Revista da Faculdade de Odontologia de Porto Alegre
V. 62, n. 1 (2021) - Artigos Originais
DOI: 10.22456/2177-0018.107322

Factors associated with edentulism in individuals with chronic kidney disease undergoing hemodialysis: a cross-sectional study

Fatores associados ao edentulismo em indivíduos com doença renal crônica em hemodiálise: um estudo transversal

Natalia Mendes de Matos Cardoso[a], Natália Cristina Ruy Carneiro[b], Lia Silva de Castilho[c], Maria Elisa Souza e Silva[c], Ana Cristina Borges-Oliveira[a]

ABSTRACT

Introduction: Chronic kidney disease (CKD) is a progressive condition characterized by structural or functional abnormalities of the kidney. CKD may be associated with several oral alterations, such as higher prevalence rate of dental caries, periodontal disease, xerostomia, candidiasis and burning mouth. The aim of the study was to identify risk factors associated with edentulism in adults with CKD undergoing hemodialysis. **Methods:** A cross-sectional study was conducted with 650 individuals aged 18 to 90 years undergoing hemodialysis in southeastern Brazil. Oral clinical examination and administration of a questionnaire addressing demographic characteristics and dental history were performed. The study received approval from the Human Research Ethics Committee of *UFMG*. **Findings:** A total of 183 participants were edentulous (28.2%). Individuals with less schooling (OR = 3.99; 95% CI: 2.34-6.79), those who had not been to a dentist in the previous six months (OR = 2.49; 95% CI: 1.52-4.08), those who rated their own smile as excellent or good (OR = 2.00; 95% CI: 1.35-2.97) and those with some mucosal alteration (OR = 4.17; 95% CI: 2.83-6.13) had a greater chance of belonging to the edentulous group. **Discussion:** The present findings can contribute to the establishment of public health policies aimed at guiding dental care programs for individuals with chronic kidney disease that take into account the specific needs of this population. **Conclusion:** Edentulism was associated with low schooling, a lack of dental care in the previous six months, a positive self-perception of one's smile and alterations in the oral mucosa.

Keywords: Renal insufficiency, chronic. Jaw, edentulous. Renal dialysis.

RESUMO

Introdução: A doença renal crônica (DRC) é uma condição caracterizada por anormalidades estruturais ou funcionais do rim. A DRC pode estar associada a diversas alterações bucais, como maior prevalência de cárie dentária, doença periodontal, xerostomia, candidíase e queimação bucal. O objetivo deste estudo foi identificar os fatores de risco associados ao edentulismo em indivíduos com DRC em tratamento com hemodiálise. **Materiais e Métodos:** Foi realizado um estudo transversal com 650 indivíduos de 18 a 90 anos em hemodiálise no sudeste do Brasil. Foi realizado exame clínico oral e aplicação de questionário abordando características demográficas e histórico odontológico. O estudo foi aprovado pelo Comitê de Ética em Pesquisa em Seres Humanos da UFMG. **Resultados:** Um total de 183 participantes eram edêntulos (28,2%). Indivíduos com menor escolaridade (OR = 3,99; IC 95%: 2,34-6,79), aqueles que não foram ao dentista nos últimos seis meses (OR = 2,49; IC 95%: 1,52-4,08), aqueles que avaliaram o seu próprio sorriso como excelente ou bom (OR = 2,00; IC 95%: 1,35-2,97) e aqueles com alguma alteração de mucosa (OR = 4,17; IC 95%: 2,83-6,13) tiveram maior chance de pertencer ao grupo de edêntulos. **Discussão:** Os presentes achados podem contribuir para o estabelecimento de políticas públicas de saúde voltadas a nortear programas de atenção odontológica à pessoa com doença renal crônica que atendam às necessidades

[a]Department of Dental Public Health, Faculty of Dentistry, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil.
[b]Department of Pediatric Dentistry, Faculty of Dentistry, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil.
[c]Department of Restorative Dentistry, Faculty of Dentistry, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil.
Corresponding author: Natália Cristina Ruy Carneiro - Email: nataliacrcarneiro@hotmail.com
Received: 07/09/2020 | **Accepted:** 12/11/2020

específicas dessa população. **Conclusão:** O edentulismo esteve associado à baixa escolaridade, falta de atendimento odontológico nos últimos seis meses, sorriso autoavaliado positivo e alterações mucosas.

