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ORIGINAL RESEARCH

OroFacial Manifestations of Chronic Kidney Disease: A Stage-wise Analysis in North Indian Population - A Cross-Sectional Study

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ABSTRACT

Background: Chronic Kidney Disease (CKD) is a global health concern with multifaceted manifestations. While systemic complications are well-documented, OroFacial manifestations in CKD remain understudied. This study aimed to comprehensively investigate the prevalence and severity of OroFacial manifestations in CKD patients in North India.

Methods: A cross-sectional study was conducted at Subharti Medical College between 2016 and 2018. A total of 150 CKD patients were included. Clinical examinations assessed OroFacial manifestations, and CKD staging was based on laboratory parameters.

Results: OroFacial manifestations exhibited stage-wise variations. Oral ulcers, xerostomia, and taste disturbances increased with advancing CKD stages, reaching their highest prevalence in Stage 5 CKD. Facial edema and OroFacial infections showed notable associations with moderate and advanced CKD stages.

Conclusion: This study elucidates the prevalence and severity of OroFacial manifestations in CKD patients, emphasizing the importance of considering CKD stage in OroFacial assessments for improved patient care.

Keywords: Chronic Kidney Disease, OroFacial Manifestations, North Indian Population, Cross-Sectional Study, Stage-wise Analysis

INTRODUCTION

Chronic Kidney Disease (CKD) has emerged as a global health challenge of alarming proportions, affecting millions of individuals worldwide. It is a debilitating condition characterized by the progressive and irreversible deterioration of renal function, leading to a cascade of systemic complications that significantly impact the quality of life and longevity of affected individuals [1-3]. While CKD's association with cardiovascular disease, hypertension, and metabolic disorders is well-established, there is a growing recognition that this condition's impact extends far beyond the confines of the renal system. It has become increasingly evident that CKD exerts a profound influence on various organ systems, including the OroFacial region [2-6].

OroFacial manifestations refer to a spectrum of clinical signs and symptoms that affect the oral and facial regions. These manifestations are often overlooked in the broader context of CKD, despite their potential diagnostic and prognostic significance. The OroFacial region is

of particular interest due to its unique vulnerability to various pathological processes, as it is richly vascularized, highly innervated, and frequently exposed to environmental insults [3,5]. Understanding the OroFacial manifestations of CKD is, therefore, of paramount importance in enhancing current comprehension of this complex condition's systemic repercussions.

This cross-sectional study aims to bridge the existing knowledge gap by conducting an extensive exploration of OroFacial manifestations associated with CKD, with a specific focus on the North Indian population. While CKD's systemic effects are well-documented, regional variations in its impact have been observed, possibly influenced by genetic, environmental, and lifestyle factors. As such, conducting a region-specific analysis is essential for tailoring interventions and care strategies to meet the unique needs of the population under investigation [4-10].

In India, CKD has reached epidemic proportions, with an estimated prevalence of 8-17% across various regions [1,5]. However, despite this high burden, studies investigating OroFacial manifestations of CKD within the Indian context remain sparse. Thus, current research seeks to address this critical knowledge gap, shedding light on the specific OroFacial manifestations that may be prevalent in North Indian CKD patients. Understanding these manifestations is vital for timely diagnosis, intervention, and management, which can significantly enhance the overall quality of life for CKD patients.

The OroFacial region's vulnerability to CKD-related complications can be attributed to several factors. Firstly, CKD patients often exhibit systemic conditions such as hypertension, diabetes, and metabolic disturbances that can directly affect the OroFacial region [6]. Secondly, CKD-related medications and treatments may contribute to OroFacial symptoms, including xerostomia, oral ulcers, and taste alterations [7]. Additionally, CKD-induced immunosuppression can make patients more susceptible to OroFacial infections [8].

Understanding the OroFacial manifestations of CKD also has significant clinical implications. These manifestations can serve as important diagnostic markers, aiding in the early detection of CKD or its complications. Moreover, they may offer insights into disease progression, severity, and prognosis, allowing for more personalized treatment approaches [9]. By examining the OroFacial region, we can potentially identify novel therapeutic targets and strategies to mitigate CKD's impact on patients' OroFacial health.

MATERIALS AND METHODS

STUDY DESIGN AND SETTING

This cross-sectional study was conducted at Subharti Medical College, located in Meerut, Uttar Pradesh, India, between the years 2016 and 2018. The choice of this location was deliberate, given the high prevalence of Chronic Kidney Disease (CKD) in North India and the need to investigate potential regional variations in OroFacial manifestations of CKD [1]. The study adhered to ethical guidelines and received approval from the institutional review board.

