Pattern and indications for tooth extraction in a Tertiary Hospital, Kebbi State, Nigeria

Taiwo OA[1]*, Oduola TK[2], Farouk OM[2], Braimah RO[1], Ibikunle AA[1], Labbo JS[2], Musa K[2], Awwal N[2], Ayodele MF[2], Amao AT[3]

[1]Department of Surgery/Dental & Maxillofacial Surgery, College of Health Sciences, Usmanu Danfodiyo University/ Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.
[2]Department of Dental and Maxillofacial Surgery, Sir Yahaya Memorial Hospital, Birnin Kebbi, Kebbi, Nigeria.
[3]Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital, Idi-araba, Lagos, Nigeria.

ABSTRACT

The aim of this study is to investigate the reasons and pattern of tooth extraction in patients attending the outpatient Dental clinic of Sir Yahaya Memorial Specialist Hospital, Kebbi, North-West Nigeria between January 2014 and December 2016. The design was a retrospective study of records of individuals who had tooth extraction. Patients' records were retrieved and analyzed for gender, age, indication(s) for tooth extraction and type of tooth/teeth extracted. A total of 428 extractions from 213 (51.0%) males and 204 (49.0%) females (M:F = 1.04:1) were undertaken during this period. There was no statistical significance difference in gender against indications for extraction [p = 0.8521, 95% CI = 0.018 (-0.096 to 0.131)]. The age ranged from 1 to 75 years (mean ± SD, 30.7 ± 15.2 years, median = 30.0) with majority of the patients (77.6%) not more than 40 years old. Teeth extracted were for patient in the age group 21-30 years. Three hundred and fifty five patients (85.0%) presented with pain while routine dental check up accounted for 4 (1.0%) cases. The major indications for extraction were dental caries and its sequelae 341 (79.7%), periodontal disease 44 (10.3%) and trauma 20 (4.6%). Teeth in the lower arch were more regularly extracted than upper teeth. The lower first molars were the principally extracted teeth. In conclusion, dental caries and its sequelae was the main reason for removal of teeth in this subset of Nigerian population. Thus, it is imperative to ameliorate the underlying social determinants of dental caries and eliminate barriers limiting access to primary preventive oral health care.

Keywords: Dental Caries, tooth extraction, indications, inequality, social determinants, oral diseases, prevention.

*Corresponding author. E-mail: droataiwo@yahoo.com. Tel: +234 8078061517.

INTRODUCTION

In many resource challenged developing countries especially those of sub-Sahara Africa, oral diseases such as dental caries and periodontal diseases persist as major public health problems regardless of significant scientific progress and aggressive oral health promotion (Taiwo et al., 2013; Fernández-Barrera et al., 2016; Petersen, 2003; Lesolang et al., 2009; Bhayade et al., 2016; Akaji et al., 2012).

These oral diseases are often overlooked resulting in spread and compromise of tissues and organs within and beyond the head and neck region (Taiwo et al., 2013;

Ibikunle et al., 2016; Akpata, 2011). Drastic measure of tooth removal is taken in many instances to avoid detrimental consequences (Lesolang et al., 2009; Akaji et al., 2012; Ibikunle et al., 2016). Tooth extractions constitute the bulk of daily regular procedures carried out in both public and private dental practice (Fernández-Barrera et al., 2016; Taiwo et al., 2013; Lesolang et al., 2009; Bhayade et al., 2016; Akaji et al., 2012). The resultant dental losses require enormous work, expertise and cost to restore to the pre-morbid state and consume large chunk of time and resources (Fernández-Barrera et

al., 2016; Taiwo et al., 2013). Thus, imposing massive strain on the cash strapped and manpower depleted health system of several low income countries (Petersen, 2003; Brennan et al., 2008).

Tooth extraction could also lead to deterioration in the persons' quality of life, mastication, aesthetic, speech and social standing (Brennan et al., 2008; Fernández-Barrera et al., 2016). Moreover, it could also result in loss of productivity/earnings and reduction of Gross Domestic Product (GDP) of the affected country (Fernández-Barrera et al., 2016; Petersen, 2003).

