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ORIGINAL RESEARCH

Prevalence of Impacted Teeth in a Brazilian Subpopulation

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ABSTRACT

The objective of this study was to estimate the prevalence of impacted teeth in a subpopulation of Brazilian patients based on the retrospective analysis of panoramic radiographs obtained at an oral radiology clinic. Out of 1,977 panoramic radiographs, 1,352 fulfilled inclusion criteria, and 22,984 teeth were assessed. Data were statistically analyzed using Kolmogorov-Smirnov's and Levene's tests; significance was set at 5%. The number of impacted teeth was assessed using analysis of variance and Tukey's post-hoc test. Our results showed significant differences for tooth type and patient age when analyzed separately ($p < 0.05$); gender did not show significant results ($p > 0.05$). Correlations between age and gender showed significant differences ($p < 0.05$), as did the correlations between age, gender and tooth type ($p < 0.05$). Mandibular molars were the teeth most frequently affected ($p < 0.05$), followed by maxillary molars ($p < 0.05$). Other tooth types did not present significant differences among themselves ($p > 0.05$). Patients aged 22 years or younger were the most frequent ones ($p < 0.05$). No significant differences were observed between age groups 37 and 51 years and 52+ ($p > 0.05$). According to the methodology here employed, gender did not affect tooth impaction, whereas age (22-36 years) and tooth type (mandibular third molars) strongly influenced results.

Keywords: Dentistry, Surgery, Oral, Tooth, Impacted.

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INTRODUCTION

Human dentition comprises 32 teeth with different shapes and functions, including incisors, canines, premolars, and molars. Impacted teeth, also called unerupted teeth, are teeth that fail to erupt into the dental arch because of either an abnormal eruption process, abnormal position in the arch, or lack of space in the arch.[1-3] Ectopic tooth buds, early loss and ankylosis of primary teeth, tooth crowding, presence of fibrous tissue covering the tooth, supernumerary teeth, presence of cysts and odontogenic tumors, occurrence of traumatic injuries during tooth formation, and dietary habits that demand very little from the stomatognathic system are all causes commonly associated with impacted teeth.[1,2,4,5]

When diagnosis is made late, impacted teeth may compromise the integrity of the maxillomandibular complex, as a result of the forces exerted by the impacted tooth on other erupted teeth, provoking tooth crowding. Other potential consequences include root resorption of adjacent teeth, orofacial pain, infections, or even the onset of odontogenic lesions.[4] In patients with partially impacted teeth, difficulties cleaning the area may lead to the accumulation of bacterial biofilm, causing halitosis, inflammation, gingival sensitivity, and caries.[3]

Whenever practitioners are faced with the clinical absence of one or more teeth and no evidence of previous tooth extraction is obtained during anamnesis, congenital absence of teeth and tooth impaction should be suspected.[1,6] Teeth erupting at later ages, e.g. mandibular and maxillary third molars and maxillary canines, are the ones most frequently affected.[2] Whereas the evolution of human intelligence has caused an increase in the size of the brain and skull, mastication muscles have been observed to decrease in volume and size over time, combined with a decrease in lower facial projection, as a result of smaller maxillary bones—but not smaller teeth.[2]

The identification of impacted teeth is usually based on imaging studies.[1,7] In fact, most of the factors involved in the decision to extract (or not to extract) impacted teeth can be determined during preoperative radiographic examination. In this sense, the panoramic radiography has become an extremely useful tool, confirming its already consolidated role in the daily practice of dental practitioners.[1,7,8]

Assessing the prevalence of impacted teeth in a given population is important for the establishment of anthropological data as well as for the planning of preventive and therapeutic strategies aimed at this population, with a direct influence on patient management and clinical decision-making.[1,2,4,6,9] The objective of this study was to estimate the

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prevalence of impacted teeth in a subpopulation of patients from the municipality of Cuiabá, state of Mato Grosso, Brazil, based on the retrospective analysis of panoramic radiographs obtained at an oral radiology clinic.

