



**PREVALENCE OF ORAL AND MAXILLOFACIAL DISEASE IN PATIENTS
UNDERGOING HEMODIALYSIS IN SOUTH OF JORDAN: A CROSS-SECTIONAL
STUDY**

Tarek Al Sheshani BDS*, Marwan Showayter BDS, Hasan Al Smadi BDS, Kais Malallah BDS, Oraib Al Rabadi BDS and Samer Yosef MD

Jordan.



*Corresponding Author: Tarek Al Sheshani BDS

Jordan.

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ABSTRACT

Background: End-stage renal disease (ESRD) requires intensive care, with hemodialysis being the most common treatment. ESRD patients frequently experience oral health complications, such as cavities, periodontal disease, and mucosal lesions. Here, we aim to investigate the prevalence of oral and maxillofacial diseases in Jordanian patients with ESRD undergoing hemodialysis. **Methods:** A cross-sectional study was conducted on 86 ESRD patients at Prince Hashim bin Abdallah II Hospital in Jordan. Sociodemographic, clinical, and oral health data were collected. Oral assessments were performed to detect bone, epithelial, soft tissue pathologies, oral ulcers and dental atrophy. **Results:** The median patient age was 50 years. Bone, epithelial, and soft tissue pathologies were present in 30%, 30%, and 28% of patients, respectively. Dental ulcers and atrophy were common, affecting 63% and 60% of patients. A longer hemodialysis duration and higher weekly session frequency were significantly associated with dental ulcers and atrophy. **Conclusion:** There is a high prevalence of oral diseases in ESRD patients undergoing hemodialysis, with significant associations between hemodialysis duration and frequency and oral health complications. Regular oral health assessments are recommended to improve outcomes in this population.

KEYWORDS: Oral Disease, Maxillofacial disease, Dialysis, Tooth infection, Decay, Dental Abscess.

INTRODUCTION

End-stage renal disease (ESRD) is considered a serious health condition that often requires intensive and costly care. It usually develops from the gradual decline in kidney function seen in patients with chronic kidney disease (CKD) or from sudden kidney damage causing acute kidney injury. CKD is diagnosed when kidney function deteriorates for more than three months, indicated by a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m² or the presence of kidney damage markers such as albuminuria, abnormal urine sediment, or electrolyte imbalances.^[1-3]

CKD is most often caused by diabetes and/or hypertension. However, other factors including glomerulonephritis, infections, and environmental exposures are also prevalent causes in regions including Asia, sub-Saharan Africa, and many developing countries.^[4] Hemodialysis is the most widely used form of kidney replacement therapy globally, representing about 69% and 89% of all kidney replacement therapies and all dialysis treatments, respectively.^[5]

Pathophysiological changes linked to ESRD are the primary cause of alterations in the oral cavity. ESRD and the medications prescribed to these patients often lead to complications affecting multiple systems and organs, which can worsen pre-existing conditions or lead to new oral health conditions such as cavities, periodontal disease, mucosal lesions, and decreased saliva production.^[6,7] Oral disease is a preventable contributor to poor health in individuals with chronic kidney disease, yet conditions such as dental decay and periodontitis still affect nearly all adults worldwide and are among the most expensive diseases to treat in many healthcare systems.^[8,9]

Considering the burden oral and maxillofacial diseases have in patients undergoing dialysis, we aim to investigate the prevalence of oral and maxillofacial diseases in patients with ESRD who are undergoing hemodialysis in Jordan to guide future clinical practice and research.

METHODS

Study design

We conducted a cross-sectional, single-center study at the dental clinic of Prince Hashim bin Abdallah II Hospital in Aqaba, South Jordan. The study involved 86 patients with ESRD undergoing hemodialysis, who visited the clinic during the specified period. The research followed the ethical guidelines of the Declaration of Helsinki, with approval granted by the hospital's institutional ethics committee. Informed written consent was obtained from all participants prior to data collection.

Data collection

Data were collected using a structured form that recorded sociodemographic and clinical details. This included age, medical history, causes of kidney failure, duration of hemodialysis, and the number of hemodialysis sessions. Oral health assessments were performed by the attending dentist, who evaluated bone, epithelial, and soft tissue pathologies, along with identifying conditions such as dental ulcers and atrophy.

Statistical analysis

We performed statistical analysis using SPSS version 29. Continuous variables were reported as medians with interquartile ranges (IQR), while categorical variables were summarized using frequencies and percentages. Associations between categorical variables were evaluated using the chi-square test and Fisher's exact test, and the Wilcoxon rank-sum test was employed to examine the relationship between hemodialysis and oral pathologies. Statistical significance was defined as a *p*-value less than 0.05.

