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Oral Manifestations of Chronic Renal Failure Patients on Hemodialysis

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Kidney disease is a worldwide health problem with increasing incidence and prevalence of disease, high cost, and poor prognosis. Chronic Kidney Disease involves an irreversible loss of renal function which leads to a change in the electrolyte balance of the human body. This can lead to a large plethora of oral manifestations. A wide range of lesions may be observed in chronic renal failure patients like gingival hyperplasia, enamel hypoplasia, petechiae, gingival bleeding, and various other lesions. As literature indicates that the incidence of these pathologies are increasing, identification and providing appropriate dental care to these patients can be imperative.

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Aims: To assess the oral manifestations of chronic renal failure patients on hemodialysis.
Methods and Materials: The oral cavity of the patients was examined for features like uremic odour, coated tongue, ulcerations, pigmentation, petechiae, ecchymosis, uremic stomatitis, xerostomia and recorded accordingly.
Statistical Analysis Used: All the findings were tabulated and were subjected to statistical analysis using Chi square test.
Results: A wide range of oral signs, symptoms, and lesions that include uremic odor(36.6%), xerostomia(58.3%), uremic stomatitis(5%), altered taste sensation(46.6%), coated tongue(1%), burning sensation(40%), ulceration/pigmentation(6.6%), candidiasis(5%), pale mucosa(13.3%), gingival enlargement (6.6%) and petechiae/ecchymosis(5%) were observed. Xerostomia was found to be the most common finding in 35(58.3%) patients affecting 20 (57.1%) of males and 15(42.8%) of females followed by altered taste sensation in 28 (46.6%) patients that showed an equal gender predilection.
Conclusions: Dental considerations of renal failure patients is of utmost importance as they present with a wide range of oral manifestations. It is the Oral Physicians responsibility to treat the oral manifestations along with rendering the appropriate dental therapy to the renal failure patients.

Keywords: Hemodialysis; oral health; renal failure; xerostomia.

1. INTRODUCTION

Oral Health is a state of being free from orofacial pain, oral and throat cancer, oral infections, tooth decay, periodontal disease, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing [1].

The human body manages a multitude of highly complex interactions to maintain homeostasis [2]. The kidneys are vital organs for maintaining a stable internal homeostasis. Renal diseases are classified based on onset as acute and chronic renal failure (CRF). A significant percentage of CRF patients require either dialysis or renal replacement therapy [3,4] Like various other systemic diseases, a plethora of oral manifestations are observed in chronic renal failure patients like altered taste, gingival enlargement, xerostomia, parotitis, enamel hypoplasia, delayed eruption, various mucosal lesions like hairy leukoplakia, lichenoid reactions, ulcerations, angular chelitis, candidiasis etc. [5,6].

The patients with Chronic Renal Failure manifest oral changes due to impaired renal function, a decreased GFR and by the accumulation and retention of various metabolic waste products that leads to an azotemic or even a a uremic state. Some of the presenting signs were an ammonia-like taste and smell, stomatitis, gingivitis, decreased salivary flow, xerostomia, and parotitis. As renal failure develops, one of the early symptoms may be a bad taste and odor in the mouth, particularly in the morning. This uremic fetor, an ammonic odor, is typical of any uremic patient and is caused by the high concentration of urea in the saliva and its subsequent breakdown to ammonia [7,8].

Salivary urea levels correlate well with the Blood Urea Nitrogen (BUN) levels with no fixed linear relationship. An acute rise in the BUN level may result in uremic stomatitis, which may appear as an erythemopultaceous form characterized by red mucosa covered with a thick exudate and a pseudomembrane or as an ulcerative form characterized by frank ulcerations with redness and a pultaceous coat.

White plaques called “uremic frost” occasionally found on the skin can rarely be found intra orally. This uremic frost results from residual urea crystals left on the epithelial surfaces after perspiration evaporates or as a result of decreased salivary flow [7].

A more common oral finding is significant xerostomia, probably caused by a combination of direct involvement of the salivary glands, chemical inflammation, dehydration, and mouth breathing (Kussmaul’s respiration) [9].

Salivary adenitis can occasionally be seen. Another finding associated with increased salivary urea nitrogen, particularly in children, is a low caries activity, despite a high sugar intake and poor oral hygiene, suggesting an increased neutralizing capacity of the urea arising from hydrolysis of urea [7].

Other oral manifestations of renal disease are related to renal osteodystrophy or secondary hyperparathyroidism, may become evident late in

the course of the disease. The classic signs of renal osteodystrophy in the mandible and maxilla are bone demineralization, loss of trabeculation, ground-glass appearance, total or partial loss of lamina dura, giant cell lesions or brown tumors, and metastatic calcifications [8].