MATERIAL AND METHODS

In this retrospective, cross-sectional study, all panoramic radiographs obtained in 2011 at an oral radiology clinic located in Cuiabá were analyzed for the presence of impacted teeth. Panoramic radiographs from patients aged 15 years or older, both male and female, were selected for screening. Only panoramic radiographs showing a high technical standard, allowing for proper visualization of all quadrants, were selected. Totally edentulous patients were excluded. The study protocol was approved by the Research Ethics Committee of Universidade de Cuiabá (protocol number 2012-060).

Radiographs were analyzed using a 20-inch LCD screen, in a room with controlled lighting and a level-controlled screen monitor. Images were analyzed using the tools and resources available in the Trophy Dicom software version 6.2 (Kodak Imaging System Carestream Health, New York, US), at maximum magnification. Data were entered into spreadsheets specifically designed for the purpose of this study.

Two examiners, who were previously calibrated during a pilot study, assessed all radiographs. Kappa coefficient was calculated for the determination of impacted teeth in 30 panoramic radiographs and yielded an inter-examiner agreement rate of 0.86, considered to be high. Impacted teeth were classified according to type of tooth (incisors, canines, premolars, and molars) and tooth location (maxillary and mandibular). The presence of supernumerary teeth was also assessed.

Data were statistically analyzed using the Kolmogorov-Smirnov test (to assess whether the distribution of residuals adhered to the normal curve) and Levene's test (homoscedasticity). In both analyses, hypotheses were not considered nil, and they were rejected considering a significance level of 5%. Analysis of variance was used to assess number of impacted teeth in relation to type of tooth, patient gender, and patient age. Tukey's post-hoc test was used to compare means according to the different aspects and interactions analyzed.

RESULTS

Of a total of 1,977 panoramic radiographs, 1,352 fulfilled inclusion criteria and therefore comprised the final sample of the present study. Of the total of 22,984 teeth assessed, 692 were impacted. Of these, 425 were from females and 267 from males.

Comparison across different tooth type and patient age categories showed statistically significant differences ($p < 0.05$). Gender, in turn, was not significant in the analysis ($p > 0.05$). Correlations between type of tooth and gender, and also between age and gender, did not result significant ($p > 0.05$), but the correlation between age and gender showed significant differences ($p < 0.05$). When the correlation between age, gender, and type of tooth was analyzed, statistically significant differences were found ($p < 0.05$). All correlation results are presented in Table 1.

According to Table 2, the analysis of different types of tooth showed a higher relative frequency of mandibular third molars among impacted teeth ($p < 0.05$), followed by maxillary third molars ($p < 0.05$). The other tooth types showed a statistically similar distribution ($p > 0.05$).

Table 3 shows the correlations between age group and number of impacted teeth. A higher frequency was observed in the 23 to 36-year age group ($p < 0.05$), followed by the ≤ 22-year group ($p < 0.05$). No differences were found between age groups 37 to 51 years and 52+ ($p > 0.05$).

Figure 1 illustrates the statistical interaction between type of tooth and patient gender. Females showed the highest mean of impacted maxillary third molars, whereas males had the highest mean of impacted supernumerary teeth. No significant differences were observed for the other tooth types.

In Figure 2, the statistical interaction between type of tooth and patient age showed statistically significant associations, especially for mandibular and maxillary third molars and supernumerary teeth in patients aged 22 years or younger.

