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Prevalence of Oral Infections and Associated Demographic Factors Among Patients in Benin City Metropolis, Nigeria

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ABSTRACT

Introduction: In Nigeria, the incidence of orodental infections and demographics of affected patients are poorly documented. This study aims to evaluate the trends, demographics and comorbidities among patients with oral infections in two study centers in Benin City.

Materials and Methods: This study evaluated five hundred and ninety-eight patients from the outpatient departments in the Dental Clinics of the University of Benin Teaching Hospital and Central Hospital, Benin City, Nigeria. Patient data collected were age, gender, diagnoses, duration of symptoms, preferred chewing side, position of extracted tooth/teeth, and underlying reported health conditions.

Results: A total of 56.86% of our respondents were females. The highest occurrence of oral infections was within the age range of 21-30 years (27.26%). The most encountered diagnoses were periodontitis (55.85%) and caries (19.57%). Retained roots (3.34%) and fractures (6.52%) accounted for non-infectious diagnoses. Comorbid conditions in the population were peptic ulcer, hypertension and/or diabetes mellitus. Time frame for seeking medical care showed that 236 patients reported for care within one week. Other observed time frames were 1-4 weeks (208) and greater than four weeks (154).

Conclusion*:* Patients between 20-30 years in both sexes were more predisposed to oral diseases with acute apical periodontitis being the most prevalent, followed by dental caries. Peptic ulcer, hypertension and/or diabetes were the coexisting chronic conditions of the study participants.

Keywords: *Oral Infections, Prevalence, Demographics, Comorbidities.*

INTRODUCTION

The oral cavity is an important system in the human body. It plays a key role in speaking, mastication, and deglutition of food. Also, it is essential for the early stages of food digestion. The mouth therefore plays additional psychological role in the identity of humans. It contains the teeth, gingival tissues, tongue, palates, buccal mucosa, and tonsils [1]. These multiple surfaces are each colonized with a unique population of about 500 - 700 species of bacteria, viruses, fungi, and protozoa, a good number of which are significantly virulent with many yet to be cultivated [2]. Microbial communities adhere to the tooth surfaces (biofilms) and use sucrose and other dietary sugars as food sources. As the biofilm grows, an anaerobic and acidic environment is formed due to the production of metabolic organic acids by-products

such as lactic acid addition, the lactate ions chelate calcium ions from the teeth, thus degrading the tooth enamel [3,4].

Oral infections have been documented as the principal reason for tooth loss, affecting about 20-50% of the world's population [5]. Reports have shown that caries was the primary cause of disability-adjusted life years (DALYs) in young adults below 35 years, whereas periodontitis and tooth loss emerged as the leading disease burden in those aged 35-59 years [6]. The annual man hour loss from school, work, and normal activities of life due to orodental diseases and their management for an average Canadian was 3.5 hours, for adults aged 20-69 years, which equated to 4.14 million days lost [7]. Inter-country and intra-country variations have been documented in the prevalence of these infections. Such variations are related to the socio-environmental conditions, behavioural factors, and the general health status of people [5].

In developing countries like Nigeria, the prevalence of oral infections and demographic of affected patients are less documented and often limited to patients under 15 years of age [8]. This study evaluated the trends, demographics and comorbidities associated with the patients with oral infections in two study Centres in Benin City Metropolis of Edo State, Nigeria.

MATERIALS AND METHODS

Study design

This study evaluated five hundred and ninety-eight patients from the outpatient departments in the Dental Clinics of the University of Benin Teaching Hospital and Central Hospital, Benin City, Nigeria, from May 2016 to September 2019. The sample size was calculated based on a previous study of a 5-58% prevalence rate for periodontitis [8].

All patients with definitive diagnoses of oral disease or conditions were enrolled in this study. Patients who visited for other dental procedures, such as emergency surgery due to traumatic injury, scaling, and polishing, were excluded from the study.

Following ethical approval from the institution review boards of both hospitals and informed consent from the study participants, a semi structured questionnaire was used to collect the following information from each participant; socio-demographic data (name, age, gender), medication history, hereditary or any underlying health conditions, diagnoses, duration of symptoms, preferred side of chewing during mastication and position of extracted tooth.