Hence, study of the patterns and indications pertaining to tooth extractions shall provide pertinent information which will hopefully assist the government and other major stakeholders in implementing policies that will improve oral health literacy, encourage early utilization of dental care and increase uptake of oral health promotion among the vulnerable population in the state and northwest region (Petersen, 2003).

Conversely, there is paucity of research from this state regarding the main factors implicated in tooth extractions. Therefore, this study aims to investigate and analyze the major patterns and indications for tooth extractions among patient seeking care in the oral surgery unit of the premier hospital in Kebbi State, northwest Nigeria.

MATERIALS AND METHODS

This was a 3 years retrospective review of the clinical records of individuals who presented at the outpatient dental clinic of Sir Yahaya Memorial hospital, Birnin-Kebbi, Kebbi State, Nigeria for tooth extractions from 1st January 2014 to 31st December 2016. This hospital is the oldest tertiary centre owned by the state government strategically located in the capital. Kebbi State boundaries are with Sokoto State in the North-East, Zamfara State in the East, Niger State in the South and Republic of Niger in the West. The state has a land mass of approximately 36,800 square kilometers. Its population of about 3.1 million is largely rural with farming as major occupation (National Population Commission, 2006). Patients with complete clinical records were included in the study while those with incomplete records were excluded.

Data gathered from the patients' records include gender, age, date of tooth extraction(s), presenting complaint, diagnosis (indication) and type of tooth/teeth removed. The indication(s) for tooth extraction were categorized as follows dental Caries and its sequelae, periodontal disease, orthodontics, trauma, recurrent pericoronitis and others. The types of teeth were grouped into upper deciduous, lower deciduous, upper anteriors, upper premolars, lower premolars, upper molars and lower molars. The type of teeth were also grouped into right and left sides of the jaws. In addition to the standard age categorization, the ages were broadly divided into those ≤40 years and those >40 years.

Data analyses were performed using Analyze-it version 2.25 Excel 12+ (2013). These were presented as mean ± standard deviation (SD) for variables with normal distribution: median and interquartile range for variables with skewed distribution and percentage for categorical variables. Two-tailed student independent t-test was used to compare the age distribution in male and female. Pearson's Chi-square was used to assess the association and level of significance among categorical variables such as indications for tooth extractions, gender, age groups and tooth types with p≤0.05 considered as statistically significance.

Ethical approval was obtained from the research and ethics committee of the Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria.

RESULTS

During this period a total of 428 extractions were done with 226 (52.8%) males and 202 (47.2%) females (M:F = 1.1:1) (Table 1). There was no statistical significance difference between both genders [t statistic=-0.26, df = 421, p = 0.7916, 95% CI = -0.4 (-3.3-2.5)]. The age ranged from 1 to 75 years (mean ± SD, 30.7 ±15.2 years, median=30.0) with majority of the patients (77.6%) not more than 40 years old (Table 1). Higher proportion of the extracted teeth belongs to the 21-30 years age group (Figure 1, Table 2).

Three hundred and fifty five cases (85.0%) presented because of pain while routine dental check up accounted for 4 (1.0%).

The major indications for extraction were dental caries and its sequelae 341 (79.7%), periodontal disease 44 (10.3%) and trauma 20 (4.6%) (Tables 1 and 2). Dental caries and its sequelae was the most frequent cause of tooth extraction across all ages except in the 8th decade where periodontal disease was dominant (Table 2). There was statistical significance between indication for extraction, gender and age of the patients (P < 0.05) (Table 2).

Slightly over 50% of teeth extracted due to periodontal disease were over 40 years and all third molars extracted for recurrent pericoronitis were in the 3rd decade (p ≤ 0.0001). Males had 95% (n = 19) of teeth extracted for trauma with 90% (n = 18) under 40 years (p ≤ 0.0001) (Tables 1 and 2).

Most of the extractions were from the left side 56.1% (n = 240). The lower teeth 68.5% (n = 293) extracted were more than twice that of the upper teeth 31.5% (n = 135) (Table 3).