Table 1: Correlation between dental impaction and clinical variables

Variable	*Sum of errors*	*Degrees of freedom*	*Mean of errors*	*Frequency*	*p**
Tooth type	109.197	16	6.825	169.056	0.000
Age	9.204	03	3.068	75.998	0.000
Gender	0.002	01	0.002	0.059	0.808
Tooth and age	61.742	48	1.286	31.862	0.000
Tooth and gender	1.140	16	0.071	1.765	0.030
Age and gender	0.234	03	0.078	1.934	0.220
Tooth age and gender	4.546	48	0.095	2.346	0.000

*Significant differences at $p < 0.05$

Table 2: Mean number of impacted teeth according to tooth type

Tooth types	*Mean number of impacted teeth*			
	1	*2*	*3*	*Number of teeth*
Mandibular first molar	0.0000[a]			-
Mandibular first premolar	0.0000[a]			-
Mandibular central incisor	0.0000[a]			-
Mandibular lateral incisor	0.0000[a]			-
Maxillary first molar	0.0000[a]			-
Maxillary first premolar	0.0007[a]			01
Maxillary central incisor	0.0007[a]			01
Maxillary lateral incisor	0.0007[a]			01
Maxillary second premolar	0.0015[a]			02
Maxillary second molar	0.0015[a]			02
Mandibular second premolar	0.0015[a]			02
Mandibular second molar	0.0022[a]			03
Mandibular canine	0.0044[a]			06
Maxillary canine	0.0104[a]			14
Supernumerary	0.0244[a]			33
Maxillary third molar		0.2004[b]		271
Mandibular third molar			0.2633[c]	356

On horizontal lines, the different superscript letters represent statistically significant differences ($p < 0.05$)

Table 3: Correlation between tooth impaction and patient age

Age group (years)	*Number of teeth evaluated*	*Subset Correlation with mean number of impacted teeth*		
		1	*2*	*3*
52+	4,556	0.0070[a]		
37-51	5,712	0.0107[a]		
23-36	9,299		0.0395[b]	
≤22	3,417			0.0679[c]

Different superscript letters indicate statistically significant differences ($p < 0.05$)

