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The Evaluation of Oral Health in Patients with Chronic Kidney Disease – A Longitudinal Study

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Abstract: *Background:* Chronic kidney disease affects more than 10% of people globally. The aim of the study was to assess oral health in patients with chronic kidney disease. The sample was composed of 233 patients, of which 147 (63%) were males and 86 (37%) were females. Participants' age varied from 31 to 70 years old. We divided the participants into four age groups: 31-40, 41-50, 51-60, and 61-70 years old. Data were analyzed by using (IBM, New York, USA, SPSS Statistics for Windows), Version 23.0. The significance level (α) was set at 0.05, with a confidence interval (CI) of 95%. The prevailing age range was from 51 to 60 years old, with 31.8% of the participants. A considerable number of patients with chronic kidney disease had low incomes, respectively 42.4% of them. 80.7% of the patients were current smokers and 73.4% of them consumed alcohol. A large proportion of respondents 83.7% of them were diabetic patients. 63.1% of the participants reported that they had hypertension. According to our findings, 55.8% of the participants brush their teeth only once a day. The study found a strong correlation between chronic kidney disease and diabetes mellitus (CI 95; 1.17-1.33, P-value <.0001), hypertension (P <.0001), alcohol consumption (P=.001), and smoking (P =.000). Gingivitis was the most common oral disease which affected 73.4% of the participants, followed by 56.7% of them who had dental caries.

Keywords: Alcohol Consumption, Chronic Kidney Disease, Dental Caries, Diabetes Mellitus, Gingivitis, Hypertension

1. Introduction

Chronic kidney disease is one of the most prominent worldwide public health problems [1]. A recent study showed that the prevalence of CKD was 13.4% [2].

According to health experts, there are many factors that contribute to an increased risk of developing kidney disease. Pecoits-Filho R et al. reported that a risk factor that is associated with CDK is diabetes mellitus [3]. The relationship between chronic kidney disease and diabetes mellitus is well demonstrated [4].

It is reported that the disease appears more with increasing age, but all age groups are at risk of being affected by kidney diseases, and most of these patients have hypertension which can damage blood vessels and the kidney's filtering apparatus [5- 8].

Studies have shown that obesity is considered as well real pathology that is associated with chronic kidney disease [9, 10]. Important scientific resources confirm the relationship between chronic kidney disease, smoking, and alcohol consumption [11, 12].

Menezes CR et al. demonstrated that patients with CKD are susceptible to dental caries [13]. Likewise, in accordance with Liu et al. periodontitis has a high incidence in patients with chronic kidney disease [14].

Gupta et al. in their study reported that the symptoms of

kidney infections can be evaluated by observing the oral cavity and the dentist may play an important role in the diagnosis of the patients [15].

A study showed that participants with improved oral hygiene (≥3 times a day) have shown less risk of CKD [16]. An important previous study has reported that patients with chronic kidney disease had low-income status and primary education [17].

The present study sets out to evaluate oral health in patients with chronic kidney disease.

2. Materials and Methods

This is an observational study. The sample was composed of 233 patients, of which 147 (63%) were males and 86 (37%) were females. The participants' age range varied from 31 to 70 years old. The current research was conducted in the period from February 2019 to November 2021 in Albania. We divided the participants into four age groups: 31-40, 41-50, 51-60, and 61-70 years old. An inclusion criterion of the sample in the present survey was considered the age from 31 to 70 years old.

Data collection was done using clinical documentation as well as questionnaires which were completed by the hospital nurses. The questionnaire includes demographic data such as gender, age- range, education level, income status, smoking, alcohol consumption, and obesity.

The questionnaire also includes the characteristics of the sample such as tooth brushing, gingivitis, and dental caries. Completion of the questionnaire took almost twenty minutes. All the participants agreed to provide their informed consent. The participants had the right to withdraw at any time. The study had no dropouts. The exclusion criteria were pregnant women. Also, the patients who were critically ill and patients undergoing renal dialysis were excluded from the study. Most of the patients in this study were tobacco users and alcohol consumption.

