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"SALIVARY CREATININE AND UREA LEVELS AS PREDICTORS OF DIALYSIS NEED IN PATIENTS WITH RENAL FAILURE"

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Abstract:

Background: The incidence of chronic renal failure is on the rise due to the rise of chronic disabling diseases and the aging of the population. The accumulation of metabolic wastes and electrolyte imbalance has detrimental consequences on the health of these people. For these individuals, hemodialysis at regular intervals is a life-saving operation. The acceptance of salivary diagnostics as an alternative to conventional procedures is growing.
Objective: The purpose of this study was to investigate the diagnostic value of saliva in patients with chronic renal failure.
Method: This case–control research includes eighty participants. The study group consisted of thirty CRF patients participating in a renal dialysis regimen. A control group consisting of 30 age- and gender-matched controls was formed. For biochemical examination, blood and saliva samples were obtained and centrifuged from both patients and controls. Patients with chronic renal failure had their serum and salivary urea and creatinine examined and correlated using the unpaired t-test and Pearson's correlation coefficient.
Results: Compared to control group serum and salivary urea and creatinine, was higher in study group, according to the findings of the study.
Conclusion: The results of this study demonstrate that the analysis of creatinine and urea, in the saliva of patients with chronic renal disease accurately matches their blood concentrations. Thus, salivary creatinine and urea could be employed as biomarkers for diagnosing chronic renal disease.

Keywords: Creatinine, dialysis, saliva, serum, urea, chronic renal failure.

INTRODUCTION

Renal failure is a process that expresses a loss of functional capacity of the nephrons, independently of its etiology. Although acute renal failure is reversible in the majority of cases, chronic renal failure (CRF) presents a progressive course towards terminal renal failure (TRF), even if the cause of the initial nephropathy disappears (1). When the glomerular filtration rate (GFR) is <15 ml/min (TRF), it is necessary to start renal replacement therapy to avoid the serious complications which can lead to the death of the patient (1). Hemodialysis is the most widely used technique. Dialysis leads to systemic alterations, oral complications and variations in the flow and composition of the saliva (2–4).

Frequency of dialysis or time to initiate dialysis remains the key factor for maintaining homeostasis and to improve the quality of life of these patients. Constant monitoring of serum levels of metabolic byproducts such as creatinine and urea is needed. Repeated venipuncture increases patient's infection risks (5).

Saliva is considered as a filtrate of the blood where various molecules pass through transcellular (passive Intracellular diffusion and active transport) or paracellular routes (extracellular ultrafiltration) into Saliva. As a result, saliva is equivalent to serum, thereby reflecting the physiological state of the body (6).

Studies have shown variations in salivary levels of urea and creatinine in renal failure patients (7,8-11)

More importantly, saliva can indicate creatinine and urea levels in patients with CRF which are the parameters usually assessed in blood samples. Analysis of salivary creatinine and urea in patients with CRF offers many advantages that have been attributed to the use of saliva as a diagnostic fluid.

Hence, a non-invasive diagnostic test with minimal risk with ability to provide a dependable evaluation of disease condition would be of worth to both the health professionals and the patients.

Parameters in saliva can be affected by many factors including diet and genetics. Because of this, use of saliva as a diagnostic fluid is still subject to continuous research.

Based on the availability of improved salivary diagnostic systems, this study was designed to assess the diagnostic accuracy of salivary levels of creatinine and

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urea, and we also aimed to determine cutoff values for salivary creatinine and urea as indicators of dialysis need in patients with renal failure.

METHOD

Study design and sample collection

The study group comprised of 30 newly diagnosed renal failure patients undergoing dialysis for the first time, whereas the control group consisted of 30 healthy individuals of the same age and gender. All participants provided written informed consent, and a comprehensive clinical history was documented. Excluded from the study were individuals with other diseases, medicines, or behaviors that impair hydration and electrolyte balance.

All participants provided 2 ml of venous blood under aseptic circumstances. The samples were centrifuged for 2–3 minutes at 2000 revolutions per minute (rpm) to obtain serum (12).

