International Journal of Clinical Trials
Bansod R et al. Int J Clin Trials. 2025 May;12(2):87-93
http://www.ijclinicaltrials.com
pISSN 2349-3240 | eISSN 2349-3259
DOI: https://dx.doi.org/10.18203/2349-3259.ijct20251204

Original Research Article

Marring effects of chronic kidney disease on the oral cabinet: a case control study

Runal Bansod[1]*, Rakhi Chandak[2], Swapnil Gotekar[3], Ramhari Sathawane[1], Dhananjay Ookalkar[4], Ashish Lanjekar[4]

[1]Department of Oral Medicine & Radiology, SDKS Dental College & Hospital, Nagpur, Maharashtra, India
[2]SAHS, DMIHER, Wanadongri, Nagpur, Maharashtra, India
[3]Department of Ophthalmology, Government Medical College, Bhandara, Maharashtra, India
[4]Ashwini Kidney Dialysis Centre, Nagpur, Maharashtra, India

Received: 10 January 2025
Revised: 17 March 2025
Accepted: 18 March 2025

***Correspondence:**
Dr. Runal Bansod,
E-mail: runalbansod@gmail.com

ABSTRACT

Background: Patients with kidney diseases are an extremely delicate group of patients. Hence a cooperation between a dentist and a nephrologist is very imperative for a suitable dental treatment of such patients. This would lead to avoidance of severe complications of kidney diseases rendering early diagnosis of the disease. To study the effect of chronic kidney disease on the oral mucosa and inspecting the wide spectrum of oral manifestations in patients with chronic kidney disease.
Methods: The study group consisting of 57 participants including the control group above the age group of 20 years was selected. Patients were selected from a private dialysis center. The study population was divided randomly into three groups, each group consisting of 19 participants. Group I consisted of 19 recently diagnosed chronic renal failure patients who were not on dialysis. Group II consisted of 19 chronic renal failure patients who were on dialysis and Group III consisted of 19 normal subjects as control group.
Results: Various oral manifestations are peculiar of chronic kidney disease and thus the oral cavity should be thoroughly examined in order to inspect these oral findings and treat them accordingly. In the present study oral manifestations such as drug induced melanosis, periodontitis, gingival enlargement, leukoplakia, angular cheilitis, mucosal pallor and oral ulcerations were seen in the study subjects
Conclusions: The oral cavity of chronic kidney disease patients may display a number of oral manifestations which at right time if treated properly may reduce the risk of spread of infections.

Keywords: Chronic kidney disease, CKD, Oral manifestations, Periodontitis

INTRODUCTION

In the new era, chronic kidney disease has been redefined as a change in the morphology, function, composition of blood and urine in kidney, lasting for almost 3 months.[1] Chronic kidney disease (CKD) can also be referred to as "chronic renal failure" or "chronic kidney failure" or "renal failure". CKD has been the 12th leading cause of death leading to 1.1 million deaths per year worldwide according to the 2015 Global Burden of Disease study.[1,2] CKD was first referred to as renal insufficiency but was then soon replaced by the term "chronic kidney disease".

Failure to get a renal replacement therapy (RRT) in CKD can be a cause of death.[1] With the help of early and appropriate care the effects of CKD can be partly prevented as the prevalence of CKD is increasing as the lifespan expands. CKD is being linked to diseases like diabetes, hypertension, obesity and atherosclerosis.[1] A wide spectrum of oral manifestations can be seen

affecting the hard and soft tissues of mouth as a result of CKD.[3] Though a majority of patients with CKD have diseases that do not complicate and affect the oral flora of the oral cavity but the dental care of CKD patients is of great importamnce.[3] The clinician must understand the correlation between dental management and multiple systems that can be affected.[3]

Diabetic retinopathy has a considerable negative influence on vision dependent daily activities such as seeing street signs or reading the news.[4]

Ocular morbidity in persons with CKD, including end-stage kidney disease (ESKD), can occur from several pathways underlying systemic conditions and risk factors responsible for CKD such as diabetes or hypertension, metabolic disorders associated with CKD, for example, oxidative stress, uraemia and anemia and treatments such as steroids or dialysis. DR is a common complication of diabetes and is also one of the main causes of vision loss in those who are middle aged and older.[7] Oral cavity is the mirror of systemic health.

