

## THE ORAL CAVITY STATUS IN PATIENTS WITH END STAGE KIDNEY DISEASE AND HEMODIALYSIS, IN CORRELATION TO THE HISTORY OF RENAL IMPAIRMENT AND C-REACTIVE PROTEIN LEVELS (Pilot study)

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### ABSTRACT

**Aim of the study** The purpose of the study was to assess the oral cavity status in patients with terminal chronic kidney disease and hemodialysis, in correlation to the history of renal impairment and C-reactive protein levels.

### INTRODUCTION

Despite the succinct definition of chronic kidney disease - clinically-relevant structural kidney changes or urinary abnormalities, with or without reduced estimated glomerular filtration rate (below 60 ml/min per 1.73 m<sup>2</sup>) and the implementation of strategies to control this disease, its prevalence has rapidly increased [1]. Approximately 10% to 15% of the global adult population is affected by chronic kidney disease [2, 3]. In addition to an increasing prevalence, chronic kidney disease (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 etiologies of CKD. 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 chronic kidney disease. A number of traditional, novel, and uremia-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 hemodialysis (HD) patients [9]. As a consequence of a number of uremic 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 temporo-mandibular joint.

Several studies have demonstrated higher rates of oral pathology in dialysis patients [12, 13], with one or more oral symptoms such as xerostomia, taste disturbances, uremic odor, mucosal inflammation, mucosal petechia / 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 the 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 dentated persons.

The CKD patients are in a state of uremia 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; uremia 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 the intense psychological burden and time-consuming treatment sessions in dialysis patients.

Besides uremia, other contributory factors are the presence of confounding diseases like diabetes mellitus, especially when we take into consideration 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. in 1994 [18]; also, secondary hyperparathyroidism accounted for alveolar bone loss in renal hemodialysis population.

Regarding the serum markers of inflammation in hemodialysis patients, serum markers related to periodontitis that have been studied include albumin and CRP [19]. Researchers have reported that hemodialysis (HD) patients have elevated levels of C-reactive protein (CRP) as compared to normal conditions and periodontal disease is associated with an elevation of serum levels of CRP [20].

## MATERIALS AND METHODS

The present study was conducted on a number of 69 patients with terminal CKD, who were following hemodialysis 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, a signed informed consent being obtained from every subject.

The data regarding the age, gender, environment, associated diseases and C-reactive protein levels were obtained from the clinical charts.

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

Each patient filled a questionnaire which offered data regarding the oral hygiene habits, diet, vicious 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

**RESULTS AND DISCUSSIONS**

We examined a number of 69 patients with chronic kidney disease. The gender distribution inside the study group revealed a higher percentage of male subjects (40 males – 57.97% and 29 females – 42.03%). The age groups distribution is presented in the Figure 1. The environment analysis revealed a significantly higher number of rural subjects than urban subjects (43 patients – 62.31% versus 26 patients – 37.69%, respectively).

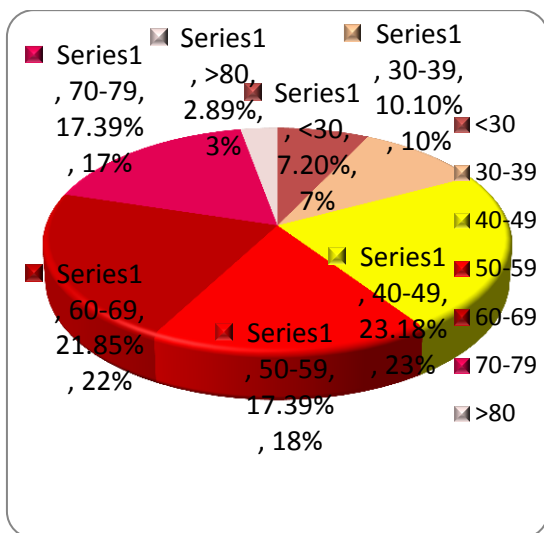


Figure 1. The age groups distribution

We observed that the main cause for terminal chronic kidney disease was also a renal one (19 cases, from which 7 cases were of polycystic kidneys), followed by diabetes mellitus and arterial hypertension (Figure 2).

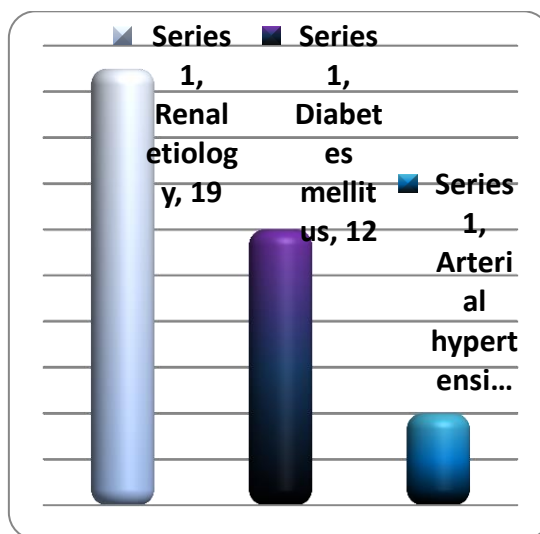


Figure 2. Distribution of CKD main causes

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

When asked about the sensation of dry mouth, forty-three patients (62.31%) accused frequent xerostomia.

