

Prevalence of endodontic diseases: an epidemiological evaluation in a Brazilian subpopulation

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Abstract

Aim: To determine the prevalence of pulp and periradicular diseases in a Brazilian subpopulation, correlating the prevalence with sex, age and most affected teeth. **Methods:** Data collected from medical records of patients treated at the Clinic of Specialization in Endodontics of the Federal University of Pernambuco between 2003 and 2010. The following variables were recorded for each patient: sex, age, affected teeth and diagnosed endodontic disease. Using Pearson's chi-square and Fisher's exact tests, the collected data analysis was set at a 5% significance level. **Results:** From all the treated teeth, 57% were diagnosed with pulp diseases, with the symptomatic irreversible pulpitis being the most prevalent (46.3%), while among the diagnosed periradicular diseases (43%), chronic apical periodontitis was the most prevalent (81%). Pulp diseases were detected in men and women in an unequal mode ($p=0.008$). Subjects under 40 years old had higher prevalence of pulp disease ($p=0.286$), and patients over 50 years were most affected by periradicular diseases ($p=0.439$). Maxillary incisors and mandibular first molars were the most affected teeth by endodontic diseases. **Conclusions:** In the evaluated subpopulation, the endodontic diseases were more prevalent in the maxillary incisive, affected indiscriminately individuals of different age groups and chronic apical periodontitis was the most prevalent diagnosed disease.

Keywords: Endodontics. Dental Pulp. Periapical Diseases. Epidemiology.

Introduction

In normal physiological conditions, the pulp tissue of a healthy tooth and its surrounding dentine is protected from the external environment by enamel and cementum. Nevertheless, aggressive agents like caries, dental trauma and restorative procedures may produce disruption of the tissue integrity that protects the pulp, allowing occurrence of infections in the dentin-pulp complex, eventually leading to a pulpal disease that may spread to the periradicular tissue¹⁻².

In Brazil, dental caries is one of the main damaging agents to dental pulp. A 2010 report on the oral health status of the Brazilian population, issued by the Brazilian Ministry of Health³, showed that 76.1% of adolescents between 15-19 years old had at least one decayed tooth. Among the individuals aged between 35-44 and 65-74 years, only 0.9% and 0.2% respectively, were caries-free.

Oral diseases are the fourth most expensive disease to treat in most industrialized countries⁴, affecting not only the teeth but also the surrounding tissues and, in later stages, compromising the phonetic functions, nutrition, aesthetics⁵ and even the overall

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health status of the individual⁶. This situation calls for investment in prevention and programs to promote oral health by the decision-makers to implement programs that should, ideally, rely on the real needs of a population. Therefore, data from endodontic epidemiological surveys may contribute to the improvement of this knowledge⁷.

Investigations on the prevalence of pulp and periradicular diseases in the Brazilian population produced few studies⁸⁻¹¹ and most of them were conducted exclusively based on radiographic assessments for the diagnosis of such infections. Considering the importance of epidemiological investigations, the objective of this study was to determine the prevalence of pulp and periradicular diseases diagnosed in a Brazilian subpopulation, correlating this information to gender, age group and most affected teeth.

Material and methods

After approval by the Research Ethics Committee of the Federal University of Pernambuco-UFPE, information was collected from 1346 medical records of patients treated at the Specialization Course in Endodontics of UFPE, a reference institution for endodontic treatment in the Brazilian Northeastern region, between April 2003 and March 2010. Only medical records containing complete information on the medical and dental history were included.

From each medical record, the following variables were collected: sex, age, affected teeth and diagnosed endodontic diseases. The diagnosis of pulp and periradicular diseases was made by evaluating the following information: main complaint and pain symptomatology; examination of extra and intraoral tissues; tests of pulp vitality, including cold and heat sensitivity; clinical assessments of periapical health, including percussion and palpation; and interpretation of periapical radiographs.

The classification for the diagnosis of endodontic diseases was the one used by the American Association of Endodontists¹², as follows: reversible pulpitis, symptomatic irreversible pulpitis, asymptomatic irreversible pulpitis, pulp necrosis, internal and/or external root resorption, acute apical periodontitis, chronic apical periodontitis, acute apical abscess, chronic apical abscess, phoenix abscess and flare up.

The collected data were analyzed using descriptive statistics, after which Pearson's chi-square and Fisher's exact tests were applied with the significance level set at 5%. The Statistical Package for Social Sciences, version 21 (SPSS, Chicago, IL, USA) was used.

Results

One thousand and six hundred teeth from 1346 patients were examined. Most individuals (n = 908, 67.5%) were female. More than half (57.0%) of all treated teeth were diagnosed with pulp diseases.

Among the diagnosed pulp diseases, symptomatic irreversible pulpitis was the most prevalent (46.3% pulp diseases, 26.38% endodontic diseases), while root resorption was the least prevalent (0.8% pulp diseases, 0.5% endodontic diseases). Chronic apical periodontitis was the most prevalent periradicular disease (81% periradicular diseases, 34.81% endodontic diseases) while flare up was not diagnosed (0%).