Overall, the low socioeconomic status of the patients went parallel to poor oral hygiene, gingivitis, and dental caries.

The patients admitted that even though they had chronic kidney disease, the quality of the food and water they used was not good, and stated that the low economic income was a source of limitation of many food products. The questionnaire was designed based on the resolution of the Albanian National Committee no. 9, date 11.11.2011. This original research was conducted according to the guidelines of the Helsinki statement [18].

Based on the Helsinki Declaration and approved by the World Medical Association in the current study the participants were patients with chronic kidney diseases. The anonymity of the participants was preserved. Descriptive analysis was performed using percentages for qualitative variables such as gender, age- range, education level, income status, smoking, alcohol, consumption, obesity, diabetes mellitus, hypertension, GFR, tooth brushing, gingivitis, and dental caries.

Statistical Analysis

The data were entered and subsequently analyzed using (IBM, New York, USA), SPSS Statistics 23.0. The significance level (α) was set at 0.05, with a confidence interval (CI) of 95%.

3. Results

The prevailing age range in the sample was from 51 to 60 years old, with 31.8% of the participants. A greater number of patients claimed that they had primary education 46.1% of them, and nearly 42.4% of the patients had low-income status. The frequency of the patients who were obese was high, respectively 69.1% of them, compared with those who were not obese 30.9% of the patients.

Smoking was the dominant characteristic among participants. 80.7% of the patients were current smokers and 73.4% of them consumed alcohol, as shown in Table 1.

Table 1. *Socio-demographic characteristics of the sample.*

	Number	Percentage
Gender		
Male	147	63
Female	86	37
Age group		
31-40 years old	25	10.7
41-50 years old	48	20.5
51-60 years old	74	31.8
61-70 years old	86	37
Education Level		
Primary education	107	46.1
Secondary education	78	33.4
Higher education	48	20.5
Income Status		
Low	99	42.4
Moderate	85	36.3
High	49	21.3
Smoking status		
Never- smokers	45	19.3
Current smokers	188	80.7
Alcohol consumption		
No	62	26.6
Yes	171	73.4
Obesity		
No	72	30.9
Yes	161	69.1

The data collected indicated that a large proportion of respondents 83.7% of them were diabetic patients. In all, 63.1% of the participants reported that they had hypertension. Approximately 57.6% of the participants had GFR (30-59), and fewer participants, 42.4% of them reported that they had GFR (60-89) as demonstrated in Table 2.

Table 2. *Patients with chronic kidney disease and concomitants illness.*

	Number	Percentage
Diabetic Patients		
No	38	16.3
Yes	195	83.7
Hypertension		
No	86	36.9
Yes	147	63.1
GFR ml/min/1.73 m^2		
60-89	99	42.4
30-59	134	57.6

According to our findings, we can state that 55.8% of the participants brush their teeth only once a day. 73.4% of them are affected with gingivitis, while 56.7% of the patients are affected by dental caries, as presented in Table 3.

Table 3. Shows dental care and oral diseases in patients with chronic kidney disease.

	Number	Percentage
Tooth brushing		
1 time a day	130	55.8
2 times a day	65	27.9
3 times a day	38	16.3
Gingivitis		26.6
No	62	
Yes Dental caries	171	73.4
No	101	43.3
Yes	132	56.7

This study proved that diabetes has a direct impact on the manifestation of the GFR and the correlation between them is strongly significant (CI 95; 1.17-1.33, P-value <.0001). Obesity influenced GFR manifestation (P-value=.001). According to the ANOVA test, there was a strong correlation between alcohol consumption, smoking, and GFR (P=.001 and P =.000, respectively). There was found a positive relationship between hypertension and GFR (P <.0001), as demonstrated in Table 4.

Table 4. Associations of the risk factors with GFR.

