



Oral and Salivary Changes among Renal Patients Undergoing Hemodialysis and Renal Transplant: A Cross Sectional Study

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ABSTRACT

Background: Renal Failure involves an irreversible loss of renal function. This result in increased Blood Urea Nitrogen (BUN) levels which may lead to high concentration of salivary urea nitrogen (SUN) levels. The oral cavity may show a variety of changes as the body progresses through an azotemic to a uremic state. The dentist should be able to recognize these oral changes as a part of the patients' systemic disease and not as an isolated occurrence. **Aims & Objectives:** To determine the Salivary Urea levels in patients undergoing hemodialysis & renal transplant and to evaluate the oral changes among them. **Methodology:** Subjects were selected from patients undergoing hemodialysis and patients who had underwent kidney transplantation from various hospitals in Guntur. The study comprised of 90 patients, of which Haemodialysis group (HD) with 60 patients, Transplant (T) group with 20 patients and 10 patients in control group. Saliva sample was collected from all the subjects to assess the SUN levels. The patients were examined for extra oral and intra oral changes. **Results:** There was a statistically significant difference in the Salivary Urea levels among HD, T and control group ($p < 0.05$). The SUN levels were significantly higher in HD and T group compared to control group. There are significant percentages of extra oral manifestations & intra oral manifestations. **Conclusion:** Oral cavity reflects the systemic health status of an individual. Thus oral physicians must be aware of these signs and symptoms manifested in the oral cavity that can suggest the renal disease.

Key words: Hemodialysis, Renal failure, Salivary urea and nitrogen, Uremic odor.

INTRODUCTION

Renal diseases are life threatening in nature next to cardiovascular diseases. The incidence of renal diseases continues to rise worldwide and as a consequence, increasing number of renal patients will probably require oral healthcare. Renal failure refers to a condition where the kidneys lose their normal function of excreting metabolic waste products from the body. In these patients there will be impaired glomerular filtration, which leads to the accumulation of various metabolic waste products in the blood such as BUN. Elevation of BUN in renal diseases may results in high concentration of urea and nitrogen

in saliva due to diffusion of nitrogenous waste into the saliva. It is also possible that saliva may be an attempted alternative route of excretion by the body in compromised renal function state.¹

The Patients with end stage renal disease have to undergo hemodialysis (HD) or renal transplantation. The aim of HD treatment is to remove metabolic waste products such as urea, nitrogen and excess fluid from the body to restore normal circulatory volume. All the renal disorders may illustrate oral manifestations and can influence the salivary composition. The oral physician can help in early diagnosis of renal diseases by identifying the oral manifestations and by assessing the changes in the salivary composition.² Thus the present study was done to assess the oral and salivary changes in patients undergoing hemodialysis and renal transplantation.

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DOI : 10.5530/BEMS.1.1.6

MATERIALS AND METHODS

The study design was simple randomized sampling type. The study was done for the period of six months. The purpose of undertaking this study was explained along with informed consent taken from

all the subjects and ethical committee approval taken for this study. Subjects were selected from patients undergoing haemodialysis and patients who had underwent kidney transplantation at various hospitals in Guntur, India. The study comprised of 90 patients of which, study group consist of 80 patients and control group of 10 patients. The study group is subdivided into Haemodialysis group (HD) with 60 patients and Transplant (T) group with 20 patients. Control group (C) comprised 10 healthy individuals selected from Dental OPD.

Selection of patients

An age group of 25 to 65 years matched for age and gender were selected for both groups. Patients with history of certain nephrotoxic drug intake and other systemic conditions were excluded. All the patients in the study groups were diagnosed with renal diseases like acute renal failure, chronic renal failure, acute nephrotic syndrome, glomerulonephritis etc. HD group consists of 60 patients (40 males and 20 females) bearing the disease for the past 1-5 years and undergoing haemodialysis once in a week for the period of 2 to 4 hours. T group consists of 20 patients (15 males and 5 females) who had undergone renal transplantation in the precedent one year.

C group comprised of 10 patients (6 males and 4 females) who were free from systemic disease and they were not under any medication for any of the systemic medical condition. An age group of 20 to 65 years matched for age and sexes were selected for all the groups.

Collection of Saliva

Renal patient's saliva samples were collected during their review visit, under strict aseptic precautions. Un-stimulated whole saliva was collected between 9 to 11 am from all the three groups using spitting method in a disposable, sterile, plastic container (Nalgene Sterile Sample Bottles) with measurement markings. The collected samples were submitted for analysis of SUN levels by an Automated Bio analyzer.

Oral examination

The clinical examination was carried out by an experienced oral clinician, under adequate illumination using mouth mirror and blunt end probe. All the subjects were examined for extra oral and intra oral changes.

All the oral changes were assessed by simple oral examination and by questioning patients regarding these symptoms. The uremic odor was determined when there was a urine odor in the breath. The xerostomia was considered by asking the patient "do you feel dryness of mouth frequently" and the dysgeusia was determined by asking the patient about the symptoms. Coated tongue was determined clinically

when there is white patch on dorsum of the tongue that can be removed by scraping with spatula.

RESULTS

There was a statistically significant difference in the mean salivary urea levels among all the groups. The mean salivary Urea level in control group was 34.2 (SD = \pm 7.0), HD group was 97.15 (SD = \pm 34.12) and in T group it was 71.53 (SD = \pm 23.83), which was statistically significant. Similarly, the mean SUN levels in T; HD and C group was 33.18 \pm 10.54, 46.33 \pm 15.43 and 14.60 \pm 5.49 respectively. The mean salivary urea and SUN level was significantly higher in HD group compared to T and Control group (Table-1).