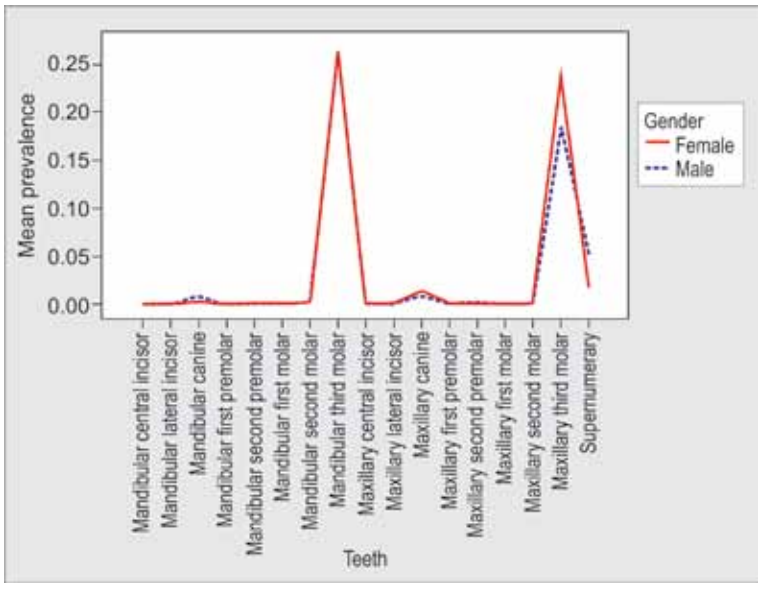

Fig. 1: Interaction between patient gender and tooth type

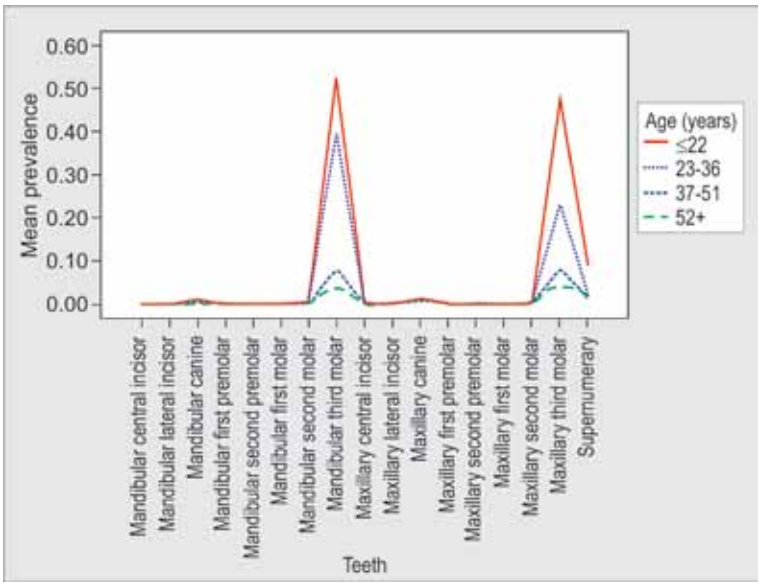

Fig. 2: Interaction between patient age and tooth type

DISCUSSION

Investigating the oral cavity beyond what is directly observable during clinical examination is extremely important and allows the dental practitioner to establish a more precise and correct diagnosis. The use of supplementary imaging exams provides valuable support in this scenario.[1,2] Panoramic radiographs are able to show details of all structures in the orofacial complex and are therefore extremely important in dental treatment planning.[8]

The prevalence of impacted teeth and their many possible etiologies have long been the subject of research.[7] Early detection of impacted or supernumerary teeth allows implementing preventive and more successful therapeutic measures.[1,2,10] Furthermore, classification of impacted teeth allows for a better communication among dental surgeons, helping anticipate difficulties and complications associated with the surgical removal of impacted teeth.[11]

Tooth impaction more frequently affects teeth that erupt at later ages. As a result, the sequence observed in this study in terms of prevalence rates—third molars, canines, premolars, incisors, first molars, and second molars—is in line with data from the literature, with slight differences in terms of the order of maxillary vs mandibular teeth.[2,4,12] Statistical analysis of the mean number of impacted teeth in the present study showed that mandibular third molars, followed by maxillary third molars, showed the highest means, which confirms the reports of most authors.[2,4]

In agreement with the findings hereby presented, previous studies have suggested a similar distribution of impacted teeth in both males and females, with only slight differences—probably clinically irrelevant.[2,12] Still regarding gender, the majority of patients selected for analysis in the present study were females (14,178 vs 8,806 in males), a phenomenon that has been reported by several authors.[2,3,13,14] It could be speculated that the higher rate of female patients may be related to a higher degree of self-care and concern with oral health and esthetics among women.

With regard to age, patients aged 20 to 29 years have been shown to present the highest prevalence rates of tooth impaction (73.9%), followed by age groups 10 to 19 (10.2%), 0 to 9, 30 to 39 (both with 5.7%), 40 to 49 (2.3%), 50 to 59, and 70 to 79 years (both with 1.1%), as reported by others.[6,12,14,15] Specifically with regard to impacted third molars, the data here presented corroborate data from the literature that describe highest prevalence rates in patients aged 15 to 29 years.[3,16]

From an epidemiological point of view, it is important to emphasize the importance of radiographically investigating the absence of a given tooth. Radiography can reveal impacted teeth even in the absence of a clear etiology, as well as cystic or tumoral lesions that may explain impaction. In the case of multiple impacted teeth, systemic abnormalities should be investigated. Finally, the decision to extract or not to extract an impacted tooth should always be based on the aim to avoid future complications.[1,2,4,17-22]

CONCLUSIONS

Based on the methodology proposed for this study, the following conclusions can be drawn:

- Mean number of impacted teeth does not seem to be significantly affected by patient gender.
- A significantly higher mean number of impacted teeth was observed in patients aged 15 to 22 years, suggesting a higher prevalence of this age group for tooth impaction.
- The following tooth types showed the highest means of impaction, as follows: Mandibular third molars,

maxillary third molars, supernumerary teeth, maxillary canines, mandibular canines, second premolars, second molars, maxillary incisors, and maxillary first premolars.

- No cases were found of impacted mandibular incisors, mandibular first premolars or first molars.

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