Palavras-chave: Insuficiência renal crônica. Arcada edêntula. Diálise renal.

Introduction

Chronic kidney disease (CKD) is a progressive condition characterized by structural or functional abnormalities of the kidney with or without a low rate of glomerular filtration[1,2]. Hypertension, cardiovascular disease and diabetes mellitus are the main etiological factors and cardiovascular disease is described as the main cause of death in individuals with CKD[3–6]. The prevalence of CKD has increased significantly, with 13.4% of the population affected worldwide[7].

The treatment for CKD is based on renal replacement therapy. Dialysis is a process of artificial filtration that removes all undesired substances accumulated due to chronic renal failure. Hemodialysis is the most common form of therapy for such patients[2].

Individuals with CKD who are undergoing hemodialysis are likely to have oral problems and inadequate oral hygiene. The literature states that poor oral health can contribute to systemic inflammation and atherosclerotic complications, leading to a higher risk of mortality[8–10]. The most frequent oral problems in individuals with CKD are a reduction in salivary flow, a higher prevalence rate of dental caries and periodontal disease, xerostomia, candidiasis and a burning sensation in the mouth. Premature tooth loss and edentulism are also common in individuals with this illness[11–14].

A recent systematic review reports that approximately one in five individuals with CKD are edentulous[13]. The main etiology and pathogenesis of edentulism in such cases is severe periodontal disease[15]. Besides clinical parameters of edentulism, it is also important to analyze the social and individual determinants involved in the occurrence of this condition. Disparities in oral health related to race and socioeconomic status are also reported to be strong determinants of tooth loss[16,17].

The aim of the present study was to identify risk factors associated with edentulism in adults with CKD undergoing hemodialysis. Based on the literature, the authors tested the hypothesis that, controlling for age, edentulous individuals with CKD undergoing hemodialysis have a greater chance of being women, having low schooling, having undergone hemodialysis for a longer period of time, having other diseases associated with CDK, having not visited a dentist in the previous six months, having a negative perception of their smile and having alterations in the oral mucosa.

Methods

Ethical aspects

This study received approval from the Human Research Ethics Committee of *Universidade Federal de Minas Gerais* (number: CAAE 05714912.0.0000.5149) and all participants signed a statement of informed consent.

Study design and sample characteristics

A cross-sectional study was conducted with a sample of 767 individuals aged 18 to 90 years of age with CKD and undergoing hemodialysis during the data collection period. Individuals were recruited from two hemodialysis centers located in the cities of Belo Horizonte and Contagem, in the southeast of Brazil. Data collection took place September and November 2011.

Eligibility criteria

Individuals with CKD received clarifications regarding the objectives of the study while awaiting dialysis and were invited to participate. Those who agreed to undergo an oral examination were included in the study. A convenience (non-random) sample was selected from the institutions at which the recruitment was performed. Individuals in a non-random sample are selected based on a value judgment rather than a statistical randomization procedure and are therefore considered to be more accessible[18].

Training and calibration process

A calibration process and pilot study were conducted prior to the main study. The training and calibration process consisted of theoretical and clinical steps[18,19]. Discussions were conducted by an experienced dentist using slides for the diagnosis of alterations in the oral mucosa. During the clinical step of the calibration process, thirteen individuals were examined and reexamined after a seven-day interval. Examinations were performed using a portable artificial light (petzl headlamp) and a disposable mouth mirror (Prisma, São Paulo, SP, Brazil) using the criteria established by the World Health Organization[20]. These individuals were from the hemodialysis center in Belo Horizonte and did not participate in the main study. The kappa statistic was used for the determination of inter-examiner ($k = 0.86$) and intra-examiner ($k = 0.90$) agreement regarding the diagnosis of mucosal alterations. The kappa values were considered good[19].

A pilot study was also conducted to test the methods and data collection instruments. For such, a convenience sample was used of 60 individuals with CKD treated at the same hemodialysis centers. The results of the pilot study demonstrated no need to alter the methods and these individuals were included in the main study.

