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Original Article

Epidemiologic analysis of dental cellulitis in Kinshasa city (the Democratic Republic of the Congo)

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Abstract – Introduction: The study aimed to determine the prevalence, describe the sociodemographic profile of individuals with dental cellulitis, and identify its associated factors in a population of Kinshasa. **Materials and methods:** This was a cross-sectional analytical study conducted in October 2017 in five hospital departments in Kinshasa. The sample population consisted of patients with dental cellulitis. Sociodemographic data and factors associated with dental cellulitis were evaluated. **Results:** Dental cellulitis was found in 12.5% of the subjects, with a slight female predominance (58.2%). A significant difference between patients with cellulitis and those without cellulitis was observed for the following variables: education level, unemployment, and low socioeconomic status ($p < 0.05$). Dental carious lesions (93.7%) were the most common causative factor, and self-medication (100%) and poor oral hygiene (83.5%) were risk or contributing factors. Univariate analysis showed that for people of ages 16–59 and ≥60 years, education level, unemployment, sugar consumption, and low socioeconomic status were significantly associated with dental cellulitis. A multivariate logistic regression analysis showed that people of ages ≥60 years [odds ratio (OR) 3.12, 95% confidence interval (CI) 1.169–4.14, $p = 0.014$], non-university status (OR 2.79, 95% CI 1.68–4.64, $p < 0.001$), unemployment (OR 2.27, 95% CI 1.73–4.20, $p = 0.005$), sugar consumption (OR 3.17, 95% CI 1.71–4.94, $p = 0.036$), and low socioeconomic status (OR 2.60, 95% CI 1.85–3.01, $p = 0.014$) were independently associated with dental cellulitis in the study population. **Conclusion:** Dental cellulitis is a public health problem in the city of Kinshasa, the Democratic Republic of Congo.

Introduction

Dental cellulitis is an infection of the cellulo-adipose tissues in the neck and around the face [1,2]. They represent a locoregional complication of an infection, most often of dental or peridental origin [2]. This common pathology in young male adults, which is initially unremarkable, is a real problem because it can quickly become life threatening, especially in its diffuse and gangrenous form, and is often associated with septic shock [2–6]. Any delay in diagnosis or therapy may lead to a poor prognosis [4]. Its prevalence has surprisingly continued to increase in recent years, and the literature states that dental cellulitis is frequently encountered in odontostomatological consultations in developing countries. This study aimed to determine the prevalence of the condition, describe the sociodemographic profile of patients, and identify the factors associated with the occurrence of dental cellulitis in Kinshasa, the Democratic Republic of Congo (DRC).

Materials and methods

This study was a cross-sectional analytical study conducted on a probabilistic sample of 633 patients who generally consulted the odontostomatology departments of randomly selected medical facilities from June 15 to October 15, 2017. These included the Kinshasa Central Military Hospital of Reference, Boyambi Hospital Center in Barumbu, Elonga Medical Center in Masina, Provincial General Hospital of

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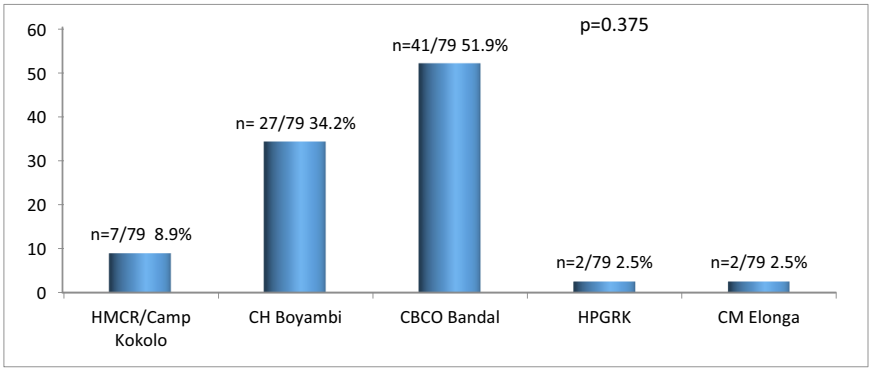

Fig. 1. Prevalence of dental cellulitis according to the medical center.