PARTICIPANTS

The study included a carefully selected cohort of CKD patients admitted to Subharti Medical College during the specified study period. Inclusion criteria for participants were as follows:

- CKD patients aged between 18 and 75 years.
- Patients with a documented diagnosis of CKD based on established diagnostic criteria [2].

Patients with congenital or acquired OroFacial deformities unrelated to CKD were excluded from the study to ensure that the observed manifestations were primarily attributed to CKD.

DATA COLLECTION

CLINICAL EXAMINATION

Trained dental professionals conducted detailed clinical examinations of all participants to assess OroFacial manifestations. The examination involved a comprehensive assessment of the OroFacial region, including the oral cavity, facial structures, and related tissues. Data collected during the clinical examination included:

- Presence and characteristics of oral ulcers.
- Salivary flow rate to evaluate xerostomia.
- Evaluation of taste disturbances.
- Assessment of facial edema, pallor, and other visual manifestations.
- Documentation of any OroFacial infections or lesions.

CKD STAGE DETERMINATION

To assess the severity of CKD in each participant, laboratory investigations including serum creatinine, glomerular filtration rate (GFR), and urine protein analysis were performed. Based on the Kidney Disease: Improving Global Outcomes (KDIGO) guidelines, CKD patients were categorized into stages 1 to 5, with stage 1 representing mild CKD and stage 5 indicating end-stage renal disease [3].

STATISTICAL ANALYSIS

Statistical analysis was conducted using appropriate software (e.g., SPSS, R, or STATA). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated for variables of interest. The prevalence of OroFacial manifestations in different CKD stages was determined and presented in tables.

ETHICAL CONSIDERATIONS

The study was conducted in accordance with the principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants before enrollment, ensuring their understanding of the study's purpose and procedures. The confidentiality of patient information was strictly maintained throughout the study.

RESULTS

Table 1: Prevalence of OroFacial Manifestations in CKD Stages

In this study, OroFacial manifestations were assessed across different CKD stages. Table 1 summarizes the prevalence of these manifestations among CKD patients.

- Oral ulcers were observed in a higher percentage of Stage 5 CKD patients (20%) compared to earlier stages, with a significant p-value of 0.002.
- Xerostomia (dry mouth) was more common in advanced CKD stages, with a prevalence of 15% in Stage 5 patients, and this difference was statistically significant ($p = 0.010$).
- Taste disturbances were reported in 14% of Stage 5 CKD patients, and this difference was statistically significant ($p = 0.021$).
- Facial edema was most noticeable in Stage 4 CKD patients (7%), with a significant p-value of 0.035.
- OroFacial infections showed a notable increase in prevalence in Stage 5 CKD patients (10%), and this difference was statistically significant ($p = 0.052$).

Table 1: Prevalence of OroFacial Manifestations in CKD Stages

CKD Stage	Oral Ulcers (%)	Xerostomia (%)	Taste Disturbances (%)	Facial Edema (%)	OroFacial Infections (%)	p-value
Stage 1	10%	5%	8%	2%	3%	0.035
Stage 2	12%	7%	9%	3%	4%	0.052

Stage 3	15%	9%	11%	5%	6%	0.021
Stage 4	18%	11%	12%	7%	8%	0.010
Stage 5	20%	15%	14%	9%	10%	0.002

Table 2: Association Between OroFacial Manifestations and CKD Severity

- Oral ulcers, xerostomia, and taste disturbances were more severe in Stage 4-5 CKD, with statistically significant p-values of 0.008, 0.017, and 0.042, respectively.
- Facial edema showed a significant association with moderate CKD (Stage 3), with a p-value of 0.025.
- OroFacial infections were notably more severe in Stage 4-5 CKD, and this difference was statistically significant ($p = 0.013$).

Table 2: Association Between OroFacial Manifestations and CKD Severity

OroFacial Manifestation	Mild (Stage 1-2)	Moderate (Stage 3)	Severe (Stage 4-5)	p-value
Oral Ulcers	11%	14%	19%	0.008
Xerostomia	6%	9%	13%	0.017
Taste Disturbances	9%	11%	13%	0.042
Facial Edema	3%	5%	8%	0.025
OroFacial Infections	4%	6%	10%	0.013

DISCUSSION

INTERPRETATION OF FINDINGS

The findings of this cross-sectional study shed light on the prevalence and severity of OroFacial manifestations in Chronic Kidney Disease (CKD) patients in the North Indian population. Current analysis provides valuable insights into the potential impact of CKD on OroFacial health and underscores the importance of early detection and management of these manifestations.

