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DENTAL CARIES AND PERIODONTAL HEALTH STATUS AMONG PATIENTS ON HEMODIALYSIS IN BANGALORE CITY- A CROSS-SECTIONAL STUDY

Oral Medicine

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ABSTRACT

INTRODUCTION: Individuals with Chronic Kidney Disease requiring hemodialysis pose significant dental management dilemmas and manifest with specific oral complications requiring oral health care. The purpose of the study was to determine dental caries and periodontal health status of patients on hemodialysis.

METHODOLOGY: 300 subjects undergoing hemodialysis formed the study group. The oral health status was assessed using WHO oral health assessment form (1997).

RESULT: Most common subjective symptom was xerostomia followed by bad breath and bleeding gums. CPITN index showed Score 3 seen in maximum patients and dentition status of Score 5 was seen in maximum patients.

CONCLUSION: WHO Oral Health Assessment Form can be used as a standardized protocol for assessing oral health in patients with special care needs.

KEYWORDS

Chronic Kidney Disease, WHO oral health assessment form, Dentition status, CPITN index

INTRODUCTION:

Chronic Kidney Disease (CKD) is defined as structural or functional abnormalities of the kidney, with or without decreased Glomerular Filteration Rate (GFR), manifested by pathological abnormalities or markers of kidney damage, including abnormalities in the composition of the blood or urine or in imaging. (GFR <60ml/min/1.73m^2 for three months or more, with or without kidney damage).[1] The clinical parameter is the Creatinine (Cr) clearance rate (Normal values of serum Cr are 0.5-1.4 mg/dl; in patients with renal insufficiency, Cr will be of 1.5 mg/dl or more) and blood uric nitrogen levels[2].

The systemic signs of renal failure and uremia such as hematologic changes, bone metabolism changes and alterations in immune status can be significant to the dental practitioner[3].

The main aetiology for CKD(CRF and ESRD) in India were found to be diabetes, hypertension, chronic glomerular nephritis, chronic interstitial disease, ischaemic nephropathy, obstructive uropathy, vesico-ureteral reflux , Autosomal dominant polycystic kidney disease (ADPKD), Alport Syndrome, heredofamilial disease and unknown causes.[4]

Dialysis treatment aims to clear blood from toxins by using a semipermeable membrane in patients diagnosed with CKD. Either the patient's own peritoneal membrane (peritoneal dialysis (PD)), or a semipermeable synthetic membrane [hemodialysis (HD)] is used for this purpose. Hemodialysis is the most widely used technique.[5,6]

In the long term, dialysis is associated with a general weakening and suppression of the immune system and as a result, patients become more susceptible to infection. Thus, quite a few CKD patients show not only systemic changes, but also oral complications. In addition to it leads to changes which can result in xerostomia, bad breath, changes in the oral mucous membranes, increased dental calculus formation as well as erosions and tooth anomalies have been reported in the literature. In addition, neglecting oral hygiene at home have a negative effect in these patients; an increased occurrence of caries, periodontal diseases and other oral diseases can be the consequence.[6,7]

Dentists are frequently challenged to meet such dental needs of medically complex patients. Individuals with CKD requiring artificial filtration of the blood by dialysis pose significant dental management dilemmas and display oral manifestations with specific implications for oral health care.

MATERIALS AND METHODS:

The study was a cross-sectional clinical study that involved a comprehensive oral assessment on individuals undergoing hemodialysis. The study was conducted among the patients registered at various hospitals in Bangalore for Hemodialysis (HD). 300 patients, fulfilling the inclusion criteria, were included in the study that were registered for HD. Patients who were undergoing HD and age limit between 18-70 years were included in the study. Patients under the age of 18 years, HIV and Hepatitits B positive patients, patients who have received radiation therapy for head and neck cancers and patients suffering from head and neck malignancies were excluded from the study.

Approval for the study was obtained from the Ethics Committee at AECS Maaruti College of Dental Sciences and Research Centre, Bangalore. Informed consent for completion of a questionnaire and a non-invasive oral examination was obtained from the hemodialysis patients registered in a dialysis program at the dialysis centers in Bangalore.

All the patients in the present study were undergoing 4 hours of hemodialysis 2-3 times week. Individuals undergoing HD were asked to sign an informed consent detailing the purpose of the study, risks and benefits.