Reference in Kinshasa, and Bandalungwa West Congo Baptist Community Medical Center. Parameters of interest were age, sex, residence, education level, occupation, eating habits, religion, socioeconomic status, etiological causative factors, and risk or contributing factors. Data processing was performed using Excel 2013 and SPSS software version 21.0. Descriptive statistics was used to calculate frequencies and median. Pearson's chi-square or Fisher's exact test, as the case may be, allowed the comparison of the proportions. Factors associated with dental cellulitis were investigated using univariate and multivariate logistic regression. Calculation of odds ratio (OR) with a 95% confidence interval (CI) made it possible to estimate the degree of association between dental cellulitis and sociodemographic factors. A *p*-value of <0.05 was considered to indicate statistical significance.

Results

Our results showed that 58.9% of those affected were women and 41.10% were men. The overall incidence of dental cellulitis was 12.5% ($n = 79/633$). Among the hospital facilities selected for the study, the Bandalungwa West Congo Baptist Community Medical Center was the most attended, followed by the Boyambi Hospital Center (with 51.9 and 34.2% of cases, respectively) (Fig. 1).

Table 1 shows that sex, age, religion, districts of residence, and occupation did not vary between the sociodemographic profile of patients with dental cellulitis and those without dental cellulitis. However, a statistically significant difference was observed in education, dietary habits, and socioeconomic status variables ($p < 0.05$) between the two groups. Dental caries (93.7%) was the determining etiological factor for disease onset (Fig. 2). Self-medication (100%), nonsteroidal anti-inflammatory drugs (NSAIDs) (88.6%), and poor oral hygiene (83.5%) were potential contributing or risk factors for dental cellulitis (Fig. 3). Table 2 shows the factors significantly associated with dental cellulitis including people aged 16–59 and ≥60 years; divorced or widowed status; non-university status, unemployment, sugar consumption, and low socioeconomic status using univariate analysis. The multivariate logistic regression analysis showed that the variables ages ≥60 years (OR 3.12, 95% CI 1.169–4.14, $p = 0.014$), non-university status (OR 2.79, 95% CI 1.68–4.64, $p < 0.001$), unemployment (OR 2.27, 95% CI 1.73–4.20, $p = 0.005$), sugar consumption (OR 3.17, 95% CI 1.71–4.94, $p = 0.036$), and low NSE (OR 2.60, 95% CI 1.85–3.01, $p = 0.014$) were independently associated with dental cellulitis in the study population.

Discussion

This study aimed to determine the prevalence of dental cellulitis, describe its sociodemographic profile, and identify the factors associated with the occurrence of dental cellulitis. A random sample of 633 patients with oral pathologies who generally consulted the odontostomatology departments of the five medical facilities were selected from 97 patients presenting with dental cellulitis at a prevalence of 12.5%. This is the first prevalence to be reported for the city of Kinshasa, DRC. Comparison with other studies is not always easy given the different methods used. However, our results are comparable with those reported by Rakotoarison *et al.* in the Soavinandriana-Antananarivo region of Madagascar in 2007, which reported a prevalence of 1.6%, which is lower than that in our study [7]. The high prevalence observed in this study was not surprising to us. It reflects the profile of our population because it is *a priori* exposed to etiological factors of dental cellulitis. In this respect, our results clearly confirm the data in the literature, which states that dental cellulitis is frequently encountered in odontostomatological consultations, with tooth decay being the most common cause, particularly in Africa, where it is found in >90% of cases [8]. The prevalence of dental cellulitis according to the medical facility of management in our study was higher in the Bandalungwa West Congo Baptist Community Medical Center followed by the Boyambi Hospital Center (Fig. 2). This trend is probably a reflection of the high hospital attendance of the residents of Lukunga and Funa districts where the two hospitals are located.

Regarding the sociodemographic profile of patients with dental cellulitis and without dental cellulitis in our study, it was similar for sex, age, religion, occupation, and district of residence. Our results do not match data from the literature, which argues that both sexes are generally affected, with a

Table 1. Sociodemographic characteristics of the population with dental cellulitis versus control population.