Data analysis

Patient data were coded and entered into SPSS version 22.0 software (SPSS Inc. Chicago IL USA). Descriptive statistics were used to report the frequencies. Inferential analyses were conducted with the aid of Chi-square, and p-values < 0.05 were considered significant.

RESULTS

The demographics of patients from both study centers are presented in Table (**1**). Majority of the study population were females accounting for 56.85% (340) while patient within the age bracket of 21-30 years were most encountered with 27.26% (163). Acute apical periodontitis was the most prominent diagnosis in patients from both centres, accounting for 55.85% (334) of the total study population. Dental caries was the second most prevalent amongst our study population with 19.6% (117).

The time frame for seeking medical care by the study population stratified according to the duration of symptoms showed that 236 (39.46%) patients reported for care within one week of developing symptoms. About half of that number of patients either waited for a week or more than four weeks after the onset of symptoms before seeking medical intervention. About three-quarters of the study participants preferred chewing with one side of the mouth (left or right), while others chewed food with both sides.

Table (**2**) shows the association between participant gender and the study population's demographics. No significant difference was observed between the females and males based on the outlined demographics (age, diagnoses, co-morbidity and duration of symptoms). However, a significant difference ($p = 0.0002$) was observed in both genders with respect to chewing side preference.

Table 1. Characteristics of Study Population (n = 598).

Variables		n	Study Centre	
			Central (n)	UBTH (n)
Sex	Male	258	146	112
	Female	340	211	129
Age range (years)	≤ 10	22	9	13
	11 – 20	76	53	23
	21 – 30	163	88	75
	31 – 40	106	65	41
	41 – 50	66	41	25
	51 – 60	63	40	23
	≥ 60	102	62	40
Diagnosis	Acute apical periodontitis	334	227	107
	Caries	117	58	59
	Abscess	32	21	11
	Retained root	20	12	8
	Gingivitis	23	13	10
	Pulpitis	28	11	17
	Fracture	39	16	23
	Other	5	0	5
Comorbidity	Hypertension	43	29	14
	Diabetes/hypertension	106	94	12
	Peptic ulcer disease	16	8	8
	Diabetes	6	3	3
	Nil	427	225	202
Duration of symptoms (weeks)	≤ 1.0	236	165	71
	1 – 2	167	109	58
	3 – 4	41	27	14
	≥ 4.0	154	58	96
Preferred chewing sides	Right	226	126	100
	Left	220	91	126
	Both	152	142	10

Table 2. Association of Gender with Patients' Characteristics.

Characteristics	Values	Male	Female	*p*-value (ci = 95%)
Age (years)	≤ 10	12	10	
	11 – 20	25	51	
	21 – 30	70	93	
	31 – 40	45	61	
	41 – 50	26	40	
	51 – 60	35	30	
	≥ 60	47	55	0.2240
Diagnosis	Acute apical periodontitis	142	192	
	Caries	53	64	
	Abscess	14	18	
	Retained root	5	15	
	Gingivitis	11	12	
	Pulpitis	12	16	
	Fracture	20	19	
	Others	2	3	0.7526

Cont…

Comorbidity	Hypertension	20	23	
	Diabetes/hypertension	49	56	
	Peptic ulcer disease	3	16	
	Diabetes	3	3	
	Nil	183	242	0.1561
Duration of symptoms	≤ 1	99	137	
(weeks)	1 – 2	77	89	
	3 – 4	13	28	
	≥ 4	69	86	0.3685
Preferred chewing side	Right	78	148	
	Left	119	101	
	Both	64	88	0.0002

Table 3. Association of Diagnosis with Comorbidity.

