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Assessment of Oral and Periodontal Parameters in Patients with End-Stage Chronic Kidney Disease*

SUMMARY

***Aim**: The purpose of the study was to assess the oral cavity status in patients with terminal chronic kidney disease (CKD) undergoing haemodialysis. **Materials and Methods**: The study comprised 69 patients with end-stage CKD undergoing haemodialysis regime. The data regarding the age, gender, environment, associated diseases were obtained from the clinical medical histories. The patients were submitted to clinical examination, which also included the periodontal probing and the gingival bleeding assessment. The type of edentulous ridge was recorded. Each patient filled a questionnaire offering data regarding the oral hygiene habits, diet, bad habits and the presence/absence of xerostomia. **Results and Discussion**: The main cause for end-stage CKD was renal, followed by diabetes mellitus and arterial hypertension. The main associated diseases to CKD were clearly secondary arterial hypertension and secondary anaemia; other associated diseases were represented by cardiac diseases, hepatitis, gastro-intestinal diseases, secondary hyperparathyroidism, cirrhosis, hypersplenism, epilepsy and neoplastic diseases. 62.31% of the patients accused frequent xerostomia. When recording the edentulous type, we observed a high percentage of complete tooth loss. **Conclusions**: There is a close link between the systemic changes in the CKD patient and the oral manifestations. Even 2 of the main causes of CKD (hypertension and diabetes mellitus) exert important changes on the tissues in the oral cavity, leading to significant tooth loss and masticatory impairment, thus, to a poor quality of life.*

Keywords: End-Stage Chronic Kidney Disease, Haemodialysis, Periodontal Status

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Introduction

Despite the succinct definition of chronic kidney disease (CKD) - clinically-relevant structural kidney changes or urinary abnormalities, with or without reduced estimated glomerular filtration rate (below 60 ml/min per 1.73 m^2) and the implementation of strategies to control this disease, its prevalence has rapidly increased[1].

Approximately 10-15% of the global adult population is affected by CKD[2,3]. In addition to an increasing prevalence, CKD is associated with markedly impaired quality of life, unemployment, depression and premature mortality[4]. This phenomenon is attributable to the multifactorial and interactive nature of the CKD aetiology. Consequently, efforts to identify potentially modifiable factors associated with CKD are required to reduce the large burden of this disease. Previously, several factors have been identified as associated with CKD[5]; among them, hypertension and diabetes mellitus are the leading causes[6].

Cardiovascular disease (CVD), which is often due to or combined with atherosclerosis and infectious complications, is the main cause of death in patients with CKD. A number of traditional, novel, and uraemia-

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specific risk factors coexist in CKD and contribute to the increased cardiovascular risk in CKD population[7].

Poor oral health, which is related to advanced age and diabetes mellitus, may constitute an under-recognized novel risk factor, because recent studies have shown how periodontitis associates with coronary heart disease and cerebrovascular disease in the general population[8], as well as in haemodialysis (HD) patients[9]. As a consequence of a number of uraemic metabolic, hormonal and immunological imbalances, CKD patients suffer from numerous systemic complications that may contribute to poor oral health[10].

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[11]. Indeed, CKD has been reported to affect the teeth, oral mucosa, bone, periodontium, salivary glands, tongue and temporomandibular joint. Several studies have demonstrated higher rates of oral pathology in dialysis patients[12,13], with 1 or more oral symptoms, such as xerostomia, taste disturbances, uraemic odor, mucosal inflammation, mucosal petechiae/ecchymosis, oral ulcerations or enamel hypoplasia. Dryness, pain, or a bad taste in the mouth may lead to anorexia and nutrient deficiencies[14].

Studies in general population suggest that edentulous subjects are prone to have an inappropriate dietary intake (such as ingesting too little protein and too much calorie-rich, high-fat food) as compared with dentate persons.