Variable	Whole group *n* = 633 (%)	Cellulitis *n* = 79 (%)	No cellulitis *n* = 554 (%)	*p*
Age (year)				0.119
0–15	63 (10.0)	3 (3.8)	60 (10.9)	
16–30	265 (42.0)	33 (41.8)	232 (42.0)	
31–45	190 (30.0)	25 (31.6)	165 (29.8)	
46–59	68 (10.7)	12 (15.2)	56 (10.1)	
≥60	46 (7.3)	6 (7.6)	40 (7.2)	
Sex				0.493
Male	260 (41.1)	33 (41.8)	227 (41.0)	
Female	373 (58.9)	46 (58.2)	327 (59.0)	
Marital status				0.113
Married	219 (34.6)	28 (35.4)	191 (34.5)	
Single	379 (59.9)	42 (53.2)	337 (60.8)	
Divorced/widowed	35 (5.5)	9 (11.3)	26 (3.6)	
Education level				**<0.001**
Non-university	261 (41.2)	50 (63.2)	211 (38.0)	
University	372 (58.7)	29 (36.7)	343 (61.9)	
Occupation				0.207
Freelance	180 (28.4)	24 (30.4)	156 (28.2)	
Public servant	106 (16.7)	8 (10.1)	98 (17.7)	
Unemployed	138 (21.8)	25 (31.6)	113 (20.4)	
Student	209 (33.0)	22 (27.8)	187 (33.8)	
Religion				0.186
Revival Church	386 (61.0)	46 (58.2)	340 (61.4)	
Catholicism	135 (21.3)	15 (19.0)	120 (21.7)	
Protestantism	87 (13.7)	13 (16.5)	74 (13.4)	
Islam	18 (2.8)	2 (2.5)	16 (2.9)	
No religion	7 (1.1)	3 (3.8)	4 (0.7)	
Diet				**0.022**
Sugar	229 (36.1)	62 (78.4)	167 (30.1)	
Sugar free	404 (63.8)	17 (21.5)	387 (69.8)	
District of residence				0.186
Lukunga	280 (44.2)	31 (39.2)	249 (44.9)	
Mont Amba	114 (18.0)	12 (15.2)	102 (18.4)	
Funa	190 (30.0)	24 (30.4)	166 (30.0)	
Tshangu	49 (7.7)	12 (15.2)	37 (6.7)	
Socioeconomic status				**0.024**
Low	464 (73.3)	65 (82.3)	399 (72.0)	
Average	149 (23.5)	14 (17.7)	135 (24.4)	
High	20 (3.2)	0 (0.0)	20 (3.6)	

clear male predominance that is widely supported by many authors [1,8–10]. This predominance would be due to the high incidence of alcohol consumption and tobacco use in male subjects or to the better immune response in females as mentioned by some authors [9]. The high incidence of dental cellulitis is mainly due to poor oral hygiene associated with abuse of anti-inflammatory drugs as a monotherapy [11]. Although women are more concerned with good oral hygiene, which should normally help prevent dental cellulitis, they have a fear of dental care; therefore, consultation is often late and after futile attempts with traditional healers. Our results are similar to those of Laroque *et al.* in Senegal (59–61.2%) [12] and of Tran Ba Huy *et al.* in France (61.6%) [4]. Our subjects included three pregnant women. Pregnant women are described in the literature as the most susceptible to dental cellulitis because the high concentration of estrogen and progesterone

in the gums promotes gum inflammation, thus compromising oral hygiene, and predisposes the woman to the spread of the infection. Indeed, some dental cellulitis cases may have serious complications that can be life threatening for patients in both the general population and pregnant women, especially during the third trimester of pregnancy, considering that in Africa, some traditions do not recommend dental care during pregnancy. Our results diverge from those of Kaba *et al.* in Libreville, Gabon [13]; Bengondo and coworkers in Yaoundé, Cameroon [14]; Bobe *et al.* in Kinshasa, DRC, 1998 [15], who found a male predominance.