Chronic renal failure (CRF) is one such disease which presents with a spectrum of oral manifestations, often due to the disease itself and treatment.[5] The plethora of oral manifestations observed in chronic renal failure and associated therapies are altered taste, gingival enlargement, xerostomia, parotitis, enamel hypoplasia, delayed eruption, various mucosal lesions like hairy leukoplakia, drug induced melanosis, lichenoid reactions, ulcerations, angular cheilitis, candidiosis etc.[6]

With growing awareness about the inter-relationship between dental and medical problems, the role of dentist has become pivotal in overall health care of patients with CKD and also to render services for the oral findings of such diseases.[6]

The objective of the present study was to thoroughly investigate the effect of CKD on the oral cavity and its manifestation on the oral habitat.

METHODS

Study place

The present study was a case control study conducted in the Department of Oral Medicine and Radiology of Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Nagpur after taking approval from the Institutional Ethics Committee.

Study duration

The study was carried out from January 2019 to February 2020.

An informed written consent was obtained from all the patients. Only those patients who were willing to participate in the study were considered. Diagnostic instruments along with other preventive measures were used such as face mask, disposable pair of surgical gloves, sterile plain mouth mirrors, sterile straight probe, sterile kidney tray, a cotton holder and receiver (Figure 1).

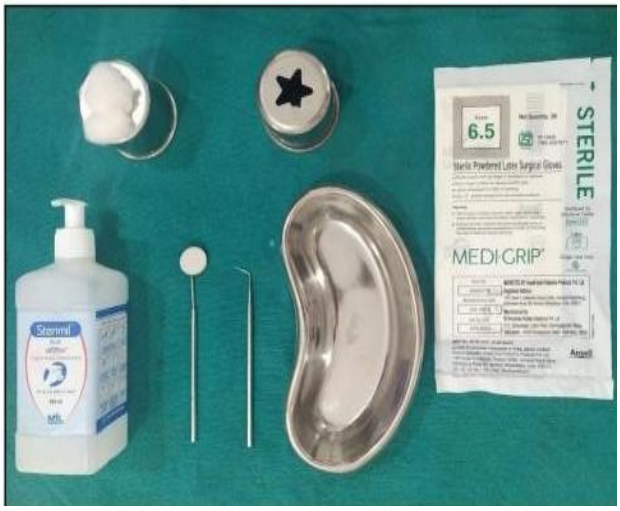

Figure 1: Armamentarium used for clinical examination.

Sampling technique

Random sampling for selection of controls (without chronic renal failure) and non-random sampling for selection of cases was done. A non-random sample of 19 chronic renal failure patients with dialysis and 19 chronic renal failure patients without dialysis were selected sequentially from the study setting. A random sample of 19 controls was selected using the LOTTREY method.

The study group consisted of 57 participants including the control group. The age range was between 20 -80 years. Patients were selected from a private dialysis center. The study population consisting of 57 participants was divided randomly into three groups, each group consisting of 19 participants.

Group I-19 recently diagnosed chronic renal failure patients who were not on dialysis. Group II-19 chronic renal failure patients who were on dialysis. Group III- 19 normal subjects as control group. A detailed case history of all the participants was taken and recorded on the first visit. A thorough clinical examination was then performed for all the participants and oral manifestations of chronic kidney disease were observed and were filled in the prepared case history proforma.

Participants aged 20 years and above presenting with chronic renal failure and end stage renal disease were included. Normal subjects as control group were included. Patients who were excluded were patients with malignancies, alcohol consumption, drug addictions,

radiotherapy, chemotherapy or any other therapies or receiving any other type of treatment modalities.

