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Original Article

Oral Manifestation Associated with Biochemical and Hematological Changes in Iraqi End-Stage Renal Failure Patients

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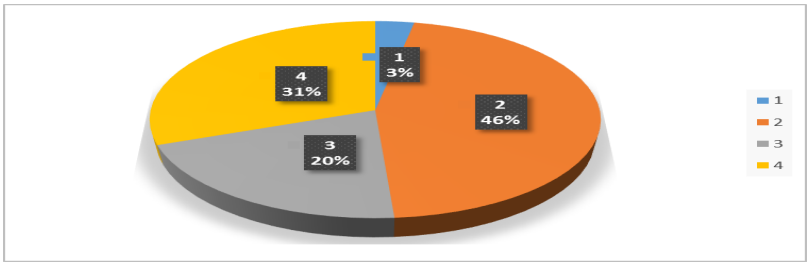
ABSTRACT

Poor oral health may relate to critical conditions in patients with stage renal failure, as aging and medications are the common concurrent cause, besides a state of biochemical, hematological, and immune deficiencies that elevate the risk for systemic consequences leading to the oral pathogen. Twenty-one male patients and nineteen females were enrolled in this research. The age intervals ranged from 22 to 66 years old. All patients were admitted to the Al-Karama teaching hospital/ Al- Hayate center in Bagdad/Iraq. All patients were subjected to oral clinical and lab analysis; The percentage distribution of oral manifestation in males was 3 % for burning sensation, 46 % for attrition, 20 % for abrasion, and 31 % for gingivitis. The females' percentage distribution was 1 % burning sensation. 45% attrition, 14 % abrasion and 30 % gingivitis. The male percentage of oral manifestations distribution were more observed in males than female, except burning sensation and attrition were more observed in females. Oral manifestations are mostly related to abnormal calcium, potassium, Aspartate aminotransferase, albumin, and hematological disorders related to end-stage renal failure patients.

GRAPHICAL ABSTRACT



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Introduction

Oral disease is elevated in renal failure and is also related to inflammation and malnutrition [1]. Renal failure patients have poor oral health [2-4]. Studies show that patients with renal failure are associated with decayed, lost, and filled teeth, loss of attachment, and periapical as well as mucosal lesions [5-7]. whatever, Poor oral cavity health may be the more severe condition in renal failure patients because of aging, common concurrent medications, and a state of immune deficiency that may elevate the risk for systemic consequences leading to periodontitis and other oral pathogens [8-12].

The kidney's functions include the excretion of the waste products of metabolism, such as urea and creatinine, control of blood volume and electrolyte balance, regulation of erythrocyte production in the bone marrow by the secretion of erythropoietin as well as participation in calcium ions homeostasis [13-17]. Pathologic conditions that result in decreased renal function are considered serious and life-threatened, especially with a critical decrease in filtration efficiency [18, 19]. Moreover, the kidney observed disturbances in blood electrolyte and acid-base balance (including hypo-hyperkalemia with acidosis), anemia, renal osteodystrophy, and hypertension [20, 21]. Chronic renal disease can rise to a wide variety of oral diseases such as, i.e., xerostomia, calcifications leading to the removal of the pulp chamber, canals, enamel hypoplasia, changed caries rates, and altered salivary pH [22, 23]. Many dental problems in renal patients, such as bleeding, gingival hyperplasia, plaque, and calculus, are elevated in patients on renal therapy [24-26]. So, consultation with the patient's physician is very important before dental treatment starts, and prophylactic medication by the dentist is often required [27-31].

The main aim of this research is to evaluate the oral manifestation of Iraqi end-stage renal patients with hematologic & biochemical changes. Evaluate the main oral pathogenic condition percentage prevalence.

Material and Methods

Twenty-one male patients and nineteen females were enrolled in this research. The age intervals ranged from 22 to 66 years old; all patients were admitted to Al-Karama teaching hospital/ Al-Hayate center in Bagdad/Iraq., after diagnosis with end-stage chronic renal disease. According to the medical protocols of oral examination by inspection and biochemical analysis results collected from the medical center laboratory archive, the data for this research were achieved [32, 33]. All patients were free from alcohol and smoking habits.

Statistical analysis

All data have been statically analyzed by using SPSS-25 /IBM. The estimated statistic functions included mean, slandered deviation, variance, confidence interval, and significant changes [34].