The CKD patients are in a state of uraemia, which is accompanied by altered immune system because of impaired function of T- and B-lymphocytes as well as monocytes and macrophages[15], resulting in a decreased host response to the subgingival Gram-negative microbial aggression; uraemia might also be accounted for association of increased prevalence and severity of gingival inflammation and periodontitis with increased dialysis vintage[16]. Other studies suggested that CKD patients are less prone to use oral hygiene procedures and to address oral healthcare resources[17] due to intense psychological burden and time-consuming treatment sessions in dialysis patients.

Besides uraemia, other contributory factors are the presence of confounding diseases like diabetes mellitus, especially if the high incidence of diabetes in dialysis population and the strong relationship between diabetes mellitus and periodontal disease in general population as reported by Grossi et al[18] has been taken into consideration; also, secondary hyperparathyroidism is accounted for alveolar bone loss in renal haemodialysis population.

The **aim** of this study was to assess the oral cavity status in patients with terminal CKD undergoing haemodialysis, in correlation to the history of renal impairment and C-reactive protein levels.

Material and Methods

The present study comprised 69 patients with terminal CKD undergoing haemodialysis regime in the Fresenius Hemodialysis Center of "Doctor C.I. Parhon" Clinical Hospital, Iasi.

The methodology of the present study followed the international standard and the principles of the Helsinki Declaration. Every patient was informed regarding the nature of the study, and signed an informed consent. The data regarding the age, gender, environment and associated diseases were obtained from the clinical medical histories.

The patients were submitted to clinical examination, which also included periodontal probing and gingival bleeding assessment. The type of edentulous ridge was recorded (we included 138 maxillae and mandibles); for the determination of the edentulous type we used the Kennedy classification system.

Each patient filled a questionnaire which offered data regarding oral hygiene habits, diet, bad habits and the presence/absence of xerostomia.

The data were recorded in individual observation charts and statistically analyzed. For the statistical analysis, we used the Microsoft Excel and PASW 18 Statistics software.

Results

We examined 69 patients with CKD. The gender distribution inside the study group revealed a higher percentage of male subjects (40 males - 57.97% and 29 females - 42.03%), which is presented in figure 1. The environment analysis revealed a significantly higher number of rural persons than urban (43 patients - 62.31% *versus* 26 patients - 37.69%, respectively).

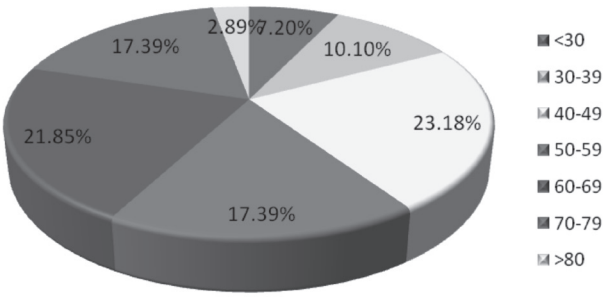

Figure 1. The age group distribution

We observed that the main cause for terminal CKD was renal (19 cases, from which 7 cases were of polycystic kidneys), followed by diabetes mellitus and arterial hypertension (Fig. 2).

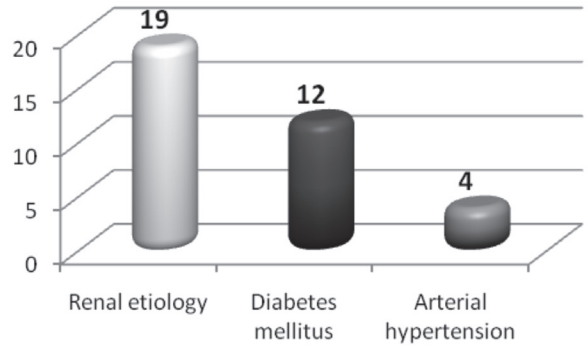

Figure 2. Distribution of main causes of the CKD

The main associated diseases to CKD were clearly secondary arterial hypertension and secondary anaemia; other associated diseases were represented by cardiac diseases, hepatitis, gastro-intestinal diseases, secondary hyperparathyroidism, cirrhosis, hypersplenism, epilepsy and neoplastic diseases (Fig. 3).