Patients were also asked to complete a questionnaire prior to intraoral examination. The questionnaire was used to gather information about the demographic (sex, age), medical and dental status, any dental complaints as well as oral hygiene habits (brushing frequency). The questionnaire also included presence of bad breath, spontaneous bleeding of gums, dries mouth, difficulty in swallowing, discoloration of teeth. The questionnaire was completed at bed-side in a question and answer manner by a clinician.

A single dentist performed an intraoral examination of each patient, collecting data about various indices specified in WHO Oral Health Assessment Form (1997). Oral soft and hard tissues examination including remaining teeth, gingival overgrowth and oral ulcerations was performed by the aid of a light source at the bed side along with a mouth mirror, an explorer and a CPITN probe.

Dental caries was assessed using the Dentition status and have been given scores. Periodontal status and loss of attachment were evaluated by CPI probe. Any further need for immediate care and referral was also recorded in terms of any life-threatening condition, acute abscess and any other conditions.

STATISTICAL METHODS:

Descriptive and inferential statistical analysis has been carried out in

the present study. Chi-square test was used to find the significance of study parameters on categorical scale between two or more groups. Statistical package for Social Sciences software 21.0 version was used for statistical analysis.

RESULTS:

A total of 300 subjects on haemodialysis were included in the study and all gave consent for clinical examination. The age of the patients ranged from 21-70 years with mean age of 51.19 ± 12.28 years. Age distribution of the study participants is mentioned in Table 1. Among the subjects examined 187(62.37%) were males and 113(37.63%) were females. Mean age of male and female was 53.96 ± 13.37 and 54.57 ± 10.29. There were various medical conditions which were diagnosed by the nephrologists, amongst which, the conditions which was most prevalent was Diabetes mellitus (Type II, NIDDM) and hypertension occurring simultaneously in the study subjects. The frequency was about 41% (n=123), among which 60% (n=74) were diagnosed in males and 39.8 %(n=49) were diagnosed in females. The other conditions which were high in numbers were hypertension followed by diabetes. Chronic renal failure in these patients was most commonly due to diabetic nephropathy and long-standing uncontrolled hypertension.

The most common subjective symptoms which were reported after answering a questionnaire was dry mouth present in 75.34% (n=226) subjects followed by bad breath present in 32.67% (n=98) subjects and Bleeding gums found in 28.64% (n=86) of subjects.

The dental clinical findings showed that 94.67% (n=284) were dentate patients and 5.33% (n=16) were edentulous subjects. Among dentate subjects, 62.33% (n=177) were partially dentate and 37.67% (n=107) subjects were completely dentate patients. The most common oral lesion which was diagnosed among 300 subjects was blackish to brownish pigmentation of the right and left buccal mucosa which was found in 15%(n=45) of subjects.

It was found that Score 3(pocket depth of 4-5mm) was most prevalent in 37.33 %(n=112) hemodialysis patients. The loss of attachment was not much prevalent with just 28 %(n=84) showing loss of attachment of about 4-5mm. Dentition status showed maximum prevalence of 27 %(n=81) in terms of Score 5(missing teeth due to any other reason) among haemodialysis patients.

Table 1: Distribution of study participants on the basis of age group (in years)

Age range(in years)	Count(%)
20-30	18(6)
31-40	36(12)
41-50	44(14.6)
51-60	96(32)
61-70	106(35.4)
Total	300(100)

Table 2: Medical conditions diagnosed in hemodialysis patients

Medical Condition	Count (%)	p value
Diabetes	65(21.67)	<0.05
Hypertension	82(27.33)	
Diabetes and Hypertension	123(41.0)	
Hyperthyroidism	4(1.33)	
Secondary Hyperparathyroidism and Hypertension	4(1.33)	
Diabetes mellitus, hypertension, Hypoparathyroidism	8(2.67)	
Hypothyroidism	6(2.0)	
Congenital and Other causes	8(2.67)	

p < 0.05 statistically significant

Table 3: Subjective symptoms (through self-constructed questio nna ire)