No age group is immune to dental cellulitis. It is fairly standard in the literature that dental cellulitis particularly affects young adults in the second and third decades of life [1,8,15]. The most affected age group in our study was 16–30 years as reported by several authors [13,15,16]. The reasons given for the predilection of this age group by these authors are the professional and social concerns of young adults in Africa, who often push general care and oral care into the background. However, there are juvenile forms of the condition that affect children aged <10 years and the elderly aged >60 years. The youngest patient with dental cellulitis found in the literature is 11 months [17] and the oldest is 93 years [4]. Our study found an age range of 10–81 years. Some authors have reported a lower prevalence of dental cellulitis in people aged >60 years [14,18]. They attribute this phenomenon to a reduced number of teeth due to multiple dental extractions related to advanced caries. These results are similar to those found in our study, *i.e.*, three cases (3.8%) in people aged >60 years. The majority of our patients believed themselves to be a part of the qualified "popular" belief, as is the case of revival churches (58.2%), which emphasizes the importance of spiritual healing rather than that based on medical or surgical intervention, often resulting in late consultations or none at all, causing many complications such as dental cellulitis.

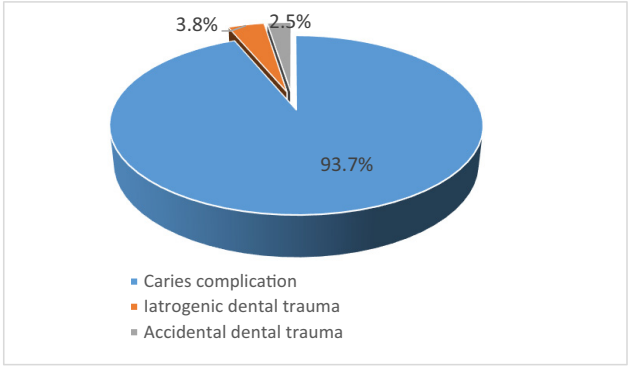

Fig. 2. Etiologic factors involved in dental cellulitis.

With regard to the place of residence, this study showed a strong following of this participation or enrolment among the inhabitants of the Lukunga and Funa districts. These two districts are made up of the most populated municipalities, where the population lives in indescribable promiscuity and a certain number of socioeconomic problems are acute, such as unemployment, crime, water and food shortage, and transport and health care difficulties, leading the population to seek easy solutions such as self-medication and traditional therapy, resulting in late consultations. This has been confirmed by Mendomo *et al.*, who recognized the role of unawareness and poverty in the occurrence of infectious dental complications [19]. As reported by several authors [7,8,19], the majority of patients with dental cellulitis belong to the underprivileged socioeconomic class, and most of them come from working-class neighborhoods where several socioeconomic problems exist. Our results showed that the majority of patients belonged to lower socioeconomic groups, for whom access to hospital services is difficult or is not a priority for general care, in particular oral care. Hence, there is the need to popularize and decentralize oral health awareness policy in this population.

Dental cellulitis affects 56.1–95% of the population [20,21]. Dental decay remains the main causative etiological factor for dental cellulitis, particularly in Africa, where it can be found in >90% cases [18,22]. Poor oral hygiene and regular

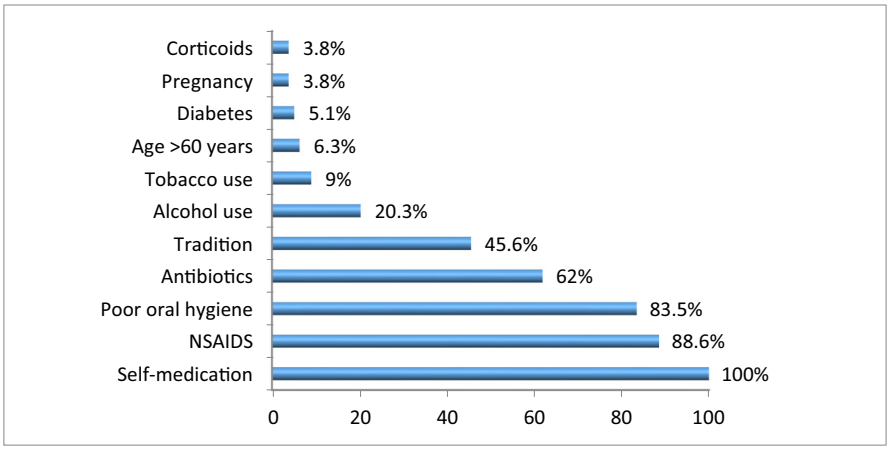

Fig. 3. Risk factors for dental cellulitis.