Nonclinical data collection

Nonclinical data were collected using a structured questionnaire administered in interview form. A single researcher was responsible for applying the questionnaire to the volunteers. The questionnaire was composed of items related to the individual's general characteristics (such as the consumption of alcohol and cigarettes), medical and dental history. Ethnicity was categorized based on the criteria established by the Brazilian Institute of Geography and Statistics (IBGE)[21]. Socioeconomic status was determined based on the Brazilian Economic Classification System[22], which categorizes families into classes A (highest), B, C, D and E (lowest). For the purposes of statistical analysis, economic classes were categorized as follows: Group 1 – composed of economically more favored individuals (Classes A and B); Group 2 – composed of economically favored individuals (Class C); and Group 3 – composed of economically less favored individuals (Class D). No patients were categorized in Class E. Schooling was evaluated based on the number of years of formal education.

The questionnaire was developed based on previous studies[8,11,23,24] and was submitted for the judgment of two researchers in the fields of dentistry and public health. To estimate the internal validity of the questionnaire, testing and retesting of the measure were conducted with the 13 volunteers who participated in the calibration exercise. The retest was carried out after a seven-day interval. Kappa coefficients regarding test/retest agreement ranged from 0.72 to 1.00, which are considered good to excellent, demonstrating an appropriate degree of reliability[19].

Clinical data collection

The oral examinations were performed to evaluate alterations in the oral mucosa using the criteria established by the World Health Organization[20]. Examinations of the mucosa, palate and tongue (edges, dorsum and base) were performed using a portable artificial light (petzl headlamp) and a disposable mouth mirror (Prisma, São Paulo, SP, Brazil). In cases of food debris and the presence of plaque, the teeth were cleaned with gauze. Denture wearers were instructed to remove the prosthesis prior to the examination. All examinations were performed by a single researcher with the aid of a research assistant who recorded the data, with the individual seated in a reclining chair while undergoing hemodialysis. Individuals with dental treatment needs were referred to the School of Dentistry of the university.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS for Windows, version 21.0, SPSS IBM Corp., Armonk, NY, USA). Descriptive and bivariate analyses were performed. The chi-square test was used to determine associations ($p < 0.05$) between the dependent variable (edentulism) and independent variables (age, sex, skin color, socio-economic class, educational level, duration of hemodialysis, occurrence of other diseases, dental care in the previous six months, self-rated smile and alterations in the oral mucosa). Multiple logistic regression analysis was performed to identify the independent impact of each variable studied. The independent variables were incorporated into the decreasing logistic model in accordance with their statistical significance ($p < 0.25$; stepwise backward procedure).

Results

The final sample comprised 650 individuals with CKD undergoing hemodialysis, representing 84.7% of the universe of individuals in treatment at the selected reference centers. The 117 dropouts were due to absences on the day scheduled for data collection, refusals to participate in the study, participation in the calibration exercise, the occurrence of deaths or other reasons.

Table 1 displays the demographic and socioeconomic characteristics of the sample. Age ranged from 18 to 90 years (mean: 53.9 ± 14.3 years). The majority was male (55.2%), black or brown (80.2%), from the more favored and favored economic classes (84.0%) and had less than eight years of schooling (72.3%).

Table 1: Absolute and relative frequency of the participants, according to socio-demographic variables (n=650).

Variable	Absolute frequency (n)	Relative frequency (%)
Age (years)		
18-45	166	25.5
46-65	341	52.5
66-90	143	22.0
Sex		
Male	359	55.2
Female	291	44.8
Skin color/Race		
White	129	19.8
Black/Brown	521	80.2
Yellow/Indigenous	0	0
Economic class		
Most favored	106	16.3
Favored	440	67.7
Less favored	104	26.0
Schooling (years study)		
< 8	470	72.3
≥ 8	180	27.7

The prevalence of complete edentulism was 28.2% (n = 183) and 71.8% of the sample had at least one tooth in the oral cavity (n = 467). Among the edentulous patients, 76.5% wore removable dentures (n = 140).

Table 2 displays the associations between the dependent and independent variables. Statistically significant associations were found between edentulism and age, sex, skin color, economic class and schooling ($p < 0.05$). Moreover, 31.4% of the edentulous individuals stated not having been to a dentist in the previous six months ($p < 0.001$); 37.3% rated their smile as excellent or good ($p < 0.001$) and 43.4% were diagnosed with some mucosal alteration ($p < 0.001$).

Table 2: Absolute and relative frequency of the participant's individual variables according to the prevalence of edentulism (n=650).