Statistical analysis

The complete statistical analysis was done by using descriptive and inferential statistics using chi square test, one-way ANOVA, Tukey multiple comparison test and students paired t test. The software used in the analysis was Statistical Package for the Social Sciences (SPSS) version 24.0 and Graph Pad Prism version 7.0. A p value of<0.05 was considered as statistically significant.

RESULTS

Table 1 denotes the number and their percentage having different oral manifestations in different groups. The most prevalent oral manifestation found in group I patients was found to be periodontitis which was found in 8 patients (42.11%) out of 19 patients. No patients having thickened mucosa, uremic stomatitis, xerostomia, coated tongue, mucosal pallor, candidiasis and angular cheilitis were found in group I. In group II (patients with CKD who are on dialysis), 5 patients (26.3%) had drug induced melanosis (Figure 2a), 5 patients (26.32%) had periodontitis, 1 patient (5.26%) had gingival enlargement,

4 patients (21.05%) had leukoplakia, 1 patient (5.26%), had coated tongue (Figure 5a), 2 patients (10.53%) had mucosal pallor (Figure 5b) and 1 patient (5.26%) had angular cheilitis. No patients in group II had thickened mucosa, uremic stomatitis, xerostomia, candidiasis, dryness of lip and oral ulcerations.

The most common and prevalent oral manifestations in group II patients were drug induced melanosis (Figure 2a, b) and periodontitis, which were found in 5 patients each followed by leukoplakia (Figure 4a) which was found in 4 patients No patients had drug induced melanosis, uremic stomatitis, xerostomia, coated tongue, mucosal pallor, candidiasis, dryness of lip and angular cheilitis (Figure 6b). Periodontitis involving gingival enlargement (Figure 3a) was found mostly in group III patients with 11 patients (57.89%) out of 19 patients having periodontitis. (Figure 6a).

Table II, denotes the comparison of each group with all the other groups for different oral manifestations using chi square test. When group I was compared with group II, the oral manifestations which showed statistically significant differences were periodontitis (p=0.016), gingival enlargement (p=0.011), coated tongue (p=0.023), mucosal pallor (p=0.0006), dryness of lip (p=0.023), angular cheilitis (p=0.023) and oral ulcerations (p=0.023). The oral manifestations which did not show statistically significant differences when group I was compared with group II were drug induced melanosis (p=0.40) and leukoplakia (p=0.05).

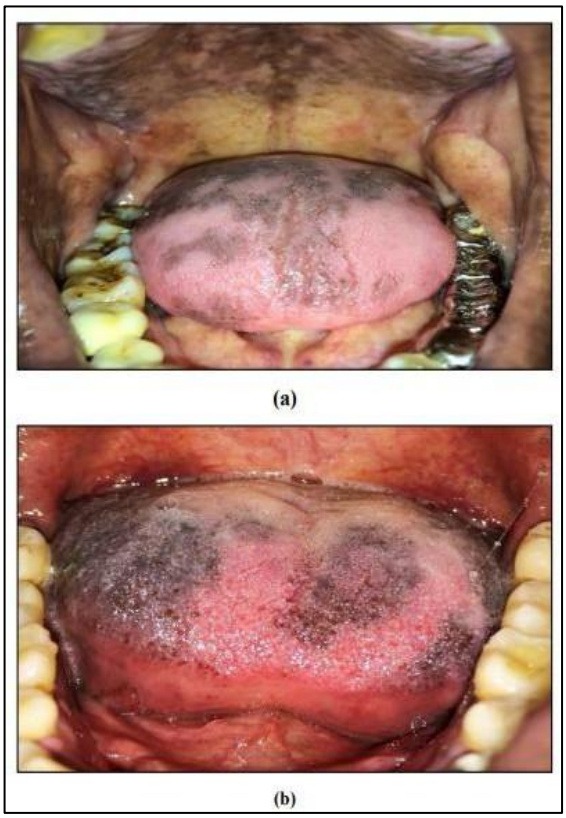

Figure 2: (a) Drug induced melanosis on the palate; (b) dorsum of tongue in a CKD patient on.