	Risk factors	P	CI 95%
GFR	Diabetes	<.0001	1.17-1.33
	Hypertension	<.0001	1.04-1.31
	Obesity	.001	1.05-1.34
	Smoking	.000	76-1.17
	Alcohol consumption	.001	.88-1.22

Tooth brushing has a direct impact on the manifestation of gingivitis (CI 95; 66-1.14, P=.001). The relation between tooth brushing and dental caries is highly significant (P -value =.004), as shown in Table 5.

Table 5. Associations of tooth brushing with gingivitis and dental caries.

	Oral diseases	P	CI 95%
Tooth brushing	Gingivitis	.001	.66-1.14
	Dental caries	.004	.82-1.03

4. Discussion

In the current study, we have reported different risk factors that are correlated with chronic kidney disease in a group of Albanian patients. Our results revealed that a large part of the patients had diabetes mellitus, 83.7% of them. These findings were similar to the previous studies which confirmed that the associations between diabetes mellitus and chronic kidney disease are incontestable [19, 20].

Lakkis JI et al, and Chagnac A et al, observed patients with a high BMI (30-35) and found positive associations between chronic kidney disease and obesity [21, 22]. This agrees with the present study.

Similar to the findings from Chen TK et al, and Grams ME et

al, our observed association between hypertension and chronic kidney disease was noteworthy [23, 24]. The patients in the study had poor filtration, respectively 42.4% of them had GFR (60-89), and 57.6% of the patients had GFR (30-59). Similar results were reported in the study published by Coresh J et al. [25].

80.7% of the patients stated that they were smokers. Analogously, Leonberg-Yoo AK et al, analyzed and found that chronic kidney disease is related to tobacco use [26]. The current study revealed that 73.4 % of patients had a habit of alcohol consumption, and there was a strong association between chronic kidney disease and alcohol consumption (P-value =. 001, CI 95; 0.88-1.22). Equivalent to the present study, some studies showed that alcohol consumption was correlated with CKD, in contrast with other studies [27-30].

In our study a considerable number of patients with chronic kidney disease had low incomes, respectively 42.4% of them, and 36.3% of CKD patients stated that they had moderate incomes. The results of our research are analogous to the review survey conducted by Gutierrez OM [17].

In the present study, it was noticed that 55.8% of them used to brush their teeth only once daily, and a significant study demonstrated strong associations between tooth brushing and chronic renal failure [16].

We note that the prevalence of dental caries was present in 56.7% of the patients, and this finding is consistent with previous studies done by Menezes CR et al, and Andaloro C et al. [13, 31]. Our results revealed that 73.4% of CKD patients had gingivitis. On the other hand, the previous study conducted by Kesmez Ö et al, has shown that 79% of Danish patients with CKD had gingival inflammatory diseases [32].

Based on data collected by the Institute of Public Health, the experts claim that in 2020 in Albania, 14% of the population is affected by chronic kidney diseases. This study indicates that patients with low socioeconomic, educational levels and accompanying diseases are a target group for chronic renal diseases and should be the focus of preventive education. Based on the results, we suggest that educating patients about the importance of blood pressure control, glycemic control, and counseling for healthy nutrition are key factors in preventing the progression of CKD. Moreover, the patients claimed that accompanying diseases such as diabetes mellitus and hypertension had a negative effect on their quality of life.

Our study shows that chronic kidney diseases have a direct impact on poor oral health and collaboration between nephrologists and dentists should be a public health priority.

There are some limitations that should be declared in this study, first was the small sample size that was taken under consideration. Also, the age range can be seen as a limitation because patients younger than 31 years and older than 70 years were excluded from the study.

5. Conclusion

Chronic kidney diseases cause poor oral health. The present study found a strong correlation between chronic kidney diseases and oral diseases. Gingivitis was the most common

oral disease which affected 73.4% of the participants, followed by 56.7% of the patients who had dental caries. This study recommends that dentists should motivate the patients to quit smoking, make them aware of good oral hygiene daily and regular dental check-ups.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Acknowledgements

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