Individual variables		Edentulism			P value**
		Present n (%)	Absent n (%)	Total n (100%)	
Age (years)*	18-45	6 (3.6)	160 (96.4)	166	**< 0.001**
	46 -65	97 (28.4)	244 (71.6)	341	
	66 -90	80 (55.9)	63 (44.1)	143	
Sex	Female	95 (32.6)	196 (67.4)	291	**0.02**
	Male	88 (24.5)	271 (75.5)	359	
Skin color	White	48 (37.2)	81 (62.8)	129	**0.01**
	Black/Brown	135 (25.9)	386 (74.1)	521	
Economic class	More favored	23 (21.7)	83 (78.3)	106	**0.02**
	Favored	122 (27.7)	318 (72.3)	440	
	Less favored	38 (36.5)	66 (63.5)	104	
Schooling (years)	< 8	163 (34.7)	307 (65.3)	470	**< 0.001**
	8 or more	20 (11.1)	160 (88.9)	180	
Hemodialysis treatment time (years)	< 5	128 (29.4)	308 (70.6)	436	0.33
	5 or more	55 (25.7)	159 (74.3)	214	
Having another disease	Yes	157 (29.4)	377 (70.6)	534	0.13
	No	26 (22.4)	90 (77.6)	116	
Dental care (< 6 months)	No	154 (31.4)	337 (68.6)	491	**< 0.001**
	Yes	29 (18.2)	130 (81.8)	159	
Smile perception	Excellent/ Good	79 (37.3)	133 (62.7)	212	**< 0.001**
	Regular/Poor	104 (23.7)	334 (76.3)	438	
Oral mucosa alteration	Present	121 (43.4)	158 (56.6)	279	**< 0.001**
	Absent	62 (16.7)	309 (83.3)	371	

* Categorized into tercis ** X^2 Test (significance level of 5%/ value in bold: statistical significance (< 0.05).

Table 3 displays the results of the multiple logistic regression analysis. Individuals with less than eight years of study had a 3.99-fold (95% CI: 2.34 to 6.79) greater chance of being edentulous. Individuals who had not been to a dentist in the previous six months had a 2.49--fold (95% CI: 1.52 to 4.08) greater chance of being edentulous. Individuals with an excellent or good perception of their smile had a 2.00-fold (95% CI: 1.35 to 2.97) greater chance of being edentulous. Individuals with alterations identified in the oral mucosa had a 4.17-fold (95% CI: 2.83 to 6.13) greater chance of being edentulous.

Table 3: Multivariate model of logistical regression to explain edentulism in individuals in hemodialysis (n=650).

Independents variables (Categories)	OR (CI 95%) Crude	OR (CI 95%) Adjusted*
Schooling (< 8 years)	4.24 (2.57-7.01)	**3.99 (2.34-6.79)**
Dental care < 6 months (absent)	2.04 (1.31-3.19)	**2.49 (1.52-4.08)**
Smile perception (Excellent/ Good)	1.90 (1.33-2.72)	**2.00 (1.35-2.97)**
Oral mucosa alteration (Present)	3.81 (2.66-5.47)	**4.17 (2.83-6.13)**

*Adjusted for control variable (age) / OR: Odds Ratio / CI 95%: Confidence interval.

Discussion

Due to the high levels of psychological stress and lack of time to perform dental care, individuals undergoing hemodialysis often consider oral health maintenance to be a low priority. Researchers report that individuals with psychological stress are more likely to exhibit risk behaviors related to oral health, which leads to a significant increase in the risk of tooth loss[9,24,25].

In the present study, the prevalence of edentulism among patients undergoing hemodialysis was 28.2%. In most cases, tooth loss is explained by the high prevalence of periodontal disease and dental caries[11–13]. According to a systematic review conducted in 2014, one out of every five adults with CKD is edentulous[13]. The present results are also in agreement with data described in a study conducted in Germany in 2012 with individuals aged 32 to 86 years undergoing hemodialysis, in which the prevalence of edentulism was 22%[26].

The findings partially support the hypothesis posed in the present study. Controlling for age, the prevalence of edentulism was associated with most of the variables analyzed (schooling, dental care, self-rated smile and alterations in the oral mucosa). However, the direct association with "self-rated perception" was different from what was expected. Moreover, the hypothesis was not supported with regard to sex, duration of hemodialysis and the occurrence of other diseases associated with kidney failure.