Result and Discussion

Oral manifestation

All patients were enrolled in oral clinical and lab analysis. The percentage distribution of oral manifestation in males was 3 % for burning sensation, 46 % for attrition, 20 % for abrasion, and 31 % for gingivitis. The females' percentage distribution was 1 % burning sensation. 45% attrition, 14 % abrasion, and 30 % gingivitis. The male percentage oral manifestations distribution was more observed in male than female except for burning sensation and attrition (Figures 1 and 2). The statistical evaluation data for final-stage renal failure disease were associated with the elevation prevalence of attrition and gingival disease, among other oral diseases. The collected data were correlated with other researchers in the disturbances of tooth, gingivitis, and periodontitis in renal problems. However, these changes could be associated with immunological and biochemical changes in renal disease patients [35-37].

Liver function

Alanine Aminotransferase (ALT) estimation for males and females, female ALT levels elevated more than males in end-stage disease. Both show

significant differences within the group and between groups (P<0.05) (Table 1). However, the values are still at a normal level (normal values <35.00 U/L).

The Aspartate Aminotransferase (AST) level for both males and females; higher values were recorded for females (normal values <32.00 U/L). AST and ALT recorded significant changes between groups (p<0.05) (Table 2).

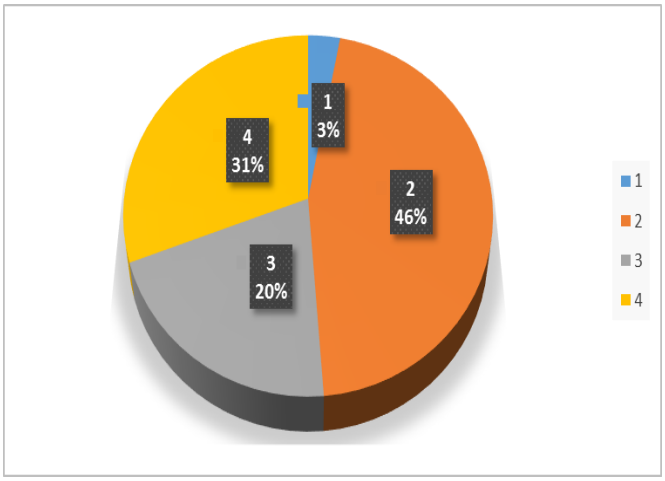

Figure 1: The percentage distribution of oral manifestation in male (1-burning sensation, 2-attrtion, 3-abrasion and 4-gingivites)

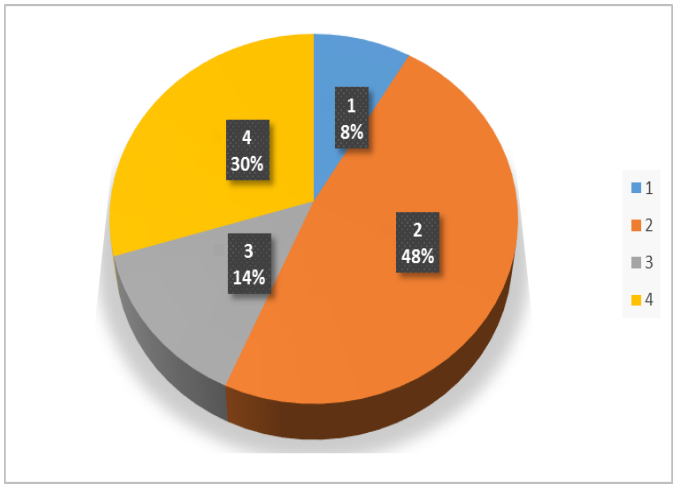

Figure-2: The percentage distribution of oral manifestation in female (1-burning sensation, 2-attrtion, 3-abrasion and 4-gingivites)

Table 1: ALT estimation for male and female, female ALT level

Function (ALT)		Male U/L	Female U/L
Mean ± SD		23.297 ± 27.888	32.753±41.516
Variance		777.752	1.724
St. error of mean		6.086	9.524
Mean differences		22.347	31.803
95% Confidence Interval of the Difference	Lower	9.652	11.793
	upper	35.041	51.813
Sig. (p < 0.05)*		.002	.004

**Significant p-value. (p < 0.05)*

Table 2: AST levels for males and females

Function (AST)		Male U/L	Female U/L
Mean ± SD		19.038 ±15.462	19.158 ±10.372
Variance		239.069	107.585
St. error of the mean		3.374	2.381
Mean differences		18.088	18.208
95% Confidence Interval of the Difference	Lower	11.051	13.209
	upper	25.126	23.207
Sig. (p < 0.05)*		0.000	0.000

**Significant p-value. (p < 0.05)*

Transaminase enzymes (AST and ALT) catalyze the amino group transfer of a keto-group of an acceptor substrate. Catalysis is dependent on the cofactor pyridoxal phosphate (PLP) [38]. Patients evaluated AST and ALT enzymes for all patients in this study were lower in AST and ALT than normal levels.