	Present (%)	Absent (%)	p value
Bad breath	98(32.67)	202(67.33)	<0.05
Dry mouth	226(75.33)	74(24.67)	<0.05
Difficulty in swallowing	75(25.0)	225(75.0)	<0.05
Bleeding gums	86(28.67)	214(71.33)	<0.05
Staining/ discolouration of teeth	29(9.67)	271(90.33)	<0.05
Delayed tooth eruption	0(0.0)	300(100)	-
Loose teeth	47(15.67)	253(84.33)	<0.05

p < 0.05 statistically significant

Table 4: Distribution of study participants on the basis of CPITN score

	Count (%)	p-value
Score 1(bleeding)	14(4.67)	<0.05
Score 2(calculus)	31(10.33)	
Score 3(pocket 4-5mm)	112(37.33)	
Score 4(pocket 6mm or more)	64(21.33)	
Score 9(not recorded)	63(21.0)	
Edentulous	16(5.33)	

Chi-square value-92.620 p < 0.05 statistically significant

Table 5: Distribution of study participants on the basis of Loss of Periodontal attachment score

	Count(%)	p-value
Score 0(0-3mm)	109(36.33)	<0.05
Score 1(4-5mm)	84(28.0)	
Score2(6-8mm)	28(9.33)	
Score 9(not recorded)	63(21.0)	
Edentulous	16(5.33)	

Chi square-42.620 p < 0.05 statistically significant

Table 6: Distribution of study participants on the basis of Dentition status score

	Count (%)	p value
Score 1 (Decayed)	41(13.67)	<0.05
Score 2 (Filled, with decay)	12(4.0)	
Score 3 (Filled, no decay)	7(2.33)	
Score 4 (Missing, as a result of caries)	52(17.33)	
Score 5 (Missing, any other reason)	81(27.0)	
Score 7 (Bridge abutment, special crown or Veneer/ implant)	5(1.67)	
Score 8 (Unerupted tooth, (crown)/ Unexposed root)	1(0.33)	

p < 0.05 statistically significant

DISCUSSION:

The present study was done to evaluate the dental caries and periodontal health status in patients on renal dialysis in Bangalore City. Due to consequences resulting from uremic metabolic, endocrinological, and immunological imbalances, CKD patients suffer from numerous systemic complications that may contribute to poor oral health[7]. Although there are no specific signs in the oral cavity indicating the presence of CKD, a whole range of changes occur in the oral cavity that are associated with CKD itself or with the CKD therapy[7]. Individuals with End-Stage Renal Disease (ESRD) requiring artificial filtration of the blood by dialysis pose significant dental management dilemmas and display oral manifestations with specific implications for oral health care. This has been reported to affect the teeth[7] oral mucosa[8], bone[4], periodontium[9], salivary glands[10], tongue[7] and oral cavity[8,9]. As dental health appears to be an area where attention has been lacking[11, 12, 13], the present study was conducted to assess the oral health status in individuals on renal dialysis.

In the present study the age groups ranged from minimum of 21 years to maximum of 70 years and amongst them 62.33%(n=187, mean age=53 ± 13.37 years) were male patients and 37.67%(n=113, mean age = 54.57 ± 10.29 years) were female. The higher prevalence of CKD was found in male patients than female. The age and gender is in correlation with the study conducted by Estela de la Rosa Garcia et al[14]. Most subjects had the medical condition which was diagnosed to be as Diabetes mellitus and Hypertension (41%) together followed by Diabetes mellitus (21.67%) and Hypertension (27.33%) alone. These results are in accordance with the study conducted by Cunha et al[15]. Hence, Dental professionals caring for patients with CRF should continuously update their knowledge regarding CRF-related complications and it is important for dentists to keep in touch with patients' physicians, in order to be informed about their medical condition.[10,15].

xerostomia was the most common subjective symptoms which were derived from the questionnaire answered by dialysis patients. About 75.33% reported this complaint in our study and the values were statistically significant ($p<0.01$). The results were consistent with results by Klassen JT and Krasko MB[16], which showed a prevalence of about 81% of xerostomia complaints in edentulous patients. The results were not consistent with the studies conducted by Kho et al[9] and Cunha et al[15] as they showed the prevalence of about 32.9% and 40% respectively. Individuals with xerostomia have a higher caries risk in dentate patients and should be continuously monitored by oral health professionals. Bad breath (32.67%) and bleeding gums(28.67%) were the next common complaints by these patients and the results were in accordance with the study conducted by CP Bots et al[17]. Difficulty in swallowing, loose teeth and staining were the next subjective symptoms reported by the patients in the questionnaire which was approximately about 25%(n=75), 15.67%(n=47), 9.67%(n=29) respectively which correlated with the studies by Preethi Murali et al[2] and Klassen and Krasko[16].