RESULTS

A total of 86 patients with ESRD who were undergoing hemodialysis were included in the study with a median age of 50 (40.0, 59.0) years. Medical history was positive in 44 (51%) of patients. Causes of renal failure were as follows: diabetes mellitus in 32 (37%) of patients, congenital in 20 (23%) of patients, hypertension in 17 (20%) of patients, and polycystic kidney disease in 17

(20%) of patients (**Table 1**). The duration of hemodialysis showed that 19 (22%) of patients undergoing hemodialysis for less than one year, 37 (43%) for more than three years, and 30 (35%) for one to three years. The number of weekly hemodialysis sessions was 33 (38%) receiving two sessions per week, 27 (31%) receiving three sessions, and 26 (30%) receiving four.

Bone pathology was present in 30% of patients, all of whom had benign conditions, whereas the remaining 70% had no bone pathology. Similarly, 30% had benign epithelial pathology, with 70% having no epithelial conditions. For soft tissue tumors, 28% of patients had benign tumors, 5.8% had malignant tumors, 58% had no soft tissue pathology, and 8.1% presented with reactive lesions. Atrophy was observed in 60% of patients, while 63% had dental ulcers.

In a comparison between patients with and without dental ulcers, there was a significant difference in the duration of hemodialysis between the groups ($p = 0.006$), with 50% of patients with ulcers undergoing hemodialysis for more than three years compared to 31% in those without ulcers (**Table 2**). The number of weekly dialysis sessions was also significantly different ($p = 0.002$), as 63% of patients without ulcers had two sessions per week, while only 24% of those with ulcers had two sessions. Patients with ulcers were more likely to receive four sessions per week (39%) compared to those without ulcers (16%). Atrophy was significantly more common in patients with ulcers (78%) than those without (31%) ($p < 0.001$).

The duration of hemodialysis was significantly longer in patients with ulcers ($p = 0.04$), with 54% of these patients' undergoing dialysis for more than three years compared to 26% of those without ulcers (**Table 3**). The number of weekly sessions also differed significantly ($p < 0.001$), with 62% of patients without ulcers undergoing two sessions per week compared to only 23% of those with ulcers, while 46% of patients with ulcers had four sessions per week compared to only 5.9% of those without ulcers.

Table 1: Demographic and clinical characteristics of included patients.

Characteristic	N = 86
Age (Years), Median (IQR)	50 (40, 59)
Medical History, n (%)	
Negative	42 (49%)
Positive	44 (51%)
Bone pathology, n (%)	
Benign	26 (30%)
None	60 (70%)
Epithelial pathology, n (%)	
Benign	26 (30%)
None	60 (70%)
Soft tissue tumors, n (%)	
Benign	24 (28%)
Malignant	5 (5.8%)

None	50 (58%)
Reactive	7 (8.1%)
Cause of renal failure, n (%)	
Congenital	20 (23%)
DM	32 (37%)
HTN	17 (20%)
PCKD	17 (20%)
Duration of hemodialysis, n (%)	
<1 year	19 (22%)
1-3 years	30 (35%)
>3 years	37 (43%)
Number of sessions, n (%)	
2	33 (38%)
3	27 (31%)
4	26 (30%)
Atrophy, n (%)	52 (60%)
Ulcer, n (%)	54 (63%)
Abbreviations: DM: Diabetes Mellitus HTN: Hypertension PCKD: Polycystic Kidney Disease	

Table 2: Comparison between patients with dental ulcers.

Characteristic	No, N = 32	Yes, N = 54	p-value
Age (Years), Median (IQR)	54 (39, 62)	50 (42, 57)	0.7
Bone pathology, n (%)			0.4
Benign	8 (25%)	18 (33%)	
None	24 (75%)	36 (67%)	
Epithelial pathology, n (%)			0.074
Benign	6 (19%)	20 (37%)	
None	26 (81%)	34 (63%)	
Soft tissue tumors, n (%)			1.0
Benign	9 (28%)	15 (28%)	
Malignant	1 (3.1%)	4 (7.4%)	
None	19 (59%)	31 (57%)	
Reactive	3 (9.4%)	4 (7.4%)	
Cause of renal failure, n (%)			0.053
Congenital	9 (28%)	11 (20%)	
DM	6 (19%)	26 (48%)	
HTN	9 (28%)	8 (15%)	
PCKD	8 (25%)	9 (17%)	
Duration of hemodialysis, n (%)			0.006
<1 year	13 (41%)	6 (11%)	
1-3 years	9 (28%)	21 (39%)	
>3 years	10 (31%)	27 (50%)	
Number of sessions, n (%)			0.002
2	20 (63%)	13 (24%)	
3	7 (22%)	20 (37%)	
4	5 (16%)	21 (39%)	
Atrophy, n (%)	10 (31%)	42 (78%)	<0.001
DM: Diabetes Mellitus HTN: Hypertension PCKD: Polycystic Kidney Disease			

Table 3: Comparison between patients with dental atrophy.