When asked about the sensation of dry mouth, 43 patients (62.31%) accused frequent xerostomia. When recording the edentulous type, we observed a high percentage of terminal tooth loss (Kennedy Class I and II covered a high value of 49.27% of the cases) - figure 4.

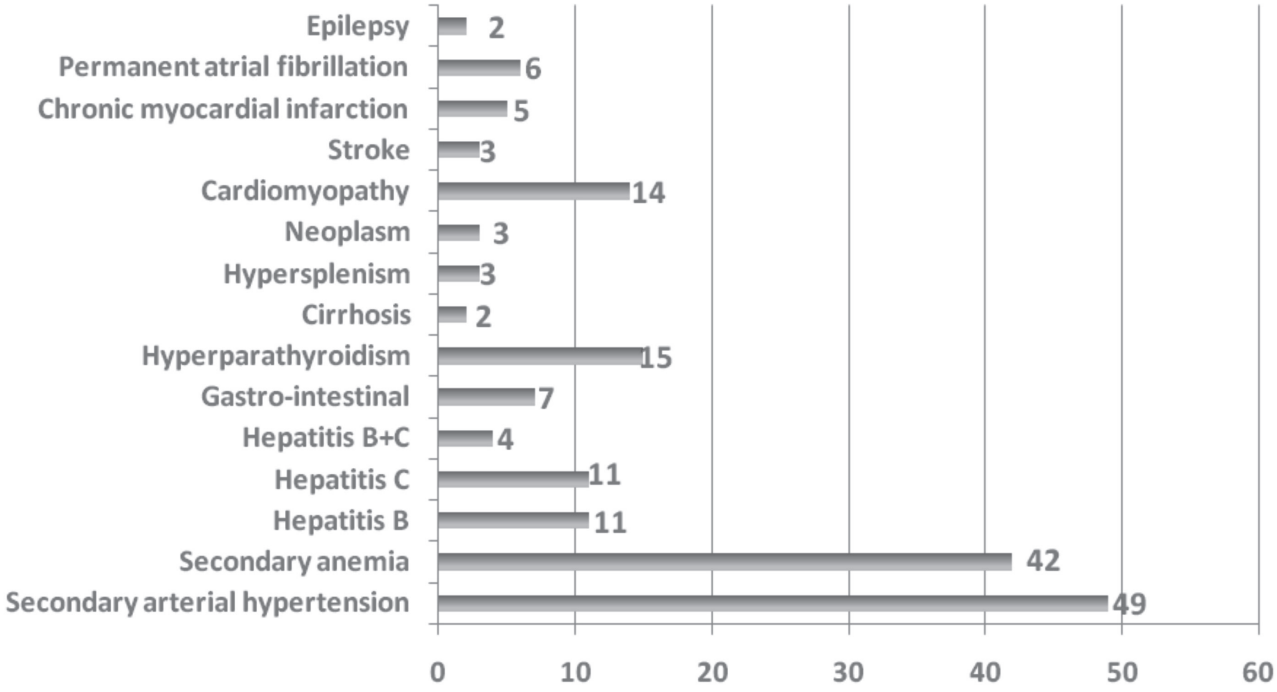

Figure 3. Distribution of associated diseases

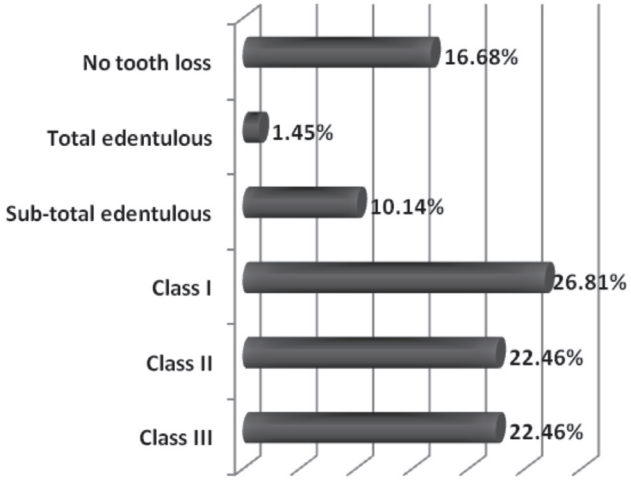

Figure 4. Distribution of edentulism types

Discussion

The present study comprised 69 patients with terminal CKD undergoing haemodialysis. The haemodialysis regime followed 2 or 3 sessions per week. In our study we observed that the main cause of the CKD was a renal one, followed by hypertension and diabetes mellitus. Our data are conclusive with the literature data; furthermore, the increased number of obesity and diabetes cases led to an increased number of CKD patients.

2 of the main complications of CKD are secondary arterial hypertension and anaemia; this fact was also supported by our results (71.01% of the study group presented high blood pressure and 60.86% secondary anaemia). These 2 complications have an important effect

on the tissues in the oral cavity, with poor irrigation and with a high risk of necrosis.

The literature data sustain that the patients undergoing haemodialysis are prone to bacterial and viral infection. In our study we encountered 11 cases of patients with Hepatitis B, 11 cases of patients with Hepatitis C and 4 cases of patients with mixed infection (hepatitis B and hepatitis C). The associated infections represent a supplementary aggression on the CKD organism, leading to a poor quality of life.