Many scientists reported that renal failure is almost associated with low levels of liver enzymes. In our opinion, lowering liver enzyme levels is reflected as lowering liver efficiency. The liver activity lowering could be reflected as a decrease in protein synthesis; such changes could affect whole-body metabolism, detoxification, and immunity, as well as the synthesis of biomolecules [39].

Mineral evaluation

Serum Phosphorus levels are listed in Table 3. According to the normal range, the female values were higher than male end-stage stage renal disease with significant differences ($p<0.05$). Significant changes between groups were estimated ($p<0.05$). Normal values (3.4 to 4.5 mg/dl).

The estimated calcium concentration is listed in Table 4. Male calcium level was lower than female in end-stage renal disease (normal values were 8.6-10.3 mg/dL), with Significant differences observed within-group and between groups ($p<0.05$).

Low serum calcium and phosphorous ion level for both males and females were detected. Lowering ions could accelerate attrition and abrasion in end-stage renal failure patients. This elevated prevalence of attrition and abrasion may be related to loss of renal ability for these ions' hemostasis. However, our results reported that calcium and phosphate interrelationships with disrupted progressively in advancing renal failure [40-42].

The sodium level was statistically evaluated. Male sodium concentrations were lower than females, with significant differences observed within-group and between groups ($p<0.05$). Male and female were below the normal range (135 to 145 mEq/L) (Table 5).

Table 3: The evaluation of serum phosphorus ion for renal male and female patients

Function (Phosphorus)			
Function		Male	female
Mean ± SD		3.110 ± 2.102	3.363 ± 1.625
Variance		4.417	2.641
St. error of mean		.459	37285
Mean differences		4.160	5.413
95% Confidence Interval of the Difference	Lower	3.203	4.630
	upper	5.116	6.197
*Sig. (p < 0.05)		0.00	0.00

**Significant p-value. (p < 0.05)*

Table 4: Serum calcium for both males and females

Function (Calcium)		Male	Female
Mean ± SD		7.514 ±1.185	7.279 ± 7.299
Variance		1.404	53.280
St. error of mean		0.259	1.675
Mean differences		6.564	9.329
95% Confidence Interval of the Difference	Lower	6.025	5.811
	upper	7.104	12.847
*Sig(<0.05)		0.000	0.000

**Significant p-value. (p < 0.05)*

Table 5: Sodium level for both males and females

Function (Sodium)		Male	Female
Mean ± SD		1.308 ± 4.494	1.200 ±2.944
Variance		20.197	8.667
St. error of the mean		1.005	0.6754
Mean differences		138.800	139.050
95% Confidence Interval of the Difference	Lower	136.697	137.631
	upper	140.903	140.468
*Sig(<0..05)		0.00	0.00

**Significant p-value. (p < 0.05)*

Statistically estimated potassium levels for both males and females; Significant differences were observed within-group and between groups ($p<0.05$). Normal values ranged from 3.5 to 5.5 mEq/L (Table 6).

Sodium and potassium ions levels were lower than the normal limit for enrolled patients in this research. These changes directly affect acid-base balance in physiological fluids. Robert W; and Qi Qian reported that normal to low levels of sodium and potassium in renal failure patients as well as acid-base alterations in patients with kidney failure, systemic inflammation, soft-tissue destruction, vascular calcification, and poor prognosis. So, this distribution in our study could explain oral manifestation in end-stage renal failure patients [43, 44].

Serum protein evaluation

Serum albumin estimation was shown elevation in females rather than males, with significant differences within-group and between groups ($p<0.05$). Both males and females were within normal values. (3.4 to 5.4 g/dL) (Table 7).

Hematology analysis

The male hematological analysis represents a decrease in red blood cell (RBC) count, Hematocrit (HCT), Hemoglobin (HGB), Red cell distribution width of Standard deviation (RDW-SD), and Platelet test (PLT). Normal levels were found for Mean corpuscular value (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), and White blood cells (WBC). Significant differences were observed within-group and between groups ($p<0.05$) (Table 8).