Diagnosis	Hypertension	Diabetes & hypertension	Peptic ulcer disease	Diabetes	None	*p* - value
Acute apical periodontitis	23	62	7	4	239	
Caries	7	22	5	1	82	
Abscess	3	1	0	0	28	
Retained root	2	4	1	0	13	
Gingivitis	1	8	1	0	13	
Pulpitis	0	3	1	0	24	
Fracture	6	5	1	1	26	
Others	1	1	0	0	2	0.5564
Total	43	106	16	6	426	

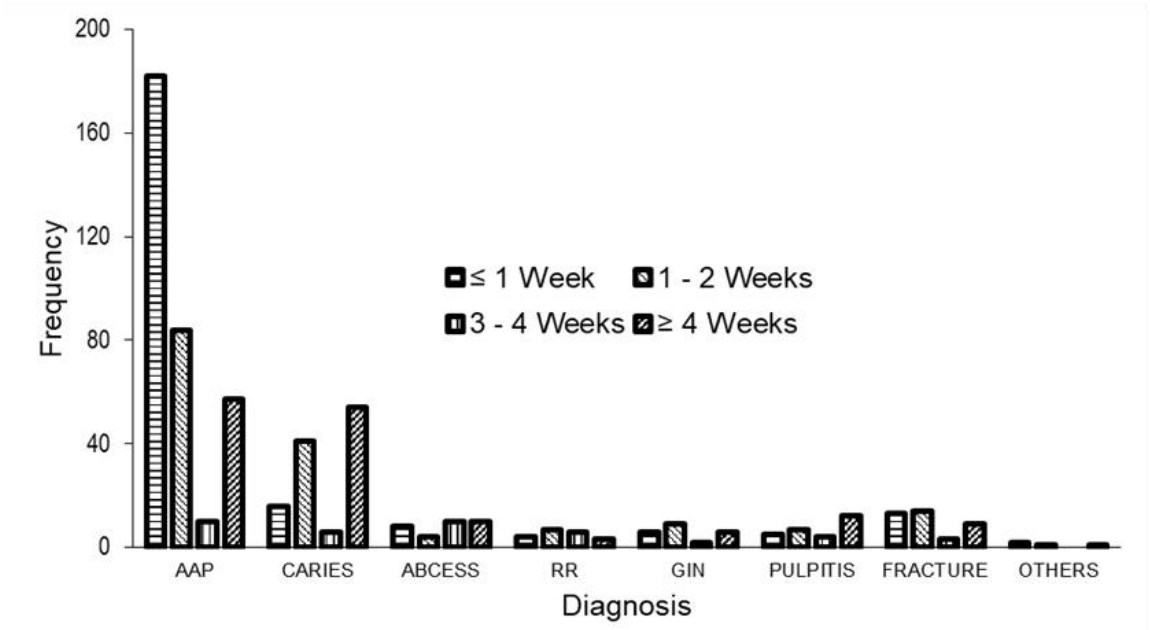

Figure 1. Association of the duration of symptoms with diagnoses (AAP = Acute apical periodontitis, RR = Retained root, GIN = Gingivitis)

Table 4. Association of Anatomical Position of Extracted Teeth with Gender of Participants.

Quadrant	Position	Male	Female	*p*-value
Right upper	1st incisor	7	7	
	2nd incisor	2	4	
	Canine	0	1	
	1st Premolar	3	8	
	2nd Premolar	5	6	
	1st Molar	18	16	
	2nd Molar	10	10	
	3rd Molar	7	10	0.7992
Right lower	1st incisor	5	3	
	2nd incisor	2	2	
	Canine	1	2	
	1st Premolar	4	4	
	2nd Premolar	6	3	
	1st Molar	25	38	
	2nd Molar	20	34	
	3rd Molar	14	20	0.6932
Left upper	1st incisor	4	2	
	2nd incisor	3	3	
	Canine	4	3	
	1st Premolar	3	4	
	2nd Premolar	8	5	
	1st Molar	14	23	
	2nd Molar	8	5	
	3rd Molar	9	15	0.5855
Left lower	1st incisor	3	3	
	2nd incisor	0	2	
	Canine	1	0	
	1st Premolar	5	4	
	2nd Premolar	5	3	
	1st Molar	24	52	
	2nd Molar	27	35	
	3rd Molar	20	24	0.2772

Table (**3**) shows the association of oral diagnoses with comorbidity in the study population. Majority of the study population (426, 71.2%) did not disclose having any other medical condition. However, the encountered medical conditions associated with some of the study participants were diabetes and hypertension (106, 17.7%), hypertension (43, 7.2%), peptic ulcer disease (16, 2.7%) and diabetes (6, 1.0%). Also, there was no significant difference between comorbid conditions and the occurrence of oral conditions.