All the patients in the study group showed extra oral and intra oral changes. The most common oral changes were uremic odor in 53.7%, dysgeusia in 47.5% and xerostomia in 45% of patients. There were significant percentages of extra oral manifestations like pedal edema in 67.5%, Pale Skin in 60%, swollen face in 40% of the study group (Table 2 & 3).

DISCUSSION

Kidneys are vital organs for maintaining homeostasis in the body. The Functions of kidneys include regulating the acid-base balance and fluid electrolyte balances of the body. The nephrons filters the blood, selectively reabsorbs water & electrolytes and excretes metabolic waste products such as urea, creatine, uric acid and other chemicals.³ The oral cavity may show a variety of changes with impaired renal function and decreased glomerular filtration, thus Dentist can help in early diagnosis of renal diseases by identifying the oral manifestations. Analysis of salivary urea levels in renal dialysis patients is a promising non invasive diagnostic tool.⁴ In a clinical study by Dhalberg et al., on parotid saliva of patients undergoing haemodialysis concluded that there exists a correlation between salivary and blood urea levels.

The normal salivary urea concentration is 12 to 70 mg/dl. In our study the mean salivary urea concentration in control group was 34.2 \pm 7.01 mg/dl whereas in HD group 97.15 \pm 34.12mg/dl and in T group it was 71.53 \pm 23.83 mg/dl. The mean SUN was significantly higher in HD and T group compared to C group, which was in accordance to previous studies. This increase in salivary urea concentration is due to the fact that urea is concentrated in saliva. This could be attributed to fact that in case of renal failure there will be a disturbance of the renal function and this lead to decrease in renal urea excretion thus leading to increase in serum urea concentration. It is also possible that saliva may be an

TABLE 1: Statistical comparison of mean values between different study groups

Variable	C-Group		HD- Group		T- Group		P-Value
	Mean	SD	Mean	SD	Mean	SD	
Age	25.2	3.82	48.0	12.61	41.2	12.64	<0.0001
Salivary Urea	34.2	7.0	97.15	34.12	71.53	23.83	<0.0001
SUN	14.60	5.49	46.33	15.43	33.18	10.54	<0.004

TABLE 2: percentage of extra oral manifestations among different groups

Extra oral manifestations	No. of patients	Percentage
Pedal edema	54	67.5%
Pale Skin	48	60%
Swollen face	32	40%
Bruises on the skin	18	22.5%

TABLE 3: percentage of intra oral manifestations among different groups

Intra oral manifestations	No. of patients	Percentage
Uremic odour	43	53.75%
Dysguesia	38	47.5%
Xerostomia	36	45%
Localised periodontitis	32	40%
Increased tongue coat	27	33.75%
Generalised gingivitis	27	34.28%
Enamel discolouration	18	22.5%

attempted alternative route of excretion by the body in a compromised renal function state.

The extra oral manifestations noted in this study were swollen face, pale skin, pedal edema, bruises on the skin.⁵ Pallor of the skin is because of anemia associated with renal failure. The pathogenesis of anemia in renal diseases may be due to various causes like nutritional deficiencies, abnormalities in iron metabolism and circulating uremic toxins that inhibit the erythropoiesis resulting in impaired production of erythropoietin by the kidney.^{6,7} Another cause for anemia in patients undergoing dialysis is frequent blood sampling and loss of blood during hemodialysis. Other clinical features in our study include bruising on the skin, which could be due to increased urea concentration in sweat resulting in pruritis, causing the patient to scratch the skin frequently.⁸

The intra oral manifestations noted in our study were uremic odour, drymouth and altered taste sensation. These findings were similar to the findings reported by Scott S De Rossi, Michael Glick and Scop Kho et al.^{8,5} Majority of patients in our study reported with uremic odor which is due to the breakdown of urea into ammonia and its byproducts. Patients in our study reported with xerostomia, which could have been secondary to the uremic involvement of salivary glands and possibly due to dehydration and reduced fluid intake.⁹

Altered taste sensation was reported in almost 47% of patients, which could be due to an increase in the urea concentration in saliva

and accumulation of urea on the tongue as uremic frost. The other reasons could be due to reduced levels of Zinc and increased dimethylamine and trimethyl amines in saliva.¹⁰

It is well known fact that renal diseases during odontogenesis can lead to yellowish discoloration of enamel. The enamel discoloration was seen in around 22% of patients in our study and it may be attributed to an increased urea concentration in the saliva and its subsequent accumulation on the teeth. The gingivitis and the periodontitis noted in these patients could be due to accumulation of urea in saliva and subsequent inflammation of these tissues. Renal osteodystrophy and secondary hyperparathyroidism also provoke the inflammation of periodontium leading to periodontitis.¹⁰

CONCLUSION

Our study concluded that salivary urea levels are significantly altered in renal patients. Accordingly, monitoring of salivary urea nitrogen (SUN) concentrations should certainly be considered as a part of routine sialometric assessment in renal transplant and dialysis patients. Dentist has a fundamental role in frequent evaluation and early detection of oral manifestation of renal patients, in order to early diagnosis. We recommend the future studies in much larger cohorts of transplant and dialysis patients to evaluate the efficacy and feasibility of salivary analysis.

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