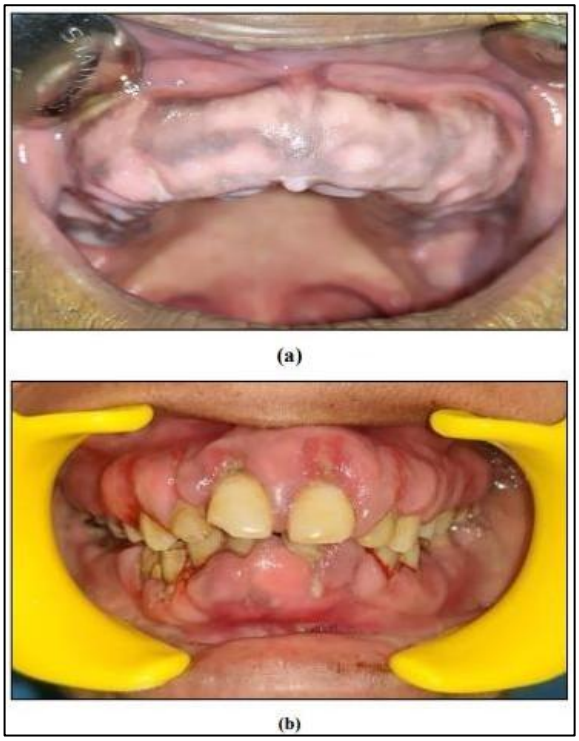

Figure 3: (a) Gingival enlargement in edentulous patient; (b) gingival enlargement along with periodontitis.

Table 1: Oral manifestations in group I, group II and group III.

S. no.	Oral manifestations	Group I (n=19)	Group II (n=19)	Group III (n=19)
		N (%)	N (%)	N (%)
1.	Drug induced melanosis	4 (21.05)	5 (26.32)	0 (0)
2.	Periodontitis	8 (42.11)	5 (26.32)	11 (57.89)
3.	Thickened mucosa	0 (0)	0 (0)	1 (5.26)
4.	Gingival enlargement	3 (15.79)	1 (5.26)	2 (10.53)
5.	Uremic stomatitis	0 (0)	0 (0)	0 (0)
6.	Xerostomia	0 (0)	0 (0)	0 (0)
7.	Leukoplakia	2 (10.53)	4 (21.05)	3 (15.79)
8.	Coated tongue	0 (0)	1 (5.26)	0 (0)
9.	Mucosal pallor	0 (0)	2 (10.53)	0 (0)
10.	Candidiasis	0 (0)	0 (0)	0 (0)
11.	Dryness of lip	1 (5.26)	0 (0)	0 (0)
12.	Angular cheilitis	0 (0)	1 (5.26)	0 (0)
13.	Oral ulcerations	1 (5.26)	0 (0)	2 (10.53)

Table 2: Comparison of oral manifestations in group I, group II and group III.

S. no.	Oral manifestations	Group I Vs Group II	Group I Vs Group III	Group II Vs Group III
1.	Drug induced melanosis	0.69 P=0.40, NS	23.46 P=0.0001, S	29.89 P=0.0001, S
2.	Periodontitis	5.70 P=0.016, S	53.16 P=0.0001, S	29.89 P=0.0001, S
3.	Thickened mucosa	-	5.12 P=0.023, S	5.12 P=0.023, S
4.	Gingival enlargement	6.43 P=0.011, S	1.07 P=0.30, NS	2.44 P=0.11, NS
5.	Uremic stomatitis	-	-	-
6.	Xerostomia	-	-	-
7.	Leukoplakia	3.72 P=0.05, NS	1.07 P=0.30, NS	0.82 P=0.36, NS
8.	Coated tongue	5.12 P=0.023, S	-	5.12 P=0.023, S
9.	Mucosal pallor	11.64 P=0.0006, S	-	11.64 P=0.0006, S
10.	Candidiasis	-	-	-
11.	Dryness of lip	5.12 P=0.023, S	5.12 P=0.023, S	-
12.	Angular cheilitis	5.12 P=0.023, S	-	5.12 P=0.023, S
13.	Oral ulcerations	5.12 P=0.023, S	2.44 P=0.11, NS	11.64 P=0.0006, S