Gingival enlargement secondary to drug therapy is the most-reported oral manifestation of renal disease. It can be induced by cyclosporine and/or calcium channel blockers. It principally affects the labial interdental papillae, although it can become extensive, involving the gingival margins and lingual and palatal surface. Despite the observation that the oral hygiene of individuals on hemodialysis is poor, there is no good evidence of an increased risk of periodontitis [9].

A wide range of oral mucosal lesions, particularly white patches and/or ulceration, have been described in individuals receiving dialysis and allograft. In particular, lichen planus-like lesions can arise, sometimes, but not always, as a consequence of the associated drug therapy (e.g., diuretics, beta-blockers). Similarly, oral hairy leukoplakia can occur secondary to drug-related immunosuppression, although clinically and histopathologically similar lesions lacking Epstein-Bar virus (EBV) have veen observed with uremia. Of note, this latter lesion may resolve with correction of the uremia [10].

The risk of oral squamous cell carcinoma in patients receiving hemodialysis is generally similar to that of otherwise healthy individuals in the general population (Lee and Gisser, 1978; Bradford et al., 1990) although reports suggested that therapy following renal transplantation predisposes to epithelial dysplasia and carcinoma of the lip [7,8,11].

Candidiasis: Angular cheilitis has been described in up to 4% of hemodialysis and renal allograft recipients. Other oral candidal lesions-such as pseudomembranous (1.9%), erythematous (3.8%), and chronic atrophic candidosis (3.8%)-have been reported in allograft recipients [12].

Prior to the availability of appropriate anti-viral drugs (e.g., acyclovir, gancyclovir, and valacyclovir), about 50% of renal allograft recipients, who were seropositive for herpes simplex, experienced recurrent, severe, and prolonged HSV infections [8].

Because of the various oral manifestations either due to disease or the therapies, the Oral physicians are challenged to meet the dental demands and render services to the patients of chronic renal failure. Hence the present study was planned to assess the oral manifestations of chronic renal failure patients on hemodialysis [13].

1.1 Aims & Objectives

To examine and record the oral health status in chronic renal failure patients on hemodialysis.

2. METHODOLOGY

The selected subjects were made comfortably seated on a dental chair and the details of demographic data along with their dialysis centres were recorded. A thorough clinical examination was carried out with a specially prepared case history proforma under artificial illumination.

The oral cavity of the patients was examined for features like uremic odour, coated tongue, ulcerations, pigmentation, petechiae, ecchymosis, uremic stomatitis, xerostomia and recorded accordingly.

Recording of symptoms namely dry mouth, burning sensation and altered taste were enquired and objectively obtained as reported by patients. A diagnosis of xerostomia was made using stick test where the diagnostic instrument i.e, mouth mirror sticks to the buccal mucosa was considered positive for xerostomia [7]. Presence of urine odoured breath was identified as Uremic odour. Presence of white plaque accumulations on the dorsal surface of the tongue which could be easily removed was recorded as coated tongue. The presence of a break in the continuity of oral mucosa was considered as Ulceration. Uremic stomatitis was registered for the presence of painful irregular erythematous areas covered with grayish white pseudomembranes localized on lateral borders and dorsum of the tongue or buccal mucosa [8]. The presence of blackish or brownish macules of the mucosa was attributed to pigmentation. Candidiasis was recorded for the presence of white plaques over the mucosa that were scrapable using a gauge leaving behind an erythematous eroded area which was removed and confirmed later with the examination of smear. Pale mucosa was recorded in conditions where normal coral pink colored mucosa appeared bland and was seen near normal to white color upon stretching [9]. Presence of edematous and enlarged gingiva

advancing the gingival 3rd of the clinical crown was considered to be positive for gingival enlargement.

The presence of blood tinged sub mucosal bruises were recorded as petechiae when they were 1-2 mm in diameter and as ecchymosis when larger.

3. RESULTS

The present study was carried out in Lenora Institute of Dental Sciences, Rajanagaram to assess the oral manifestations in chronic renal failure patients on hemodialysis. The sample included 60 subjects with age ranging from 35 yrs to 61 yrs among which 33 (55%) were males with mean age of 47.7 years and 27 (45%) were females with a mean age of 46.9 years which showed a slight male predilection for Chronic renal failure as depicted in Table 1 and Graph 1.

All the patients were subjected to a thorough clinical examination after obtaining the informed consent and the incidence of various oral manifestations were recorded where 2(3%) of them presented with absence of features and 58 (97%) patients had at least one or more of the features included in the study.