Characteristic	No, N = 34	Yes, N = 52	p-value
Age (Years), Median (IQR)	52 (37, 61)	50 (41, 57)	0.8
Medical History, n (%)			0.8
Negative	16 (47%)	26 (50%)	
Positive	18 (53%)	26 (50%)	
Bone pathology, n (%)			0.7
Benign	11 (32%)	15 (29%)	
None	23 (68%)	37 (71%)	
Epithelial pathology, n (%)			0.9
Benign	10 (29%)	16 (31%)	
None	24 (71%)	36 (69%)	
Soft tissue tumors, n (%)			0.7
Benign	9 (26%)	15 (29%)	
Malignant	1 (2.9%)	4 (7.7%)	
None	22 (65%)	28 (54%)	
Reactive	2 (5.9%)	5 (9.6%)	
Cause of renal failure, n (%)			0.12
Congenital	9 (26%)	11 (21%)	
DM	8 (24%)	24 (46%)	
HTN	7 (21%)	10 (19%)	
PCKD	10 (29%)	7 (13%)	
Duration of hemodialysis, n (%)			0.04
<1 year	9 (26%)	10 (19%)	
1-3 years	16 (47%)	14 (27%)	
>3 years	9 (26%)	28 (54%)	
Number of sessions, n (%)			<0.001
2	21 (62%)	12 (23%)	
3	11 (32%)	16 (31%)	
4	2 (5.9%)	24 (46%)	
Ulcer, n (%)	12 (35%)	42 (81%)	<0.001
DM: Diabetes Mellitus HTN: Hypertension PCKD: Polycystic Kidney Disease			

DISCUSSION

ESRD is considered a serious condition that requires extensive care and often results from CKD or acute kidney injury. Hemodialysis is the most common kidney replacement therapy, accounting for 69% of all treatments.^[10] ESRD is associated with complications that impact various systems, including the oral cavity, where patients experience issues like dental decay, periodontal disease, mucosal lesions, and reduced saliva production.^[11] These oral conditions are preventable yet remain a significant health burden for ESRD patients. Oral diseases, prevalent globally, are costly to treat and contribute to the overall decline in health for individuals with CKD.^[12] Therefore, in this study, we aimed to investigate the prevalence of oral and maxillofacial diseases in Jordanian patients with ESRD and undergoing hemodialysis.

Our findings showed that bone, epithelial, and soft tissue oral pathologies were common among patients with ESRD though mostly benign, with dental ulcers and atrophy were prevalent, affecting 63% and 60% of patients, respectively. In a study by Dembowska et al. investigating the prevalence of oral mucosal lesions in

patients with ESRD undergoing hemodialysis showed that compared to a control group, patients undergoing hemodialysis had a significantly higher rates of oral lesions including mycosis, herpes labialis, xerostomia, and burning mouth. While tumors, white lesions, or aphthous lesions did not differ significantly between patients undergoing hemodialysis and controls.^[13] Patients undergoing hemodialysis are more vulnerable to oral pathogens, with a variety of microorganisms commonly found in this population, including *Prevotella intermedia*, *Porphyromonas gingivalis*, and *Candida albicans*.^[14]

We also showed that patients with ulcers were more likely to have undergone hemodialysis for more than three years compared to those without ulcers. In a study by Joshi et al. showed that oral ulcers were among the most common reported oral problems in patients undergoing dialysis, with a positive correlation between the duration of dialysis and the decayed missing-filled teeth index.^[15] In a systematic review by Ruospo et al. showed that in 11 studies of 832 patients with CKD, the prevalence of mucosal ulcerations was 8.6 (2.7-24.2), and in 6 studies of 404 CKD patients, oral mycosis

prevalence was 19.6 (12.2-30.1).^[16] These high rates of oral diseases may influence directly the clinical outcomes of patients undergoing hemodialysis, by causing endothelial dysfunction, chronic inflammation, and vascular injury.^[17,18]

Our study offers several strengths. Firstly, by focusing on a specific and vulnerable population, patients with ESRD undergoing hemodialysis, which is an under-represented group in Jordan, we offer novel insights on the prevalence of oral and maxillofacial diseases in this population and help reduce the burden they face. Additionally, following a structured and consistent method to collect data, where thorough oral health assessments by dental professionals were performed, enhances the reliability of the findings. Despite its strengths, our study has some limitations which could be enhanced in the future. It was conducted in a single center, limiting the generalizability of the results to a broader population. The cross-sectional design captures data at a single point in time, which makes it difficult to establish causal relationships between hemodialysis and the development of oral diseases. Future multicenter studies across Jordan are needed to increase the generalizability of the findings. A larger, longitudinal study with long follow-up periods could help in exploring causal relationships between the duration and frequency of hemodialysis and the progression of oral health issues.

CONCLUSION

In conclusion, our study shows a substantially high prevalence of oral and maxillofacial diseases in patients with ESRD undergoing hemodialysis in Jordan, including dental atrophy and oral ulcers. Significant associations were found between the frequency and duration of hemodialysis and the presence of conditions like dental ulcers and atrophy, which emphasize the need for routine oral health assessments and early interventions in this patient population to improve their quality of life and overall health outcomes. Future research must also delve into exploring causal relationships in those patients.

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