Another complication of the CKD consists in cardiac diseases; a relatively high percentage (20.28%) of the study population presented different forms of cardiomyopathy, even with ischemic events (3 cases of stroke and 5 cases of chronic myocardial infarction); moreover, 6 patients presented permanent atrial fibrillation.

Xerostomia may predispose to caries and gingival inflammation as well as contribute to speech difficulties, denture retention, mastication, dysphagia, sore mouth, loss of taste, and infections[19]. In our study, we observed a high percentage of patients who frequently presented such symptoms of dry mouth (62.31%).

Although the number of teeth is of importance for masticatory function, for nutritional status it is especially important to have premolars and molars. The increased periodontitis and dental caries rates of CKD patients lead to tooth loss, which may result in chewing difficulties due to inadequate occlusive surfaces or the limitations of prostheses[20]. The results of our study revealed also a high percentage of Class I and II of edentulous ridges (terminal edentulism).

Conclusions

Chronic kidney disease is a part of maladies with high prevalence, high morbidity and mortality. Furthermore, there is a close link between the systemic changes in the CKD patient and the oral manifestations. Even 2 of the main causes of CKD (hypertension and diabetes mellitus) exert important changes on the tissues in the oral cavity, leading to significant tooth loss and masticatory impairment, thus, to a poor quality of life.