Figure (**1**) depicts the association of the duration of symptoms before reporting for medical care with diagnoses. Most patients who reported for medical intervention within less than one week of developing

symptoms of oral infections had acute apical periodontitis.

Table (**4**) shows the association between the extracted tooth and the anatomical position with gender. The molars were the most frequently extracted teeth. The first, second and third molars of the four quadrants of the mouth were the most frequently extracted teeth in both sexes. Also, there was no significant differences between the anatomical position of extracted teeth and gender of the study patients.

DISCUSSION

The high prevalence of oral infections among females may be due to several factors such as the early eruption of teeth in the females leading to longer exposure time to the cariogenic oral environment [9,10]. In addition, the constituents of saliva and its flow rates are markedly altered by hormonal changes at puberty, menstruation, and pregnancy [11,12] and these could have made the oral environment more cariogenic for women than men. However, no significant difference was reported between females and males regarding diagnoses of oral infections (p = 0.7526).

There was a high rate of oral diseases in both sexes within the age group of 21-40 years; accounting for 44.98% of the study population. Most young adults in this age group are engaged in unhealthy behavioural practices like smoking and consuming sugary beverages and chocolates that predispose them to oral infections [13]. Additionally, the increasing prevalence of oral sex among young people in this age group could have facilitated the transmission of mucosal infections due to gum injuries [14]. Studies have shown that oral-candidiasis, Herpes simplex and mucormycosis were among the popular sexually transmitted infections among young adults [15,16]. Mucormycosis is a rare fungal infection that affects the maxilla, especially among diabetic and immunocompromised patients. It has also been documented that adults aged 21-40 years are more likely to use oral prosthetics either for aesthetic or medical reasons. The prosthetics device can enhance microbial adhesion and biofilm formation on the affected teeth and, if left untreated, could initiate the development of carious lesions [17-20].

The most common oral diagnoses in this study was acute apical periodontitis (55.0%), prevalent in patients within the age group of 21-40 years. Previous studies had reported a prevalence of 15-58% for periodontal disease with deep pocketing in Nigerian patients aged 15 years and above; the occurrence of the disease was attributed to poor oral hygiene and socioeconomic status [20].

The study population's time frame for seeking medical care seemed to follow no pattern in their visit to the dental clinics but the type, nature, and severity of the oral infections encountered and associated symptoms may have informed these variations in the time frame for seeking medical care. Most of the study participants had acute apical periodontitis, a known dental emergency characterized by throbbing pain, erythema and swelling [21]. The associated severe and persistent symptoms push the patient's quick visit to the dental clinic to seek medical intervention in less than one week of symptoms. The current findings showed that 50% of the cases diagnosed with ailment (mandibular fracture) also reported for medical care in less than one week, possibly due to the severity of the experienced symptoms. Mandibular fracture is a medical emergency prominently caused by road traffic injuries, falls, interpersonal violence, and sports activities [22]. The fracture can lead to Ludwig angina, a reportedly life-threatening odontogenic infection of the lower molars (i.e., mandibular molars), with the associated pain/swelling of the oral cavity rapidly progressing to aspiration pneumonia and airway obstruction [23]. Damage or infection to the mandibular area is often accompanied by immediate impairment of speech, chewing, swallowing, breathing and aesthetics of the face [24]. The apparent traumatic nature and consequence of this condition explained and highly justified the speedy report of patients to the hospital for care.