Uremic odour was recorded in 22 (36.6%) subjects among which 63.6% were males and 36.4% were females showing a male predilection.

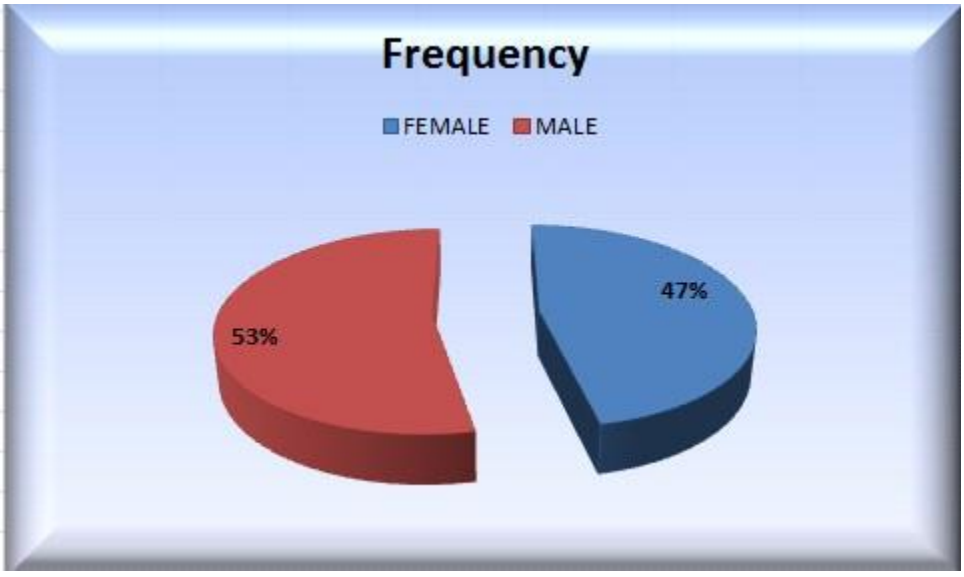
Xerostomia was the commonest finding that accounts for 58.3% (35 patients) of which 20 (57.1%) were males and 15 (42.9%) were females reflecting a male predilection.

Uremic stomatitis, Candidiasis and Petechiae/ecchymosis constituted of about 5% each among which uremic stomatitis was found only in 3 males and none of the females showed uremic stomatitis. There was a female predilection for candidiasis as seen in 2 (66.6%) patients and in 1 (33.3%) male patient. Petechiae /ecchymosis was observed in 2 (66.6%) males and 1 (33.3%) female patient depicting a male predilection.

Altered taste sensation was recorded in 28 (46.6%) subjects as the second most common oral manifestation with equal gender predilection.

Table 1. Age & gender predilection for chronic renal failure

S No	Gender (No.) (%)	Age	
		Range	Mean ± Std Deviation
1	Female (27) (46%)	35 -60	46.9 ± 7.2
2	Male (33) (53.3%)	38 – 60	47.7 ± 6.7



Graph 1. Depicting the distribution of gender among the 60 chronic renalfailure patients

Coated tongue was found in 6(1%) male patients and while none of the females manifested the coated tongue.

Burning sensation was observed in 24(40%) patients among which 13 (54.1%) were females and 11 (45.8%) were males which showed a high predilection for females.

Ulcerations/pigmentation and pale mucosa were observed in 6.6% and 13.3% of the subjects respectively with equal gender predilection. A female predilection for gingival enlargement was evident and accounted for about 6.6% of total subjects out of which 75% were females and 25% were males.

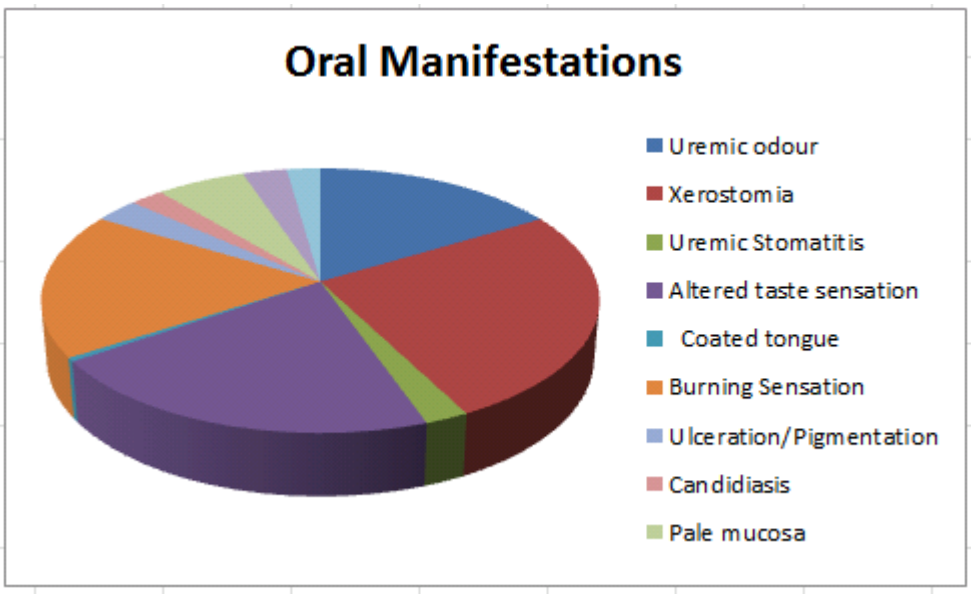
It has been observed a high incidence of xerostomia followed by altered taste sensation in patients with chronic renal failure as shown in Table 2 and Graph 2. However 2(3%) of the patients were not positive for any of the above recorded features.