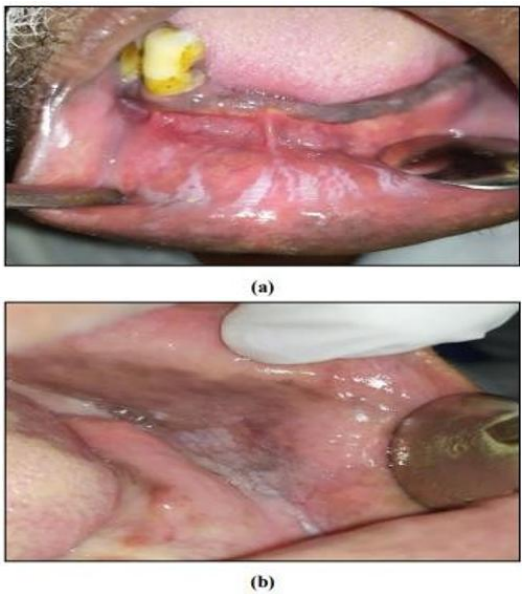

Figure 4: (a) Homogeneous leukoplakia with crack mud appearance on the labial mucosa; (b) homogeneous leukoplakia on left buccal mucosa and vestibule in CKD patient.

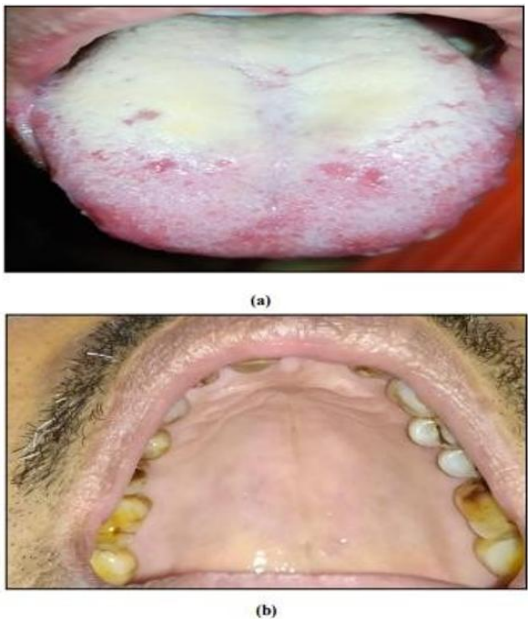

Figure 5: (a) Coating on dorsum of tongue; (b) mucosal pallor on the palate area.

Figure 6: (a) Severe periodontitis; (b) angular cheilitis in CKD patient.

Mucosal pallor showed slightly statistically significant difference with a p value of 0.0006. When group I was compared with group III, the oral manifestations which showed statistically significant differences were drug induced melanosis (p=0.0001), periodontitis (p=0.0001), thickened mucosa (p=0.023), dryness of lip (p=0.023).

Drug induced melanosis and periodontitis showed highly significant statistical difference with a p value of 0.0001. The oral manifestations which did not show any statistically significant differences were gingival enlargement (p=0.30), leukoplakia (p=0.30) (Figure 3b) and oral ulcerations (p=0.11).

When group II was compared with group III, the oral manifestations which showed statistically significant differences were drug induced melanosis (p=0.0001), periodontitis (p=0.0001), thickened mucosa (p=0.023), coated tongue (p=0.023), mucosal pallor (p=0.0006), angular cheilitis (p=0.023), oral ulcerations (p=0.0006).

Drug induced melanosis and periodontitis (Figure 3b) (refer above) showed highly significant statistical difference with a p value of 0.0001 and mucosal pallor and oral ulcerations showed moderately significant statistical difference with a p value of 0.0006.