All participants were instructed to abstain from eating and drinking for two hours prior to saliva collection. After 5 minutes of relaxation, saliva was collected via spitting. To prevent biochemical changes, the samples were immediately transported to the laboratory in a vaccination carrier containing an ice pack.

The samples were centrifuged for 10 minutes at 4000 rpm to get the supernatant saliva. Patients with renal failure had blood and saliva drawn 2 hours before to dialysis, between 9 and 11 a.m.

Using a semi-autoanalyzer, the levels of Urea and creatinine were measured in serum and supernatant saliva (12).

Biostatistical analysis:

The results were analyzed using version 26 of the SPSS statistical software for Windows.

Using an unpaired ***t-test***, the levels of serum and salivary, creatinine and urea were compared between renal failure patients and age- and sex-matched healthy controls. Statistical significance was determined to exist when ***p*** 0.05. The Pearson correlation coefficient was employed to examine the relationship between quantitative variables. The correlation coefficient of Pearson is denoted as ***r*** value.

RESULTS:

The levels of serum urea and creatinine are given in Table 1. As anticipated, the mean serum levels of urea and creatinine were significantly elevated in CRF patients (P 0.05 A significant positive correlation was found between serum and salivary urea concentrations [r = +0.873, fig 1, P = 0.00] and between serum and salivary concentrations of creatinine [r = +0.855, fig 2, P = 0.00, Table 2].

Table 1: Biochemical parameters evaluated in blood and saliva in the patients with CRF n = 30 and in the controls n = 30

		Patient n=30 (M±SD)	Control n=30 (M±SD)	P-value
Serum (mg/dl)	Urea	**178.16 ±33.44**	**24.97±3.20**	**
	Creatinine	**8.391**±2.19	**1.13**±0.46	**
Saliva (mg/dl)	Urea	**111.51±19.87**	**12.00**±2.37	**
	Creatinine	**1.88**±0.33	**0.34**±0.16	**

M: mean, SD: stander deviation, n: number of participants, *p < 0.05 and **p < 0.01

Table 2: Correlation between serum and salivary creatinine and urea levels in patients with CRF and healthy controls.

	Creatinine	urea
r	+0.873	+0.855
P-value	0.00	0.00
N	60	60

r: Correlation coefficient,

The acquired diagnostic accuracy of salivary urea and creatinine in this research showed that saliva can be used as a noninvasive diagnostic fluid to monitor the levels of the mentioned parameters in renal failure patients.

DISCUSSION:

In agreement with our studies, the increase in salivary urea concentration in CRF patients has been observed in all investigations that have studied this biochemical parameter for both children and adults

The kidneys manage the volume and composition of extracellular fluid to maintain the body by continuously processing plasma through filtration, reabsorption, and secretion of chemicals, so contributing to the maintenance of the body's internal environment (16). Damage to the kidneys diminishes their glomerular filtration capacity, leading to elevated serum levels of metabolic products. Urea & creatinine are significant indicators of changes in renal function among the byproducts (17). Among all metabolic wastes, urea and creatinine levels are regarded as decisive indications of dialysis beginning.[4] Due to the limitations of invasive sera collection methods and the convenience of saliva collection, saliva has been investigated as an alternative to serum. Saliva is a filtrate of sera and has been studied as an alternative to serum (18,19). In this work, we investigated the possibility of using saliva as a substitute for monitoring metabolic wastes of kidney failure.

Due to the aforementioned considerations, age- and gender-matched controls were chosen as comparisons in the study. Both patients and controls had a positive connection between salivary urea and creatinine levels and blood levels. This result is consistent with the previous result (20,21, 22,23). Differences in serum urea and creatinine levels correlated with variations in salivary levels in this investigation. The change rate was not, however, consistent.

CONCLUSION

The results of this investigation led us to the conclusion that salivary diagnostics is a simple, rapid, noninvasive, affordable, highly accurate, and reliable method for assessing the blood levels of metabolic wastes and electrolytes in renal failure patients.

Salivary urea and creatinine are diagnostically reliable and can be used to evaluate blood levels of metabolic wastes such as urea and creatinine, as well as to screen high-risk individuals to determine the need for dialysis.

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