4. DISCUSSION

Our study comprised of 60 CRF patients with an age range of 31 — 60 yrs and a mean of 47.4 years with a slight male predilection comprising of 33 (53.3%) males and 27(46%). The demographic details of our study was in accordance with various other reported studies conducted by Syed Parvez Ali et al. [14], Taye Jemilat Lasisi et al. [15], Shruthi T Patil et al. [16], Naseer Ahmed et al. [17], Ramesh Venkatapathy et al. [18] and J. F. M. Wetzels et al. [19]. However, the study conducted by Estela M.L.Cardoso et al. [20] showed equal gender predilection.

Table 2. Oral manifestations in chronic renal failure patients

S.No	Oral manifestation	No. of patients		
		Male No. (%)	Female No. (%)	Total No. (%)
1	Uremic odour	14 (63.6%)	8 (36.3%)	22 (36.6%)
2	Xerostomia	20 (57.1%)	15 (42.8%)	35(58.3%)
3	Uremic Stomatitis	3 (100%)	0 (0%)	3 (5%)
4	Altered taste sensation	14 (50%)	14(50%)	28 (46.6%)
5	Coated tongue	6 (100%)	0(0%)	6(1.0%)
6	Burning Sensation	11 (45.8%)	13 (54.1%)	24(40%)
7	Ulceration/Pigmentation	2 (50%)	2(50%)	4(6.6%)
8	Candidiasis	1 (33.3%)	2 (66.6%)	3(5%)
9	Pale mucosa	4 (50%)	4(50%)	8(13.3%)
10	Gingival Enlargement	1 (25%)	3 (75%)	4(6.6%)
11	Petechiae/Echymosis	2 (66.6%)	1 (33.3%)	3(5%)



Graph 2. Depicting the oral manifestations evident among the 60 chronic renal failure patients

The thorough clinical examination that was carried out in our present study showed a wide range of oral signs, symptoms, and lesions that include uremic odor (36.6%), xerostomia (58.3%), uremic stomatitis (5%), altered taste sensation (46.6%), coated tongue(1%), burning sensation(40%), ulceration/pigmentation (6.6%), candidiasis(5%), pale mucosa (13.3%), gingival enlargement (6.6%) and petechiae/ecchymosis (5%). Of all the findings, xerostomia was found to be the most common finding in 35 (58.3%) patients affecting 20 (57.1%) of males and 15 (42.8%) of females followed by altered taste sensation in 28 (46.6%) patients that showed an equal gender predilection.

Nandan RK et al. [10] assessed the extra oral and intra oral manifestations and correlated the blood and salivary urea levels. The reported intra oral manifestations include uremic odour, dry mouth and dysguesia, increased tongue coat, enamel discoloration, generalized gingivitis, generalized gingivitis with localized periodontitis. Our study was in line with the study with respect to intra oral manifestations.

Shu — Fen Chuang et al. [11] evaluated the oral and dental manifestations of 43 diabetic and 85 non-diabetic uremic patients receiving hemodialysis and showed that diabetic patients on hemodialysis had more severe subjective symptoms including dry mouth, taste change and painful mucosa. The majority of diabetics presented with coated tongue (39.5%) and non diabetics presented with uremic odour (49.4%). The present study population included non diabetics but yet showed the prevalence of manifestations as reported in the former study [18].

Akanksha Yadav et al. [12] assessed the oral manifestations in 50 patients on hemodialysis out of which only 26 patients had oral mucosal lesions with altered taste sensation being the commonest oral manifestation and was in contrast with our study. Xerostomia was the mostly evident oral manifestation of chronic renal failure patients in our study.