Pulpal pain is often spontaneous, intense, and throbbing, usually exacerbated by temperature, which outlasts the evoking stimulus and tends to radiate to the ipsilateral ear, temple, or cheek. This pain compels patients to readily seek dental care within a few days of developing symptoms as seen in this study for pulpitis [25]. About 10% of the study participants with dental caries reported for care in less than one week of tooth decay, possibly due to the absence of toothache in the early stages. However as tooth decay progresses, infections, pain, facial swelling and fever would result [26].

Humans have been documented to display a behavioural pattern towards using one side of the body in relation with the dominant hemisphere of the brain [27,28]. Although the study population were not subjected to hemispherical literalities testings, a slight majority of them had a preferential right side of the mouth (37.79%) over the left side of the mouth (36.79%) for chewing. This finding agrees with the conclusions from some works where most individuals preferred to chew with the right side of the mouth in line with the dominant hemisphere of their brains [28-30].

Sex or gender did not significantly affect the evaluated variables like; age, diagnoses, comorbidity, and duration of symptoms, except preferred chewing side which differed between genders (p = 0.0002). Women preferred the right side chewing compared to men who preferred to chew with the left side.

This study obtained self-reported information on comorbidities. A majority of the study population did not disclose other medical conditions. This is consistent with a previously reported study where it was observed that respondents who had chronic comorbid conditions significantly withheld information from their clinician [31]. Previous studies have reported an association between many systemic conditions like diabetes, cardiovascular diseases, endocarditis, pregnancy-related issues, rheumatoid arthritis and osteoporosis with chronic dental diseases [32-34]. In addition, peptic ulcer disease has also been linked with oral infections. A cross-sectional study has reported a statistically significant association between periodontal disease and peptic ulcer [35]. Furthermore, 7.2% of the participants in this study reported hypertension as a comorbid condition.

Periodontitis, the most prevalent oral disease reported in this study, represents a reservoir site for producing inflammatory mediators (C-reactive proteins, interleukins and tumor necrosis factor-alpha). These mediators of inflammation are important drivers of hypertension. Experimental and observational clinical evidence has suggested an association between periodontitis and hypertension [36].

The observed high number of excised molars (first, second and third) in both genders may be due to their posterior position in the mouth and pivotal role in mastication. Mastication involves the crushing and grinding of food particles in the mouth, which brings the maxillary and the mandibular molars into repetitive contact. This repeated process lodges food particles in-between the molars that are difficult to remove due to the back position of the molars in the mouth. Prolong exposure of the food debris to the molars may lead to their decay, thereby necessitating an extraction.

The study also found a correlation between the chewing side preference and the position of the most frequently extracted tooth. It was observed that patients who preferred to chew on one side of the mouth also lost more teeth from that side. This may be due to the unilateral masticatory habits of the patients with the associated accumulation of plaque and calculus on the contralateral side, leading to dental caries, periodontal diseases and other oral infections [37]. It has been documented that the preferred chewing side has a high traumatic potential effect on the temporomandibular joint of the same side [38,39]. Furthermore, the mechanical stresses from continuous mastication in the preferred chewing side may also affect the dento-facial morphology, leading to an increased predisposition to oral infections [39].

In addition, prolonged one-sided chewing during the formative years may predispose an individual to pain in the pre-auricular area, soreness of masticulatory muscles and weakness of temporomandibular joints. All of these can lead to the accumulation of plaque/calculus and, consequently, an increased predisposition to oral infections that could ultimately lead to the extraction of the infected teeth [37]. Also, since there was no significant difference between the preferred chewing side and the most frequently excised teeth, our study revealed that preferred chewing side may not be a potential predisposing factor for tooth extraction.

CONCLUSION

The epidemiological data from the two study centers have demonstrated that patients between 21 - 40 years are equally predisposed to oral diseases and dental caries. Acute apical periodontitis was the most prevalent in both genders. Also, the teeth of the first, second, and third molars were the most extracted teeth, and both genders preferred to chew with the right side of the mouth. The study revealed the presence of peptic ulcer, hypertension, diabetes and a combination of hypertension/diabetes as coexisting

chronic conditions by the participants. There were no statistically significant association between, peptic ulcer, diabetes, hypertension and encountered oral diseases.

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