The female hematological analysis represents a decrease in RBC count, HCT, HGB, RDW-SD, and PLT. Normal levels were found for MCV, MCH, MCHC, and WBC. Significant differences were observed within-group and between groups ($p<0.05$) (Table 9). Hematological analysis for males and females showed a decrease in RBC count, HCT, HGB, RDW-SD, and PLT. Almost patients with renal disease develop hemostatic disorders and different forms of bleeding diatheses. Bleeding can occur in the cutaneous, mucosal, or serosal area. Recorded hematological changes could explain our oral manifestations.

Also, Patients' platelet lowering is an important factor associated with hemorrhage in renal failure that leads to anemia and its complications. Anemia could be related to the accumulation of medications, lowering clearance, and anticoagulation use during treatments [45-47], such changes correlated with our results.

Table 6: Potassium level for both males and females

Function (potassium)		Male	Female
Mean ± SD		3.1 ± 0.785	3.0958± .84276
Variance		.605	.710
St. error of mean		.1698	.193
Mean differences		3.897	4.146
95% Confidence Interval of the Difference	Lower	3.543	3.740
	upper	4.251	4.552
Significant p-value (<0.05)		.000	.000

Table 7: Serum albumin estimation for males and females

Function (Albumin)		Male	Female
Mean ± SD		3.810 ± .512	4.147±1.210
Variance		.262	
St. error of mean		.112	.298
Mean differences		2.860	3.197
95% Confidence Interval of the Difference	Lower	2.627	2.571
	upper	3.093	3.824
*Sig(<0.05)		.000	.000

**Significant p-value. (p < 0.05)*

Table 8: Male hematological analysis

Function / parameters / (Male)		RBC	HCT	HGB	MCV	MCH	MCHC	RDW-SD	RDW-CV	WBC	PLT
Mean ± SD		3.0738 ±.40385	26.8000 ±4.70755	8.6762 ±1.55785	86.9333 ±8.11956	28.1429 ±2.90836	32.3381 ± 1.05569	43.1810 ± 3.58031	13.8048 ±1.83152	6.5919 ±2.55640	1.9962E2 ±86.99625
Variance		.163	22.161	2.427	65.927	8.459	1.114	12.819	3.354	6.535	7.568E3
St. error of mean		.08813	1.02727	.33995	1.77183	.63466	.23037	.78129	.39967	.55785	18.98414
Mean differences		2.12381	25.85000	7.72619	85.98333	27.19286	31.38810	42.23095	12.85476	5.64190	198.66905
95% Confidence Interval of the Difference	Lower	1.9400	23.7072	7.0171	82.2874	25.8690	30.9076	40.6012	12.0211	4.4782	159.0688
	upper	2.3076	27.9928	8.4353	89.6793	28.5167	31.8686	43.8607	13.6885	6.8056	238.2693
Significant p-value. (<0.05)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Table 9: Female hematological analysis

Function / parameters /(Female)		RBC	HCT	HGB	MCV	MCH	MCHC	RDW-SD	RDW-CV	WBC	PLT
Mean ± SD		3.221 ±0.811	28.516 ±5.977	9.142 ±1.831	89.226 ±4.670	28.663 ±1.662	32.142 ±1.344	46.447 ±4.651	14.310 ±1.344	7.114 ±2.557	2.017 ±58.763
Variance		0.658	35.720	3.354	21.810	2.762	1.806	21.628	1.805	6.536	3.453
St. error of mean		0.1861	1.371	.420	1.071	0.381	0.308	1.067	0.308	0.587	13.481
Mean differences		2.271	27.566	8.192	88.276	27.713	31.192	45.497	13.361	6.164	200.734
95% Confidence Interval of the Difference	Lower	1.880	24.685	7.309	86.025	26.912	30.544	43.256	12.713	4.931	172.411
	Upper	2.662	30.446	9.075	90.527	28.514	31.840	47.739	14.008	7.396	229.057
*Sig(<0.05)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

**Significant p-value. (p < 0.05)*

Meanwhile, renal failure patients usually present with multiple oral complaints, including burning and taste alterations. Burning mouth complaints are reported more often in women than men [48] that agree with our results listed in Figures 1 and 2, which explain the elevated burning sensation percentage in females (8%) rather than males (3%).

Conclusion

According to this study, there is a correlation between patients with end stage renal failure and the oral changes (gingivitis, burning sensation attrition, abrasion that manifest attributable to the variability and difference in the hematologic and biochemical levels for those people.

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Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

The authors declare no conflict of interest. No fund was received to conduct this study.

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