Individuals with less schooling undergoing hemodialysis had a greater chance of being edentulous. This finding may be related to the fact that most individuals with less schooling also have a lower income and probably have less access to dental services as well as fewer financial resources for periodic dental appointments and treatment. The literature shows that low income and schooling are directly related to tooth loss[4,16,17,27]. A study conducted in the United States in 2014[4] involving 2749 individuals with CKD found that most of the toothless individuals had a low income and less than 12 years of schooling. Indeed, people with lower schooling generally have the poorest oral health indexes and often only seek treatment when a problem is apparent[17,27].

The considerable regional inequalities in Brazil exert a direct influence on access to specialized oral health services. Moreover, even if specialized procedures enable the greater preservation of teeth, tooth extraction is considered inevitable in cases of tooth decay in advanced stages of tissue destruction[27]. Individuals often only visit a dentist in the occurrence of pain and may prefer to undergo tooth extraction, which they consider to be more practical and less costly. In many cases, individuals are unaware of the future consequences

of tooth loss. Moreover, there is a prevailing cultural notion that tooth loss throughout the ageing process is "normal"[28].

Individuals undergoing CKD who reported not having been to a dentist in the previous six months had a 2.5-fold greater chance of being edentulous. This result may be explained by the fact that most edentulous individuals don't think about possible oral problems and don't visit the dentist very often. Moreover, individuals use to associate the presence of teeth in mouth with dental care utilization[22]. Studies have demonstrated that individuals undergoing dialysis only visit a dentist in the occurrence of pain or when the need for treatment becomes evident[24,26].

Another point that may be associated with the low frequency of visits to a dental office among this group of patients is the refusal on the part of dentists to provide treatment. According to Jain et al.[12], many dentists refuse care with the justification of not having sufficient knowledge on CKD and due to the fear of some systemic complication. According to the authors, this situation contributes to the considerable need for prosthetic rehabilitation among patients undergoing hemodialysis. A study conducted in China in 2014 revealed that 19.5% of 306 hemodialysis patients did not receive dental treatment due to rejections on the part of dentists[10].

The majority of individuals with CKD in the present study rated their smile as either good or excellent. According to Rodakowska et al.[29], oral problems are not considered a major concern among individuals undergoing hemodialysis, which may be due to an adaptation to impaired oral health or a change in health priorities. The present findings also showed that most edentulous individuals made use of complete removable dentures and it is possible that the patients consider their dentures to be more attractive than their previous compromised teeth. In general, dentures have aligned, larger, whiter teeth and provide greater volume to the lips, generating a younger, more pleasing appearance. According to Silva et al.[30], complete dentures in edentulous individuals provide patient satisfaction and restore one's self-esteem.

The association between edentulism and the positive perception of one's smile could also be related to the absence of pain in such individuals. Complete extractions often represent a solution for ending pain and it is probable that individuals prefer being without teeth to experiencing pain[31]. Unfortunately, there is also the cultural belief that losing one's teeth over the years is a normal occurrence[32].

Individuals with CKD in whom mucosal alterations were identified had a greater chance of being edentulous. It may be related to the use of inadequate or ill-adapted dentures causing injuries to the soft tissues. Also, the literature describes that the presence of mucosal alterations may be associated with insufficient and improper hygiene habits as well as the use of dentures for a long period of time[33,34].

Some limitations of the present study should be pointed out. The cross-section design does not enable the evaluation of causal relationships. A non-probabilistic sample was used due to the difficulty in selecting eligible participants, which does not ensure the external validity of the results. The lack of a control group makes it difficult to perform generalizations to other populations. Furthermore, memory bias may have occurred among the participants during the administration of the questionnaire regarding the duration of hemodialysis and the time of the last visit to a dentist.

Tooth loss may result in changes in the stomatognathic system, such as temporomandibular disorder, excessive load on the remaining teeth and difficulty chewing[35,36]. It can change one's lifestyle by affecting facial esthetics and speech, which exerts a negative impact on social and professional aspects, causing psychosocial problems and reducing one's quality of life[8,9].