Molars accounted for 76.4% (n = 327) of teeth removed with first molars dominant 31.5% (n = 135). The most regularly extracted teeth were the lower left first molars 61 (14.3%) and lower right first molars 40 (9.3%) (Table 4). Dental caries 87.8% (n = 287) and periodontal diseases 6.7% (n = 22) were the key indications for the extractions of these molars (p > 0.0001) (Table 4).

The upper incisors 33 (7.7%) were the principal anterior teeth extracted with dental caries, periodontal disease and trauma playing significant roles (Table 4).

And for deciduous teeth, dental caries and sequelae accounted for 78.1% (n=25) with 53.1% (n=17) being molars (Table 4).

DISCUSSION

Worldwide, the pivotal role of healthy teeth in achieving sound population oral health is unequivocal (Petersen, 2003; Taiwo et al., 2013; Brennan et al., 2008).

Table 1. Distribution of indications for extractions by gender.

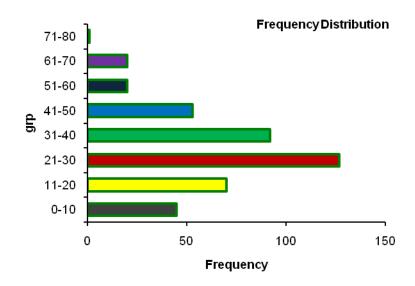| Indications for extractions	Gender		Total (%)
	Female (%)	Male (%)	
Dental caries and sequelae	172 (40.2)	169 (39.5)	341 (79.7)
Orthodontics	3 (0.7)	2 (0.5)	5 (1.2)
Periodontal disease	20 (4.7)	24 (5.6)	44 (10.3)
Recurrent Pericoronitis	6 (1.4)	7 (1.6)	13 (3.0)
Trauma	1 (0.2)	19 (4.4)	20 (4.6)
Others	0 (0.0)	5 (1.2)	5 (1.2)
Total	202 (47.2)	226 (52.8)	428 (100.0)

$\chi^2 = 20.59$, df = 5, p = 0.001.

Figure 1. Bar chart of age groups of patients that have tooth extraction.

Table 2. Distribution of indications for extractions by age group.

Indications for extractions	Age group		Total (%)
	≤40 years (%)	>40 years (%)	
Dental caries and sequelae	277 (64.7)	64 (15.0)	341 (79.7)
Orthodontics	5 (1.2)	0 (0.0)	5 (1.2)
Periodontal disease	19 (4.4)	25 (5.8)	44 (10.2)
Recurrent Pericoronitis	13 (3.0)	0 (0.0)	13 (3.0)
Trauma	18 (4.2)	2 (0.5)	20 (4.7)
Others	0 (0.0)	5 (1.2)	10 (2.4)
Total	332 (77.6)	96 (22.4)	428(100.0)

$\chi^2 = 56.81$, df = 5, p < 0.0001.

Unfortunately, incessant tooth extractions remain a significant barrier in achieving this target across many parts of Africa (Taiwo et al., 2013; Lesolang et al., 2009; Akaji et al., 2012).

The current study indicated a slight male predilection in concordance with recent finding from northwest Nigeria (Taiwo et al., 2012). It however, contradicts reports from southern Nigeria, Burkina Faso, Pakistan and India (Guiguimde et al., 2014; Saheeb and Sede, 2013; Danielson et al., 2011; Kashif et al., 2014; Nuvvula et al., 2016). Earlier authors have blamed female anxiety and fear of oral surgical procedure coupled with their

Table 3. Distribution of age group by gender and arch involved.

