagulation and platelet function disorders . Some of them manifest oral symptoms and signs. Oral symptoms may be more or less prevalent in the oral mucosa. It has been proven that approximately 90% of the patients with CKD have soft tissue changes. Besides changes in the soft tissue, in these patients there is an increased risk of caries which is a multifactorial disease.

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