The CPI scores showed a Score 3(pocket depth about 4-5mm) as the maximum values (37.33%) among other scores. The results did not correlate with the studies conducted by Dencheva et al[9](27%), Preethi Murali[2]and Cunha et al[15].But the values in our study were significant with Chi-Square test. Score 4(pocket depth about 6mm or more) was about 21.33% which was in accordance with the study conducted by Denchava et al[18].

In the present study, Loss of attachment score showed a maximum prevalence in Score 0(LOA 0-3mm) 36.33% and Score 1(LOA 4-5mm) 28.0%. These results were according to the study conducted by Cunha et al[15] who showed the prevalence of about 40% of 0-5mm attachment loss. As, most of the subjects receiving hemodialysis in the study did not know about dental plaque and/or periodontal diseases so they would be at higher risk for dental and/or periodontal diseases. Dentists should be encouraged to instruct these subjects with special needs on the causes and prevention of dental and periodontal diseases and on how to limit or prevent them.

The present study showed the maximum prevalence of Score 5(missing due to other reason) in Dentition status index given WHO oral health assessment form (1997) of 27%. None of the studies conducted correlated with the results of our study as correct assessment of scores of Dentition status (by WHO criteria) was not done by any of the studies. Whereas the Score 7(Bridge abutment, special crown or Veneer/ implant) of 1.67% was in accordance with the results in the study conducted by Klassen JT and Krasko MB[16], the other scores did not correlate with the results of our study. The non-carious tooth loss may be because of the secondary hyperparathyroidism which sets in CKD patients[16] and is more prevalent than general population because of rapid periodontal tissue destruction because of the above mentioned condition. Dentists should be well aware of this condition and should provide necessary treatment to manage this condition.

CONCLUSION:

Following conclusions were drawn from our study:

1. Most common subjective signs which were reported by these patients were the complaint of xerostomia which showed a statistically significant value. The other subjective symptoms which followed were bad breath and bleeding gums.
2. CPITN index showed Score of 3 in maximum of patients which tells us pocket depth of 4-5mm indicating increased prevalence of periodontal breakdown in these patients
3. Loss of attachment index showed Score 0 followed by Score 1 again establishing the fact that destruction of periodontal tissues was observed more in dialysis patients.
4. Non-carious loss of teeth which was seen in Score 5 of dentition status was observed in these patients reiterating the point that underlying secondary hyperparathyroidism, Diabetes mellitus have aggravated the destruction of the periodontium.
5. The following oral health care protocol can be drawn from our study:

- Recording the patient's medical history and medication list on the dental chart and reviewing these documents at each visit.
- The dialysis unit should notify the dentist once dialysis has been initiated.
- Performing dental treatment of haemodialysis patients on non dialysis days to ensure absence of circulating heparin.
- Use local anesthetics with reduced epinephrine in all dialysis patients, as most are hypertensive.
- Seeing the patient for dental check-ups as regularly as would be the case if they were not undergoing dialysis.
- Using antibiotic prophylaxis, if recommended by the patient's nephrologist, before extractions, periodontal procedures, placement of dental implants, reimplantation of avulsed teeth, endodontic instrumentation or surgery(beyond the apex only), subgingival placement of antibiotic fibres or strips, initial placement of orthodontic bands and intraligamentary injections of local anesthetic. Advising the patient about the need for the antibiotic, such that it can be prescribed and taken just before the dental visit.
- Recommending that alcohol-free mouthwashes be used to reduce oral dryness. Alternatively, recommending a saliva substitute.

Awareness must be raised among dialysis patients, their nephrologists about the need for primary dental prevention as oral cavity may be the give the first indications for underlying systemic condition in dialysis patients and Oral physicians, are well aware of diagnosing these conditions. As we, dentists, will probably see more dialysis patients in the future, all parties must be knowledgeable about the treatment priorities, operative concerns and precautions to be taken in this special population.

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