Regarding gender, pulp diseases were detected in men and women in an unequal mode (p = 0.008), as statistically significant differences were verified for symptomatic irreversible pulpitis, which affected more females (p = 0.005), and for asymptomatic irreversible pulpitis, which affected more males (p < 0.001). The periradicular diseases were diagnosed in men and women similarly (p = 0.895) (Table 1).

Table 1 - Prevalence of treated teeth due to pulp and periradicular pathologies according to gender.

Pathologies	Gender				Total		p value
	Male		Female		n	%	
	n	%	n	%	n	%	
Pulp							p ⁽¹⁾ = 0.008*
Reversible Pulpitis	8	2.4	10	1.7	18	2.0	
Symptomatic Irreversible Pulpitis	132	40.1	290	49.7	422	46.3	
Asymptomatic Irreversible Pulpitis	66	20.1	67	11.5	133	14.6	
Pulp Necrosis	109	33.1	194	33.3	303	33.2	
Internal Root Resorption	-	-	-	-	0	0	
External Root Resorption	1	0.3	2	0.3	3	0.3	
Internal and External Root Resorption	1	0.3	4	0.7	5	0.5	
Normal pulp (endodontic treatment with prosthetic purpose)	12	3.6	16	2.7	28	3.1	
Total	329	100.0	583	100.0	912	100.0	
Periradicular							p ⁽¹⁾ = 0.953
Acute Apical Periodontitis	7	3.0	18	4.0	25	3.6	
Chronic Apical Periodontitis	192	82.4	365	80.2	557	81.0	
Acute Apical Abscess	7	3.0	15	3.3	22	3.2	
Chronic Apical Abscess	27	11.6	56	12.3	83	12.1	
Phoenix Abscess	-	-	1	0.2	1	0.1	
Flare Up	-	-	-	-	0	0	
Total	233	100.0	455	100.0	688	100.0	

(*): Significant association at the level of 5.0%.

(1): Using Fisher's exact test.

There were no statistically significant differences between different age groups and the prevalence of endodontic diseases ($p = 0.388$) (Table 2). The prevalence of pulp diseases was higher in patients under 50 years old, whereas the age group 50 to 59 years showed the lowest prevalence ($p = 0.286$). The periradicular diseases affected a greater proportion of patients over 50 years of age, while individuals under 18 years were less affected ($p = 0.439$).

Pulp and periradicular diseases affected the maxillary and mandibular teeth with the same frequency ($p = 0.581$). In the maxilla, the second molars (75.6%) were the most affected teeth by pulp diseases, while the central and lateral incisors (57.5%) were the most affected by periradicular diseases ($p < 0.001$). In the mandible, the teeth most affected by the pulp diseases were the third molars (82.6%), while the first premolars (49.2%) were the most affected by periradicular diseases ($p = 0.107$) (Table 3). The dental elements most affected by endodontic diseases in the maxilla were the incisors (31.87%), while in the mandible, the first molars were the most affected (41.28%).

Discussion

This cross-sectional study had as its primary objective describing the prevalence of pulp and periradicular diseases in a Brazilian urban subpopulation by analysis of medical records of patients treated at the clinic of the Postgraduate Course in Endodontics in Recife (PE), in the Brazilian Northeastern region. Since the studied patients do not represent a random sample of the population, but individuals who sought dental treatment, the extrapolation of results for the general Brazilian population should be made with caution. However, we emphasize that this dental service is a reference in the region for endodontic care, which may portray the reality of the geographical region reached by our clinic.

The results of this study demonstrate that the most prevalent endodontic disease in both sexes was chronic apical periodontitis. The prevalence of chronic apical periodontitis (34.81%) agreed with studies conducted in other populations in Buenos Aires in Argentina¹³, Bucaramanga and Floridablanca in Colombia¹⁴, and Barcelona in Spain¹⁵, where it ranged 27% to 49%. However, these results were higher than those reported in other surveys conducted in English¹⁶ (4.1%), Scottish¹⁷ (5.8%) and Kosovan¹⁸ (12.3%) populations. The discrepancies observed among these studies may be justified by the different degrees of human development among these populations.

The prevalence of chronic apical periodontitis in Brazilian subpopulations was target of previous studies^{11,19}, which found a prevalence of chronic apical periodontitis of 3.4%¹¹ and 5.9%¹⁹, respectively, whereas in our study, which evaluated a larger population sample than those studies, we detected a higher prevalence, i.e., 34.81%.

The discrepancies observed between the results of the mentioned studies may be justified by lack of homogeneity in the analyzed population, lack of standardized evaluation methods, and the populations' general level of oral health, factors that hamper comparing results from different studies.