References

1. *Coresh J, Selvin E, Stevens LA, Manzi J, Kusek JW, Eggers P, Van Lente F, Levey AS*. Prevalence of chronic kidney disease in the United States. *JAMA*, 2007; 298:2038-2047.
2. *Chen J, Wildman RP, Gu D, Kusek JW, Spruill M, Reynolds K, Liu D, Hamm LL, Whelton PK, He J*. Prevalence of decreased kidney function in Chinese adults aged 35 to 74 years. *Kidney Int*, 2005; 68(6):2837-2845.
3. *Singh NP, Ingle GK, Saini VK, Jami A, Beniwal P, Lal M, Meena GS*. Prevalence of low glomerular filtration rate, proteinuria and associated risk factors in North India using Cockcroft-Gault and Modification of Diet in Renal Disease equation: an observational, cross-sectional study. *BMC Nephrol*, 2009; 17:10-14.
4. *Murtagh F, Eddington-Hall J, Higginson IJ*. The prevalence of symptoms in end-stage renal disease: a systematic review. *Adv Chronic Kidney Dis*, 2007; 14(1):82-99.
5. *Tangri N, Stevens LA, Griffith J, Tighiouart H, Djurdjev O, Naimark D, Levin A, Levey AS*. A predictive model for progression of chronic kidney disease to kidney failure. *JAMA*, 2011; 305:1553-1559.
6. *Levey AS, Astor BC, Stevens LA, Coresh J*. Chronic kidney disease, diabetes, and hypertension: what's in a name? *Kidney Int*, 2010; 78:19-22.
7. *Stenvinkel P, Carrero JJ, Axelsson J, Lindholm B, Heimburger O, Massy Z*. Emerging biomarkers for evaluating cardiovascular risk in the chronic kidney disease patient: How do new pieces fit into the uremic puzzle? *Clin J Am Soc Nephrol*, 2008, 3:505-521.
8. *Grau AJ, Buggle F, Ziegler C, Schwarz W, Meuser J, Tasman AJ, Buhler A, Benesch C, Becher H, Hacke W*. Association between acute cerebrovascular ischemia and chronic and recurrent infection. *Stroke*, 1997; 28:1724-1729.
9. *Kshirsagar AV, Craig RG, Moss KL, Beck JD, Offenbacher S, Kotanko P, Klemmer PJ, Yoshino M, Levin NW, Yip JK, Almas K, Lupovici EM, Usvyat LA, Falk RJ*. Periodontal disease adversely affects the survival of patients with end-stage renal disease. *Kidney Int*, 2009; 75:746-751.
10. *Souza CM, Braosi AP, Luczyszyn SM, Casagrande RW, Pecoits-Filho R, Riella MC, Ignacio SA, Trevilatto PC*. Oral health in Brazilian patients with chronic renal disease. *Rev Med Chil*, 2008; 136:741-746.
11. *Summers SA, Tilakaratne WM, Fortune F, Ashman N*. Renal disease and the mouth. *Am J Med*, 2007; 120:568-573.
12. *Naugle K, Darby ML, Bauman DB, Lineberger LT, Powers R*. The oral health status of individuals on renal dialysis. *Ann Periodontol*, 1998; 3:197-205.
13. *Proctor R, Kumar N, Stein A, Moles D, Porter S*. Oral and dental aspects of chronic renal failure. *J Dent Res*, 2005; 84:199-208.
14. *Carrero JJ*. Identification of patients with eating disorders: Clinical and biochemical signs of appetite loss in dialysis patients. *J Ren Nutr*, 2009; 19:10-15.
15. *Girndt M, Sester M, Sester U, Kaul H, Kohler H*. Molecular aspects of T- and B-cell function in uremia. *Kidney International*, 2001; 59(Supplement):78:S206-S211.
16. *Castillo A, Mesa F, Liebana J, et al*. Periodontal and oral microbiological status of an adult population undergoing haemodialysis: a cross-sectional study. *Oral Diseases*, 2007; 13(2):198-205.

17. *Borawski J, Wilczynska-Borawska M, Stokowska W, Mysliwiec M*. The periodontal status of pre-dialysis chronic kidney disease and maintenance dialysis patients. *Nephrology Dialysis Transplantation*, 2007; 22(2):457-464.
18. *Grossi SG, Zambon JJ, Ho AW, et al*. Assessment of risk for periodontal disease. I. Risk indicators for attachment loss. *Journal of Periodontology*, 1994; 65(3):260-267.
19. *Porter SR, Scully C, Hegarty AM*. An update of the etiology and management of xerostomia. *Oral Surg Oral Med Oral Pathol Oral Radiol* Endod, 2004; 97:28-46.
20. *Sheiham A, Steele JG, Marcenes W, Finch S, Walls AW*. The relationship between oral health status and Body Mass Index among older people: A national survey of older people in Great Britain. *Br Dent J*, 2002; 192:703-706.

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