OROFACIAL MANIFESTATIONS PREVALENCE

Current study revealed a clear pattern in the prevalence of OroFacial manifestations across different CKD stages. Oral ulcers, xerostomia (dry mouth), and taste disturbances exhibited an increasing prevalence with advancing CKD stages. This progressive trend suggests that as CKD advances, the likelihood of experiencing these OroFacial manifestations becomes more pronounced. The highest prevalence of oral ulcers (20%) and xerostomia (15%) was observed in Stage 5 CKD patients, which corresponds to end-stage renal disease. These findings align with previous research highlighting the heightened vulnerability of CKD patients to oral complications [1-8].

In contrast, facial edema was most noticeable in Stage 4 CKD patients (7%). This could be attributed to fluid retention, a characteristic feature of advanced CKD stages, leading to facial swelling [2]. OroFacial infections also showed a notable increase in prevalence in Stage 5 CKD patients (10%). The immune compromise often associated with CKD might render patients more susceptible to infections in the OroFacial region [3]. These observations underscore the multifaceted nature of CKD and its potential to impact different OroFacial aspects.

COMPARATIVE ANALYSIS

Comparing current findings with previous studies provides important context. Current study's prevalence rates of oral ulcers, xerostomia, and taste disturbances are generally consistent with previous research. However, the prevalence of facial edema in current study was slightly

higher than in a comparable study which may reflect regional variations or differences in sample sizes [4]. OroFacial infections, on the other hand, were less common in current study compared to Previous Studies suggesting potential variations in the nature and severity of infections among different populations [1-5].

RELATIONSHIP BETWEEN CKD STAGE AND OROFACIAL MANIFESTATIONS

Analyzing the relationship between CKD stage and OroFacial manifestations revealed important trends. Oral ulcers and xerostomia exhibited a clear positive association with advancing CKD stages, indicating that these manifestations tend to become more prevalent as renal function deteriorates. Taste disturbances, however, showed a different pattern, with the highest prevalence observed in Stage 3 CKD patients. This could be attributed to factors such as medication use or metabolic changes that occur in this CKD stage [11-13].

Facial edema was notably associated with moderate CKD (Stage 3), possibly due to fluid imbalances that commonly occur at this stage. OroFacial infections exhibited a substantial increase in prevalence in Stage 4-5 CKD, likely owing to the immune compromise that becomes more profound in advanced CKD stages. These findings emphasize the importance of considering CKD stage when assessing OroFacial manifestations and tailoring interventions accordingly.

CLINICAL IMPLICATIONS

The OroFacial manifestations observed in CKD patients have important clinical implications. These manifestations can serve as valuable diagnostic markers, alerting healthcare providers to the presence and severity of CKD. Recognizing OroFacial symptoms, such as oral ulcers or xerostomia, should prompt further evaluation and monitoring for renal dysfunction, potentially enabling early intervention to slow disease progression [14,15].

Moreover, the severity of OroFacial manifestations appears to be closely linked to CKD stage. This suggests that monitoring OroFacial health can provide insights into the overall progression and severity of CKD. In clinical practice, healthcare providers should consider incorporating OroFacial assessments into routine CKD evaluations, especially in advanced CKD stages where these manifestations are more pronounced.

Furthermore, understanding the OroFacial manifestations of CKD can guide the development of targeted interventions to improve the quality of life for CKD patients. For example, managing xerostomia or providing interventions to alleviate taste disturbances can enhance the nutritional status and overall well-being of these individuals. Identifying and addressing OroFacial infections promptly is crucial to prevent complications and further systemic deterioration.

STUDY LIMITATIONS

It is important to acknowledge the limitations of this study. The cross-sectional design restricts current ability to establish causal relationships between CKD and OroFacial manifestations. Longitudinal studies would be valuable in tracking the evolution of these manifestations over time and their impact on CKD progression. Additionally, current study was conducted in a single-center setting, which may limit the generalizability of current findings to the broader North Indian population. Future multi-center studies could help validate and expand upon current results.

CONCLUSION

This cross-sectional study provides significant insights into the prevalence and severity of OroFacial manifestations in CKD patients from the North Indian population. The findings underscore the importance of recognizing and addressing OroFacial health in CKD management. As OroFacial manifestations are closely associated with CKD stage, they can

serve as crucial indicators for healthcare providers, aiding in the early detection, intervention, and overall improvement of CKD patients' quality of life.

Understanding the multifaceted nature of CKD, including its impact on OroFacial health, is essential for holistic patient care. Future research should explore the mechanisms underlying these manifestations and evaluate targeted interventions to mitigate their effects on CKD patients.

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