Table 2. Sociodemographic factors associated with dental cellulitis.

Variable	Univariate analysis			Multivariate analysis		
	β	*p*	OR (95% CI)	*β*	*p*	OR (95% CI)
Sex						
Male			1			
Female	0.033	0.493	1.03 (0.64–1.67)	0.297	0.267	1.35 (0.79–2.28)
Age						
0–15			1			1
16–59	1.041	**0.029**	1.98 (1.01–2.30)	−0.365	0.441	0.69 (0.27–1.76)
≥60	1.352	**0.005**	3.86 (1.98–5.30)	1.137	**0.014**	3.12 (1.169–4.14)
Marital status						
Others			1			1
Divorced/widowed	0.960	**0.018**	2.61 (1.18–5.80)	0.670	0.153	1.96 (0.78–4.90)
Education level			1			
University						
Non-university	1.031	<**0.001**	2.80 (1.72–4.57)	1.026	<**0.001**	2.79 (1.68–4.64)
Occupation			1			
Employed						
Unemployed	0.592	**0.025**	2.81 (1.08–3.03)	0.235	**0.005**	2.27 (1.73–4.20)
Religion						
Others						
Revival church	0.131	0.592	1.14 (0.71–1.84)	0.175	0.500	1.19 (0.72–1.98)
Sugar			1			
No						
Yes	0.214	**0.022**	3.23 (1.77–5.98)	0.159	**0.036**	3.17 (1.71–4.94)
Socioeconomic level			1			
Average/High						
Low	1.590	**0.033**	2.80 (1.98–3.31)	0.470	**0.014**	2.60 (1.85–3.01)
Constant	–	–	–	−2.150	0.074	0.117

consumption of sweets are two etiopathogenic factors that result in tooth decay. Neglect of dental care and not visiting the dentist at least once a year are the main reasons for several infectious dental complications [10,11,21]. The results confirm those of Bobe *et al.*, who found that tooth decay was the main determinant of dental cellulitis [15]. Iatrogenic trauma by tooth extraction comes second in our study. These would be due to iatrogenic dental procedures performed in septic conditions, patient negligence of post-extraction care, or trauma due to technical deficiencies in the part of the practitioner. Our results are similar to those of Merle *et al.*, who reported dental extractions as the second most common factor, but with a much higher percentage than ours (23%) [23]. On the other hand, our results diverge from those of Ngapeth-Etoudi *et al.* in Yaoundé, who reported periodontal diseases as second (13.66%) [16].

There are many risk and contributing factors for dental cellulitis, and self-medication followed by NSAIDs and poor oral hygiene were the most prevalent risk factors. These results corroborate those in the literature [24,25]. A direct association between NSAIDs taken for self-medication and the prevalence of dental cellulitis has not yet been positively established, although numerous studies have incriminated them as major risk factors [25]. This can be explained by the role of NSAIDs in inflammation, which remains above all a nonspecific defense of the body against microbial invasions. Statistical analysis using multivariate logistic regression after adjustment showed that people aged ≥60 years, non-university educational status, unemployment, sugar consumption, and low socioeconomic level were independently associated with dental cellulitis in the study population. The effects of these factors were statistically different, as people aged ≥60 years increased risk of developing dental cellulitis by three, and non-university status factor, unemployment, sugar consumption and low socioeconomic status factors increased risk of developing dental cellulitis by two. Therefore, we considered these sociodemographic factors as being associated with dental cellulitis. Age ≥60 years was more important in this study. However, explanations of this notion of age differ in the literature. According to Romain *et al.*, age ≥60 years is most clearly associated with dental cellulitis [26].

Conclusion

Dental cellulitis is common in Kinshasa, DRC, and constitutes a public health problem. The sociodemographic profile of patients with dental cellulitis and without dental cellulitis is comparable for sex, age, occupation, and religion. Sociodemographic factors associated with dental cellulitis are age ≥60, non-university education, unemployment, sugar consumption, and low socioeconomic status. Dental caries, self-medication, NSAID use, and poor oral hygiene are potential determining and contributing etiological factors.

Conflicts of interests: The authors declare that they have no conflicts of interest in relation to this article.

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