CKD may lead individuals more susceptible to infections due a reduced immunological response and general health debilitation. On top of that, the investigation performed in the

present study takes importance as a compromised oral health caused by extensive tooth loss has been associated though previous studies with nutritional deficiencies, due to chewing difficulties, and changes in the stomatognathic system[35,36]. Thus, those individuals face with oral health problems that might compromise their general health and quality of life. Finally, the evaluation of factors associated with edentulism in CKD individuals can assist in the establishment of better oral health public policies that take into account their specific needs. The high prevalence of edentulism found in the present study underscores the need for adequate dental care to ensure oral health and avoid the undesirable consequences of tooth loss in this group of individuals.

Conclusion

In the present study, 28.2% of the individuals with chronic kidney disease undergoing hemodialysis were edentulous. Edentulism was associated with low schooling, a lack of dental care in the previous six months, a positive self-perception of one's smile and alterations in the oral mucosa.

Funding

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior- Brasil (CAPES)- Finance Code 001; Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG); Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), and Pró-Reitoria de Pesquisa da Universidade Federal de Minas Gerais (PRPq/UFMG).

Conflict of interest

The authors declare that they have no conflict of interest.

References

1. Levey A, Eckkardt K, Tsukamoto Y, Levin A, Coresh J, Rossert J, et al. Definition and classification of chronic kidney disease: a position statement from kidney disease improving global outcome. Kidney Int. 2005;67(6):2089-100.
2. Lira E Silva JA, Bernardino ÍM, da Silva JRC, Lima TLMA, Soares RSC, d'Ávila S. Quality of life related to oral health of patients undergoing hemodialysis and associated factors. Spec Care Dentist. 2017;37(5): 236-45.
3. Vesterinen M, Ruokonen H, Furuholm J, Honkanen E, Meurman JH. Oral health in predialysis patients with emphasis on diabetic nephropathy. Clin Oral Invest. 2011;15(1):99-104.
4. Ioannidou E, Swede H, Fares G, Himmelfarb J. Tooth loss strongly associates with malnutrition in chronic kidney disease. J Periodontol. 2014;85(7):899-907.
5. Solomon S, Forna N, Ursarescu I, Segal L, Nistor I, Veisa G. 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). Romanian J Oral Rehabil. 2014;6(1):9-14.
6. Al-Shamsi S, Regmi D, Govender RD. Chronic kidney disease in patients at high risk of cardiovascular disease in the United Arab Emirates: A population-based study. PLoS One. 2018;13(6):e0199920.
7. Hill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, Lasserson DS, et al. Global Prevalence of Chronic Kidney Disease–A Systematic Review and Meta-Analysis. PLoS One. 2016;6:11(7):e0158765.