Age groups	Gender		Arch	
	Female (%)	Male (%)	Upper (%)	Lower (%)
0 - 10	20 (4.7)	25 (5.8)	13 (3.0)	32 (7.5)
11 - 20	32 (7.5)	38 (8.9)	12 (2.8)	58 (13.6)
21 - 30	61 (14.3)	66 (15.4)	45 (10.5)	82 (19.2)
31 - 40	47 (11.0)	45 (10.5)	27 (6.3)	65 (15.2)
41 - 50	28 (6.5)	25 (5.8)	24 (5.6)	29 (6.8)
51 - 60	9 (2.1)	11 (2.6)	6 (1.4)	14 (3.3)
61 - 70	4 (0.9)	16 (3.7)	8 (1.9)	12 (2.8)
71 - 80	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.2)
Total	202 (47.2)	226 (52.8)	135 (31.5)	293 (68.5)
	$\chi^2 = 8.56$, df = 7	p = 0.2857	$\chi^2 = 13.74$, df = 7	P = 0.0559

Table 4. Distribution of patients' tooth groups and indications for extractions.

Tooth groups	Dental caries/S	Periodontal disease	Trauma	Recurrent pericoronitis	Orthodontics	Others	Total
Upper deciduous	3 (0.7)	3 (0.7)	2 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	8 (1.9)
Lower deciduous	22 (5.1)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.5)	0 (0.0)	24 (5.6)
Lower incisors and canines	10 (2.3)	5 (1.2)	9 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)	24 (5.6)
Lower molars	211 (49.3)	10 (2.3)	1 (0.2)	12 (2.8)	1 (0.2)	0 (0.0)	234 (54.7)
Lower premolars	7 (1.6)	4 (0.9)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	12 (2.8)
Upper incisors and canines	8 (1.9)	8 (1.9)	8 (1.9)	0 (0.0)	1 (0.0)	5 (1.2)	30 (7.0)
Upper molars	59 (13.8)	12 (2.8)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	72 (16.8)
Upper premolars	21 (4.9)	2 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	23 (5.4)
Total	341 (79.6)	44 (10.3)	20 (4.7)	13 (3.0)	5 (1.2)	5 (1.2)	428 (100)

$\chi^2 = 259.62$, df = 35, p < 0.0001.

preference for non-surgical dental treatment (Taiwo et al., 2013; Akaji et al., 2012).

Pathologies resulting from untreated dental caries could cause excruciating pain sometimes not amenable to analgesics (Akaji et al., 2012; Taiwo et al., 2013; Saheeb and Sede, 2013; Omitola and Arigbede, 2010). Furthermore, if left unattended they could inevitably leads to more sinister sequelae such as abscess, cellulitis, Ludwig angina, necrotizing fasciitis, severe sepsis, shock and not uncommonly death (Omitola and Arigbede, 2010; Akpata, 2011). Pain was detected as the foremost impetus for presentation in this sub-population similar to reports from various investigators across other regions of Nigeria (Akaji et al., 2012; Saheeb and Sede, 2013; Omitola and Arigbede, 2010). Patients presenting late for treatment faces heavy financial outlay (Taiwo et al., 2013). Many being from low socio-economic strata barely surviving on subsistence agriculture incur huge losses of income during their period of hospitalization in addition to the piles of hospital bills incurred (Taiwo et al., 2013; Ibikunle et al., 2016; Taiwo et al., 2012). This imposes severe constraint on the fragile health system already comatose from incessant under funding, corruption, brain

drain and years of trying to curtail the onslaught of infectious diseases coupled with non-communicable diseases such as cancer, hypertension, diabetes, substance abuse and others (WHO, 2008). The pervasive socio-economic inequities across many developing communities worldwide have been incriminated as a barrier in early utilization of healthcare (WHO, 2008; Taiwo et al., 2013). All these have serious socio-economic repercussions, with perpetuation of poverty and chronic underdevelopment(WHO, 2008). Therefore, the present research suggests the need to decisively tackle the underlying structural and social determinants of oral health by improving the living conditions of these vulnerable rural communities through making health services easily accessible to all.