The results of this study showed that the pulp diseases were detected in men and women in an unequal mode ($p = 0.008$), where the symptomatic irreversible pulpitis affected more females ($p = 0.005$), while asymptomatic irreversible pulpitis affected more males ($p < 0.001$). This difference may be explained by the fact that women take more care of their health and appearance than men⁸, which may lead them to seek dental care immediately in symptomatic cases, while men choose to postpone treatment²⁰. On the other hand, men and women presented a similar prevalence of periradicular diseases ($p = 0.953$), confirming what has been previously reported in other studies^{11,19,21}.

The results presented here indicated that the prevalence of pulp diseases was higher in people under 50 years of age, whereas periradicular diseases affected more patients over 50 years of age. There were no statistically significant differences between the age groups and the prevalence of endodontic diseases ($p = 0.388$). These findings agree with those of Kamberi et al.¹⁸ (2011), Paes da Silva Ramos Fernandes et al.¹¹ (2013), Peters et al.²¹ (2011), Terças et al.¹⁹ (2006), who observed an increase in the prevalence of periradicular lesions with increasing patient age. According to Terças et al.¹⁹ (2006), this result is expected since, with increased age, the tooth is exposed to caries, periodontal disease, friction and various operative procedures that increase the risk of pulpal inflammation, which if not treated may progress to periapex.

In this study, the central and lateral incisors and the first molars were the teeth most affected by endodontic diseases. As reported by Al-Negrish²² and Berlinck et al.⁸ (2015), the reason for the incisors to be most the affected may be associated with dental traumas, which usually affect the teeth that are in anterior position and more prominent in the dental arch. On the other hand, the higher prevalence of the first molars may be related to their morphology, with multiple grooves that facilitate the largest plaque retention, and the fact that they are the first permanent teeth to erupt in the oral cavity²³.

Table 2 - Prevalence of treated patients due to pulp and periradicular pathologies according to age groups.

Age Groups	All patients	Pulp		Pathologies		Both		p value
		n	%	n	%	n	%	
≤18	226	125	55.3	82	36.3	19	8.4	$p^{(1)} = 0.388$
19-29	300	155	51.7	116	38.7	29	9.7	
30-39	334	180	53.9	123	36.8	31	9.3	
40-49	266	139	52.3	105	39.5	22	8.3	
50-59	165	75	45.5	78	47.3	12	7.3	
≥60	55	26	47.3	25	45.5	4	7.3	
Total	1346	700	52.0	529	39.3	117	8.7	

(1): Using Pearson's chi-square test.

Table 3 - Prevalence of treated teeth due to pulp and periradicular pathologies according to dental groups.

Dental Groups	All Teeth	n	Pathologies		p value
			Pulp %	Periradicular N %	
<i>Maxillary</i>					
Incisors	320	136	42.5	184	57.5
Canines	62	33	53.2	29	46.8
1 st Premolars	160	90	56.3	70	43.8
2 nd Premolars	164	105	64.0	59	36.0
1 st Molars	212	139	65.6	73	34.4
2 nd Molars	78	59	75.6	19	24.4
3 rd Molars	8	5	62.5	3	37.5
Subtotal	1004	567	56.5	437	43.5
<i>Mandibular</i>					
Incisors	38	22	57.9	16	42.1
Canines	19	14	73.7	5	26.3
1 st Premolars	61	31	50.8	30	49.2
2 nd Premolars	93	50	53.8	43	46.2
1 st Molars	246	138	56.1	108	43.9
2 nd Molars	116	71	61.2	45	38.8
3 rd Molars	23	19	82.6	4	17.4
Subtotal	596	345	57.9	251	42.1
Total	1600	912	57.0	688	43.0

(*): Significant association at the level of 5.0%.

(1): Using Pearson's chi-square test.

Although the percentage of assessed maxillary teeth was higher than the mandibular ones, there was no significant difference between the maxilla and mandible in the incidence of teeth affected by endodontic diseases, which is consistent with the results of other authors^{18,24}. On the other hand, the studies of Al-Negrish²³ and Scavo et al.¹³ (2011) reported that in their studies the maxillary teeth were predominantly more affected in relation to the mandibular.

Although our results do not describe a random sample of the Brazilian population, but accounting that Brazil is a continent-wide country, these results provide relevant information on the prevalence of pulp and periradicular diseases that most affect a subpopulation this may help to define new treatment strategies and prevention of endodontic diseases.

Based on the results obtained in this study, we conclude that in the evaluated subpopulation:

- chronic apical periodontitis and symptomatic irreversible pulpitis were the most prevalent diagnosed endodontic diseases;
- symptomatic irreversible pulpitis affected more females, whereas asymptomatic irreversible pulpitis was more prevalent in males;
- endodontic disease affected indiscriminately individuals of different age groups and the maxillary and mandibular teeth;
- incisors and first molars were the most affected teeth by endodontic diseases.

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