The oral manifestations which did not show any statistically significant differences were gingival enlargement (p=0.11), leukoplakia (p=0.36).

DISCUSSION

The present study was carried out to evaluate the oral manifestations, in chronic kidney disease patients. The present study was carried on 57 subjects and divided equally in three groups (19 subjects in each group).

The oral cavity is a mirror of human body that acts as a diagnostic reflector for several systemic diseases and like any other systemic diseases, renal diseases also manifest characteristically in the oral cavity. Drug-induced melanosis can be defined as a form of abnormal skin pigmentation that may be caused due to drugs through several varied mechanisms.[8]

In the present study, 21.05% participants in group I, 26.3% in group II, showed drug induced melanosis. While no patients in group III reported with drug induced melanosis. In the present study, 42.11% patients in group I had periodontitis, 26.32% in group II and 57.89% in group III reported with periodontitis. The high prevalence of periodontitis in the control group may be due to age, gender, race/ethnicity, income, education, dental visits and systemic diseases such as diabetes, obesity, osteoporosis, polypharmacy, metabolic syndrome.[9] CKD patients suffering from periodontitis are medically complex leading to several challenges for the oral health care professionals in the management of the disease.

Hence a close association between the nephrologist and the dentist is mandatory in order to minimize the complications during management of periodontal conditions.[10] In the current study, thickened mucosa was not seen in patients of group I and group II while 1 patient (5.26%) of patient reported with thickening of oral mucosa. This was due to presence of oral white lesions which can cause thickening of the keratotic layer or the non-keratotic material to get accumulated.

The thickening might have occurred due to increase in the thickness of the keratin layer which might have been triggered due to factors such as local frictional irritation, immune reactions or due to more crucial processes like premalignant or malignant changes and transformations.[11] In the present study, gingival enlargement was present in 15.79% of patients in group I, 5.26% in group II and 10.53% in group III. In the current study gingival enlargement was observed in group I and group II. Due to the factors such as poor oral hygiene and other local factors, gingival enlargement was also observed in the control group. This is supported by a study done by Draghici et al, in which patients presenting with gingival enlargement were included and it was found out that local mechanical factors play an important role in building up of plaque, produced and sustained due to poor oral

hygiene contributing to the worsening of the periodontal condition.[13]

In the present study, uremic stomatitis was not observed in all the three groups. Since uremic stomatitis is a very rarely reported oral mucosal disorder, it's usually seen associated with long-term standing uraemia in CKD patients.[14] In the current study, leucoplakia was observed in 10.53% patients in group I, 21.05% in group II and in 15.79% patients in group III. No statistically significant differences were found for leukoplakia between the study groups (group I and group II) and the control group. This may be due to the reason that leukoplakia is a potentially malignant lesion that is strongly associated with increased consumption and use of tobacco. In the present study, coated tongue was observed in 5.26% of the patients in group II, while no patients in group I and group III reported with coated tongue. In the present study, mucosal pallor was observed in 10.53% of the group II patients while no patients in group I and group III reported with mucosal pallor.

A higher frequency was reported (37%) in a study by Ali et al, (2015).[15] In a study done by Ali et al, (2015) it has been reported that a rise in the level of blood urea nitrogen may lead to oral manifestations such as mucosal pallor which can support the findings of presence of mucosal pallor in the present study.[8] In the present study, dryness of lips was observed in 5.26% of patients in group I while patients in group II and group III did not report with dryness of lips. In the current study, angular cheilitis was observed in 5.26% of the subjects in group II, while group I and group III patients did not report with angular cheilitis.

This was similar to the findings in a study done by Murali et al, (2012) in which angular cheilitis was reported in 2% of the CKD patients.[16] Oral ulcerations were observed in 5.26% of subjects in group I, while group II and group III subjects did not report with angular cheilitis. In the current study, xerostomia was not observed in all the three groups. In the current study, candidiasis was not observed in the study groups and the control groups.