P.Mosannen Mozaffari et al. [21] reviewed the oral manifestations in patients prior and after renal transplantation and stated that various oral manifestations ranging from xerostomia to tumors were found in pre transplant patients. Gingival enlargement was found to be more prevalent in post transplant patients resulting from medication followed by renal transplantation. However our study group constitutes patients similar to pre transplant group and shows several oral manifestations as reported by P.Mosannen Mozaffari et al. [21] along with gingival enlargement in 6.6% of sample population.

Shilpa Kuravatti et al. [22] reviewed oral manifestations in patients with chronic kidney disease and reported a spectrum of oral manifestations as uremic stomatitis, dry mouth, petechiae, ecchymosis, candidiasis, mucosal lesions, gingivitis and periodontitis which are also evident in our study.

Mario Dioguardi et al. [23] conducted a meta analysis on the oral manifestations in chronic uremia patients and stated the evidence of Enamel hypoplasia, Uremic stomatitis, increased formation of tartar, xerostomia, dental calculus, gingival bleedings, osteodystrophy, oral mucosal ulcerations, similar to the findings of our study excluding the enamel hypoplasia [10].

The present study showed a highest incidence of xerostomia (58.3%) attributing to the electrolyte imbalance of the body that concomitantly reflects in the reduction of the salivary flow. This was in accordance with various reported studies as 51.4% by Nandan Rk et al. [10], 46% in Akansha Yadav et al. [12] and 40% by C. P.Bots et al. [24].

The altered taste perception as reported by 46.6% of our study population could be precipitated and accentuated by xerostomia. The other factors contributing to the altered taste perception are high levels of urea, ammonia, dimethyl and trimethyl amines and low levels of zinc. The altered taste sensation was reported in 42.8% by Shu Fen Chang et al. [11] and in 86% by Akansha Yadav et al. [12].

The uremic odour seen in 36.6% of our patients was in line with Akansha Yadav et al. [12]. However a study by Nandan et al. [10] showed a higher incidence of 45%. The uremic odour could result from the subsequent increase in the ammonia levels in saliva. This can further results in uremic stomatitis in long standing cases as seen in 6.6% of our patients. The xerostomia also compromises the mechanical cleansing of the oral cavity by the saliva that could result in features like coated tongue accounting to 1% of our study. This was in contrast with the study by Nandan Rk et al. [10] which showed 34.2% of coated tongue. However the study [10] did not

differentiate between the features manifested by patients on hemodialysis and renal transplant patients.

The pale mucosa was observed in 13.3% of our patients whereas Akansha Yadav et al. [12] reported pale mucosa in 8% of their study. The burning sensation accounts for 40% of our study sample which was in line with a study by Akansha Yadav et al. [12] that showed 46% of burning sensation. The ulcerations account for 6.6% of the study population which was reported as 10% in a study by Akansha Yadav et al. [12] and 1.2% by Shu Fen Chuang et al. [11].

Though Candidiasis is a commonly encountered feature in renal transplant patients, it was found in 5% of the patients in the present study. The prevalence of candidiasis in renal failure patients was reported to be 10.1% by Mosannen Mozaffari et al. [21] and 8% in a study by Akansha Yadav et al. [12].

Petechiae/ ecchymosis accounted for 5% of our patients whereas Shu Fen Chuang et al. [11] showed 22.4% and 10% by Akansha Yadav et al. [12]. The appearance of petechiae/ecchymosis in chronic renal failure patients on hemodialysis could be attributed to the consequence of qualitative and more or less quantitative platelet defects.

The prevalence of gingival enlargement in renal failure patients was reported to be about 8- 81% as reported by Mosannen Mozaffari [21] and Akansha Yadav et al. [12]. The reported wide range of gingival enlargement could be explained by the fact that the variation in the type of sample selected i.e., renal transplant patients with subsequent medication, subjects before and after dialysis, subjects on medication alone and patients with comorbid conditions. The gingival enlargement was recorded in 6.6% our patients [25].

To the best of our knowledge, the reported literature shows only a few studies on oral manifestations of chronic renal failure patients among our population. Our study may be considered as maiden of its kind to include the oral manifestations of chronic renal failure patients on hemodialysis.

5. CONCLUSION

Renal failure is one of the major life threatening diseases that increases the morbidity and mortality due to the alterations of certain biochemical parameters and posing the Oral physician with a spectrum of oral manifestations. The sample population showed male predilection of 4th and 5th decades. Among the spectrum of oral manifestations recorded, xerostomia was found to be the most common finding followed by altered taste sensation. Xerostomia and altered taste sensation were found to be the most common oral manifestations seen in CRF patients on hemodialysis.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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