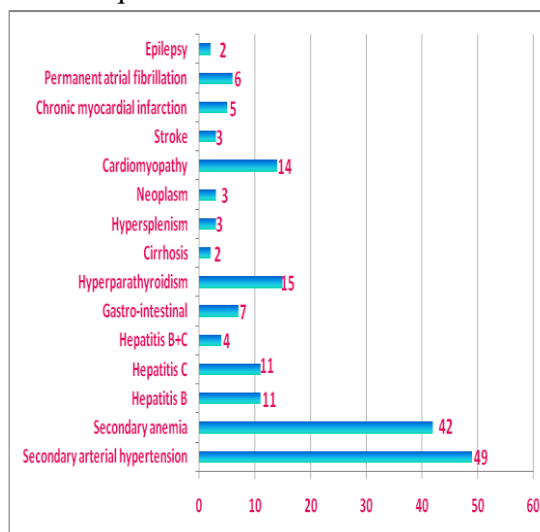


Figure 3. Distribution of associated diseases

The mean value of the CRP levels was of 0.608mg/dl. The measured values revealed relatively normal intervals (85.7% presented values under 1.00 mg/dl) (Figure 4).

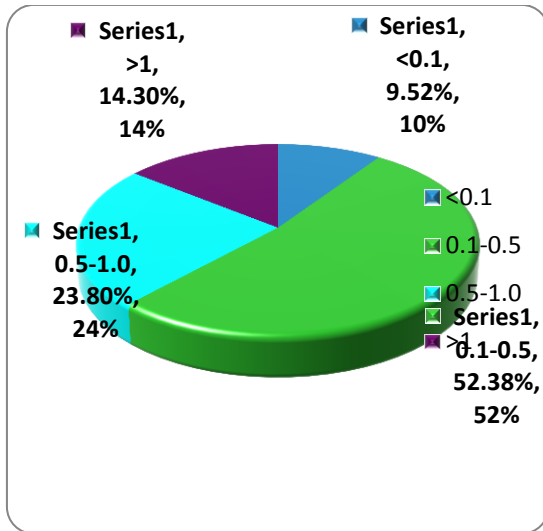


Figure 4. The CRP levels interval distribution

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 5).

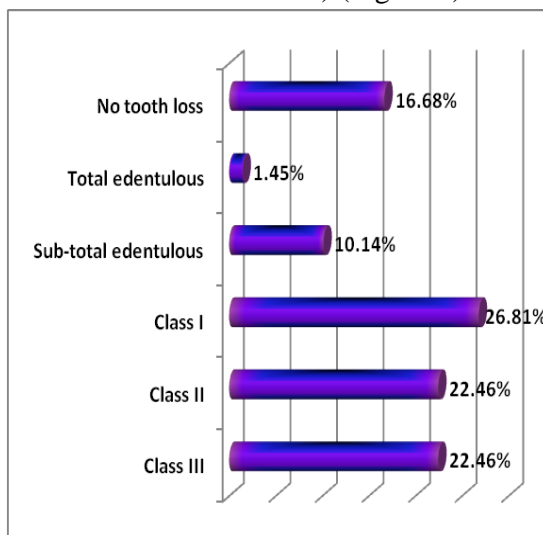


Figure 5. The edentulous types distribution

The present study was conducted on a number of 69 patients with terminal chronic kidney disease, under hemodialysis. The

hemodialysis regime follows two or three sessions per week.

In our study we observed that the main cause of CKD is 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 lead to an increased number of CKD patients.

Two of the main complications of CKD are secondary arterial hypertension and anemia; this fact is also supported by our results (71.01% of the study group presented high blood pressure and 60.86% - secondary anemia). These two 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 under hemodialysis are prone to bacterial and viral infection. In our study we encounter 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 [21]. In our study we observed a high percentage of patients who frequently presented such symptoms of dry mouth (62.31%).

Whereas the number of teeth is of importance for masticatory function, having premolar and molar teeth is especially important for nutritional status. The increased periodontitis and dental caries rates of CKD patients lead to tooth loss, which may result in chewing difficulties because of inadequate occlusive surfaces or the limitations of prostheses [22]. The results of our study revealed also a high percentage of Class I and II of edentulous ridges (terminal edentations).

The literature offers numerous data regarding the inflammatory nature of periodontal and endodontic lesions, which

are the main causes of tooth loss. Thus, the assessment of the inflammatory markers becomes of critical importance. Literature supports a bidirectional relation between CKD and periodontal disease. Patients with CKD have higher prevalence of periodontal disease while non-surgical periodontal therapy has been indicated to decrease the systemic inflammatory burden in patients with CKD, especially those undergoing HD therapy. The mean level of CRP in our study group presented itself in normal ranges but further studies regarding the levels of inflammatory cytokines are needed, with the purpose of establishing a clear connection.

## CONCLUSIONS

Chronic kidney disease is part of the 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 two 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.

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