The limitation of the present study is that the sample size is smaller. Further studies with a larger sample size are recommended for better observations of the findings of the present study.

CONCLUSION

The purpose of this study was to deeply introspect the effects CKD on the oral cavity and the vivid oral manifestations which it can cause. Various oral manifestations are peculiar of chronic kidney disease and thus the oral cavity should be thoroughly examined in order to inspect these oral findings and treat them accordingly. In the present study oral manifestations such as drug induced melanosis, periodontitis, gingival enlargement, leukoplakia, angular cheilitis, mucosal pallor and oral ulcerations were seen in the study subjects.

ACKNOWLEDGMENTS

Authors wish to extend heartfelt gratitude to those who have contributed to the successful completion of this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Versino E, PiccoliG. Chronic kidney disease: the complex history of the organization of long-term care and Bioethics. Why now, more than ever, action is needed. Int J Environ Res Public Health. 2019;16(5):785.
2. El Nahas, M., Bello, A.K. Chronic kidney disease: The global challenge. Lancet. 2005;365:331–40.
3. 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.
4. Gupta P, Liang Gan AT, Kidd Man RE. Impact of incidence and progression of diabetic retinopathy on vision-specific functioning. Ophthalmol. 2018;125(9):140-9.
5. Asha V, Latha S, Pai A, Srinivas K, Ganapathy KS. Oral Manifestations in Diabetic and Nondiabetic Chronic Renal Failure Patients on Hemodialysis J Indian Aca Oral Med Radiol. 2012;24:274-9.
6. Proctor R, Kumar N, Stein A, Moles D, Porler S. Oral and dental aspects of chronic renal failure. J Dental Res. 2005;84:199-208.
7. Nusinovici S, Sabanayagam C, Teo BW, Tan GS, Wong TY. Vision impairment in CKD patients: epidemiology, mechanisms, differential diagnoses and prevention. American journal of kidney diseases. 2019;73(6):846-57.
8. Nisha R, Srinivasa Kannan SR, ThangaMariappan K, Jagatha P. Biochemical evaluation of creatinine and urea in patients with renal failure undergoinghemodialysis. J Clin Pathol and Laboratory Med. 2017;1(2):1-5.
9. Delwiche F, Segal GM, Eschbach JW, Adamson JW. Hematopoietic inhibitors in chronic renal failure: Lack of in vitro specificity. Kidney international. 1986;29 (3):641-8.
10. Bourgoignie JJ, Jacob AI, Sallman AL, Pennell JP. Water, electrolyte and acid-base abnormalities in chronic renal failure. In Seminars in Nephrology. Elsevier. 1981;1(2): 91-111.
11. Luke RG. Serum chloride and bicarbonate levels in chronic renal failure. Archives of Int Med. 1979;139(10):1091-2.
12. Slatopolsky E, Bricker NS. The role of phosphorus restriction in the prevention of secondary

hyperparathyroidism in chronic renal disease. Kidney Int. 1973;1;4(2):141-5.
13. Çağlayan F, Dağistan S, Keleş M. The osseous and dental changes of patients with chronic renal failure by CBCT. Dentomaxillofacial Radiol. 2015;18;44(5):3-9.
14. Leslie SW. Anatomy, Abdomen and Pelvis, Kidneys. Treasure Island, FL: StatPearls. 2018.
15. Ali U, Nagi A, Naseem N. Oral Manifestations Of Chronic Kidney Disease. Pakistan Oral Dental J. 2015;1;35(3):352-5.
16. Murali P, Narasimhan M, Periasamy S. A comparision of oral and dental manifestations in diabetic and non-diabetic uremic patients receiving hemodialysis. J Oral Maxillofac Pathol. 2012;16(3):374-79.

Cite this article as: Bansod R, Chandak R, Gotekar S, Sathawane R, Ookalkar D, Lanjekar A. Marring effects of chronic kidney disease on the oral cabinet: a case control study. Int J Clin Trials 2025;12(2):87-93.