Moreover, our results found that dental caries and its sequelae recorded over two thirds of teeth extracted. This concur with recent studies from numerous developing nations (Lesolang et al., 2009; Taiwo et al., 2012; Guiguimde et al., 2014; Saheeb and Sede, 2013; Kashif et al., 2014; Medina-Solís et al., 2013) but counter findings from developed countries that demonstrated downward spiral in dental caries among their population

(Aida et al., 2006; McCaul et al., 2001). Mounting evidences revealed that inequality in the distribution of indicators of socioeconomic status such as education, income, occupation and inequality coefficients may amplify the risk of dental caries(Costa et al., 2012; Schwendicke et al., 2015). This is buttressed by the observation that parents with poor educational backgrounds and low income tend to have low oral health literacy and thus increase the risk of their wards developing early childhood dental caries (Traebert et al., 2009). In addition, significant variations in caries experience have been shown to exist within and between countries at various levels of economic development (Do, 2012). Socio-economic disadvantaged minorities in affluent countries have almost mirror image of caries experience as that of similar groups in poor developing countries (Do, 2012; Traebert et al., 2009). Hence, it is suggested that in the short term to prevent further spiral of dental caries, oral health should be seamless incorporated into the existing primary health care. However, in the long run equitable and sustainable population based programs targeted at improving upstream factors such as social-economic disparities; inequitable access to quality education and affordable dental care should be prioritized.

Periodontal disease was the second leading cause of tooth extraction in this series; the current figure of 10.3% is above that earlier reported by others in the region and India (Danielson et al., 2011; Nuvvula et al., 2016). The proportion of extraction owing to periodontal disease was greater in those over the age of 40 years especially in the 8th decade. This observation have been blamed on lack of regular oral care, lack of awareness, poor socio-economic conditions and institutional barriers in accessing dental services (Lesolang et al., 2009; Kashif et al., 2014; Nuvvula et al., 2016).

Worldwide, trauma was declared as one of the leading cause of dental injuries and hospital admission (Oginni et al., 2006). Road traffic crashes (RTC), sports, gunshot, fall and interpersonal violence have been implicated in both adults and children (Oginni et al., 2006; Olasoji et al., 2002; Taiwo et al., 2013). Ignoring treatment of these dental injuries at the time of occurrence could ultimately result in sacrifice of the teeth affected (Taiwo et al., 2013). The 4.2% recorded for trauma in this series is greater than previous reports from northwest Nigeria (Taiwo et al., 2013; Taiwo et al., 2012). Ninety five percent of males were involved and the proportion of anterior teeth lost to trauma in both adults and children was alarming in this current study. In this region, organized public mass transit is non-existent. There is heavy reliance on commercial motorcycles as the major mode of intra-city transport (Oginni et al., 2006). The operators of these commercial cycles are notorious for substance abuse and non-adherence to road safety regulations such as wearing helmets and complying with legislated speed limit. These suggest a serious need to

embark on massive public enlightenment on dental trauma as one of the consequences of substance abuse and non-adherence to traffic rules and the urgency of policy makers to provide safe affordable public transport.

The result of the present work highlights orthodontics as one of the least popular indication for tooth extraction keeping with many studies from northwest Nigeria but contrary to findings from Southern Nigeria, Turkey and Western countries (Guiguimde et al., 2014; Saheeb and Sede, 2013; Danielson et al., 2011; Aida et al., 2006; McCaul et al., 2001; Bani et al., 2015) (Figure 2). This could be attributed to dearth of specialist orthodontists in this region. Demands for fixed orthodontic services in our centre have necessitated referral to more established centre in other parts of the country.

Recurrent pericoronitis secondary to impaction was clearly established in this research as one of the principal reason for the extraction of third molars comparable to the findings in the literature (Taiwo et al., 2012; Saheeb and Sede, 2013; Danielson et al., 2011; Adeyemo et al., 2008). Over 90% of these patients presented between 3rd and 4th decades in concordance with other studies (Adeyemo et al., 2008; Danielson et al., 2011; Saheeb and Sede, 2013; Taiwo et al., 2012; Lesolang et al., 2009). This report affirms the unpopularity of prophylactic third molar extraction unlike in North America where it is widely embraced (Adeyemo et al., 2008; Rafetto, 2015; Cunha-Cruz et al., 2014). Prevention of future pathologies including infections, cysts and neoplasm; cost effectiveness, ease of removal at younger age, reduction in risk of mandibular angle fracture and lack of clear evident role of wisdom tooth in occlusion and mastication were some of the justifications for the prophylactic extraction of asymptomatic non-diseases third molars (Rafetto, 2015; Cunha-Cruz et al., 2014). However, current evidences debunk these claims and strongly push for discontinuation of this practice (Taiwo et al., 2012; Adeyemo et al., 2008; Costa et al., 2013).