8. Chen LP, CK Chiang, Peng YS, Hsu SP, Lin CY, Lai CF, et al. Relationship between periodontal disease and mortality in patients treated with maintenance hemodialysis. Am J Kidney Dis. 2011;57(2):276-82.
9. Holley JH. General medical care of the dialysis patient: Core curriculum 2013. Am J Kidney Dis. 2013;61(1):171-83.
10. Xie T, Yang Z, Dai G, Yan K, Tian Y, Zhao D, et al. Evaluation of the oral health status in Chinese hemodialysis patients. Hemodial Int. 2014;18(3):668-73.
11. Fisher MA, Taylor GW, Shelton BJ, Jamerson KA, Rahman M, Ojo AO, et al. Periodontal disease and other non-traditional risk factors for CKD. Am J Kidney Dis. 2008;51(1):45-52.
12. Jain S, Singla A, Basavaraj P, Singh S, Singh K, Kundu H. Underlying kidney disease and duration of hemodialysis: An assessment of its effect on oral health. J C Diagn Res. 2014;8(5):ZC65-9.
13. Ruospo M, Palmer SC, Craig JC, Gentile G, Johnson DW, Ford PJ, et al. Prevalence and severity of oral disease in adults with chronic kidney disease: a systematic review of observational studies. Nephrol Dial Transplant. 2014;29(2):364-75.
14. Oyetola EO, Owotade FJ, Agbelusi GA, Fatusi OA, Sanusi AA. Oral findings in chronic kidney disease: implications for management in developing countries. BMC Oral Health. 2015;15:24.
15. Limeres J, Garcez JF, Marinho JS, Loureiro A, Diniz M, Diz P. Early tooth loss in end-stage renal disease patients on haemodialysis. Oral Dis. 2016;22(6):530-5.
16. Gilbert GH, Duncan RP, Shelton BJ. Social determinants of tooth loss. Health Serv Res. 2003;38(6 Pt 2):1843-62.
17. Esan TA, Olusile AO, Akeredolu PA, Esan AO. Socio-demographic factors and edentulism: the Nigerian experience. BMC Oral Health. 2004; 4(1):3.
18. Kirkwood BR, Stern J. Essential Medical Statistics. 2nd ed. London: Blackwell; 2003.
19. Rigby AS. Statistical methods in epidemiology. V. Towards an understanding of the kappa coefficient. Disabil Rehabil. 2000;22(8):339-44.
20. World Health Organization. Oral Health Surveys. Basic methods. 5th edn. Geneva: World Health Organization; 2013 [cited 2020 Jun 9]. Available in: http://www.who.int/oral_health/publications/9789241548649/en/.
21. Brazilian Institute of Geography and Statistics. Brazil. Ethnic-racial characteristics of the population. Rio de Janeiro: IBGE; 2013 [cited 2020 May 27]. Available in: http://portal.mte.gov.br/data/files/8A7C816A316B688101318A-B565C54F14/PCERP2008.pdf.
22. Associação Brasileira de Empresas de Pesquisa. Critério de Classificação Econômica Brasil. São Paulo; 2015 [cited 2020 Jun 9]. Available in: http://www.abep.org/codigos-e-guias-da-abep.
23. Born G, Baumeister SE, Sauer S, Hensel E, Kocher T, John U. Characteristics of risk groups with an insufficient demand for dental services - results of the study of health in Pomerania (SHIP). Gesundheitswesen. 2006;68(4):257-64.
24. Dumitrescu AL, Gârneată L, Guzun O. Anxiety, stress, depression, oral health status and behaviours in Romanian hemodialysis patients. Rom J Intern Med. 2009;47(2):161-8.
25. Sanders AE, Slade GD, Turrel G, Spencer AJ, Marcenes W. Does psychological stress mediate social deprivation in tooth loss? J Dent Res. 2007;86(12):1166-70.
26. Ziebolz D, Fischer P, Hornecker E, Mausberg RF. Oral health of hemodialysis patients: across-sectional study at two German dialysis centers. Hemodial Int. 2012;16(1):69-75.
27. Peres MA, Barbato PR, Reis SC, Freitas CH, Antunes JL. Tooth loss in Brazil: analysis of the 2010 Brazilian Oral Health Survey. Rev Saude Publica. 2013;47(3):78-89.
28. Mendonça TC. Dental mutilation: rural workers' concepts of responsibility for tooth loss. Cad Saude Pública. 2001;17(6):1545-7.
29. Rodakowska E, Wilczyńska-Borawska M, Fryc J, Baginska J, Naumnik B. Oral health-related quality of life in patients undergoing chronic hemodialysis. Patient Prefer Adherence. 2018;12:955-61.
30. Silva ME, Magalhães CS, Ferreira EF. Complete removable prostheses: from expectation to (dis)satisfaction. Gerodontology. 2009;26(2):143-9.
31. Silva ME, Magalhães CS, Ferreira EF. Dental loss and prosthetic replacement expectation: qualitative study. Cien Saúde Colet. 2010; 15(3):813-20.
32. Lo EC, Tan HP. Cultural challenges to oral healthcare implementation in elders. Gerodontology. 2014;31(1):72-6.
33. Martori E, Ayuso-Montero R, Martinez-Gomis J, Viñas M, Peraire M. Risk factors for denture-related oral mucosal lesions in a geriatric population. J Prosthet Dent. 2014;111(4):273-9.
34. Lynge Pedersen AM, Nauntofte B, Smidt D, Torpet LA. Oral mucosal lesions in older people: relation to salivary secretion, systemic diseases and medications. Oral Dis. 2015;21(6):721-9.
35. Erzurumlu ZU, Celenk P. A radiological evaluation of the effects of edentulousness on the temporomandibular joint. J Oral Rehabil. 2020; 47(3):319-24.
36. Kossioni AE, Dontas AS. The stomatognathic system in the elderly. Useful information for the medical practitioner. Clin Interv Aging. 2007; 2(4):591–7.