Our data showed that tooth extraction reached its climax among the 21 to 30 years old in accordance with previous investigators (Taiwo et al., 2013; Taiwo et al., 2012; Saheeb and Sede, 2013; Danielson et al., 2011). Consumption of processed foods, beverages and resistance to oral hygiene practices by this group of young people have been suggested as plausible factors for this result. However, the predominance of dental caries up to the 7th decade suggests that dental caries is active even in the elderly. We speculate that the consumption of caries prone diet is more widespread than earlier imagined. Hence, it might be wise to extend the benefits of healthy dietary education across all age groups.

The current work disclosed the left side to be more affected by tooth extraction in agreement with an earlier observation from the region (Taiwo et al., 2012) but conflicts that from southern Nigeria (Saheeb and Sede, 2013; Danielson et al., 2011). The proportion of teeth
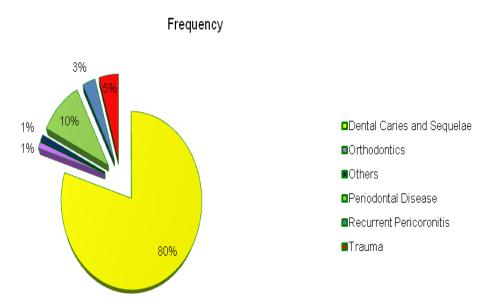
Frequency

Figure 2. Pie chart showing indication for tooth extraction.

removed in the mandible doubles that of the maxilla in this series in agreement with various works (Taiwo et al., 2012; Saheeb and Sede, 2013; Danielson et al., 2011; Medina-Solís et al., 2013; Taiwo et al., 2013).

The molars especially the first molars were the most widely extracted teeth across primary and permanent dentition in concurrence with prior works (Lesolang et al., 2009; Taiwo et al., 2012; Saheeb and Sede, 2013; Danielson et al., 2011; Kashif et al., 2014). The susceptibility of molars have been blamed on function, posterior location, early eruption that lead to prolong exposure to sugar products, large anatomic surface area; and presence of deep/difficult to clean pits and fissures (Lesolang et al., 2009; Saheeb and Sede, 2013; Kashif et al., 2014). To guard against the above and achieve long-lasting caries free years; water fluoridation at the population level; application of fissure sealants to primary and permanent molars at early period following eruption and atraumatic restorative treatment (ART) of occlusal dental caries with glass ionomer cement (GIC) have been mentioned as some of the fundamental cost effective oral health promotive strategies (Lesolang et al., 2009). Others include twice daily brushing with fluoridated toothpastes i.e lastly before going to bed and after eating in the morning; avoidance of in-between meal snacks, rinsing and dental check-up once every 6 months (Lesolang et al., 2009; Kashif et al., 2014; Nuvvula et al., 2016).

However, we emphasize that the success of the above downstream strategies crucially pivoted on effectively tackling the upstream factors by reducing financial hardship, expand dental health preserving strategies could improve dental and general health of the entire population of this region to capture the poor and cover more dental services.

Conclusion

Dental caries and its sequelae was the main reason for tooth extraction and the molars were the most susceptible teeth in this subset of Nigerian population. Thus, it is imperative to look at the underlying social determinants of these oral diseases and barriers to accessing primary preventive oral health care. Preventive programs targeting mothers, kindergarten and schools up to secondary level should be vigorously pursued.

We acknowledge that the limitations of this study include its restriction to the hospital setting, thus, the sample might not be representative of the entire Kebbi population. In addition, owing to its retrospective data collection, important information might have been lost or omitted during collation coupled with different ways of documentation by various clinicians. Hence, future prospective study is recommended to explore our findings.

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