Pesquisa Brasileira em Odontopediatria e Clínica Integrada 2022; 22:e200183
https://doi.org/10.1590/pboci.2022.034
ISSN 1519-0501 / eISSN 1983-4632

ORIGINAL ARTICLE

Pain Perception Before Endodontic Treatment: from Primary Care to Specialized Care

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Academic Editor: Wilton Wilney Nascimento Padilha

Received: 14 August 2020 / **Review:** 06 July 2021 / **Accepted:** 09 October 2021

How to cite: Lima RF, Magalhães MBP, Oliveira DV, Freitas DAS, Ferreira EF, Martins RC. Pain perception before endodontic treatment: from primary care to specialized care. Pesqui Bras Odontopediatria Clín Integr. 2022; 22:e200183. https://doi.org/10.1590/pboci.2022.034

ABSTRACT

Objective: To analyze patients' pain perception requiring endodontic treatment referred to a Dental Specialties Center. **Material and Methods:** Data was collected through a self-administered questionnaire for patients about their experience of pain and another for endodontists about the treatment performed. The results were analyzed descriptively using Pearson's Chi-square test and Fisher's Exact test, with Bonferroni correction ($p \leq 0.05$). **Results:** The median age of the patients was 39 years, and 71.1% were female. The median waiting time for treatment was five months. Pain was reported by 75.2% of patients, occurred more than one month earlier (63.6%), with moderate/severe intensity (66.9%), and most patients sought emergency treatment more than once (79.1%). In addition, pain was associated with sex (female; $p=0.008$); moderate/severe intensity ($p<0.001$); the number of times that patient had to go to the dentist because of the tooth treatment (twice or more; $p=0.002$); and type of tooth treated (posterior tooth; $p=0.002$). **Conclusion:** Severe pain episodes resulted in a repeated search for emergency services, which may overload the primary care service, especially if the waiting time for endodontic treatment is long.

Keywords: Toothache; Secondary Care; Endodontics.

Introduction

The Brazilian Unified Health System (SUS, in Portuguese) was created in 1988 with the Federal Constitution and guaranteed all Brazilians the right to health and universal access to health services [1]. In 1994, the comprehensive health care model for the population was reorganized through the Family Health Program, later called Family Health Strategy (FHS). The entire structure of health care was remodeled in levels of care (primary, secondary, and tertiary), with Primary Health Care (PHC) as the user's gateway to the health system [2].

The inclusion of the Oral Health Teams in the FHS occurred only in 2000 to plan oral health actions based on territorialization, guided by social determinants and epidemiological needs of the population [3]. An epidemiological survey of the oral health of the Brazilian population was conducted in 2003, which evidenced the need to restructure the offer of oral health services to provide specialized services appropriate to the reality of the epidemiological profile of Brazilians [4]. Then, the National Oral Health Policy was implemented in 2004. Dental Specialties Centers (DSCs) were created as a reference for PHC units, integrated into the local-regional planning process, offering, minimally, the specialties of endodontics, periodontics, minor oral surgery, oral diagnosis with emphasis on diagnosis and detection of oral cancer, and care for patients with special needs [5,6].

Emergency care is performed in PHC and is associated with pain most of the time [7-9]. Dental caries in the initial stages produces vascular alterations due to the inflammatory process generated in the pulp tissue. The evolution of this process, combined with contamination by microorganisms, promotes irreversible alterations in the pulp tissue, resulting in the need for endodontic treatment [10].

Belo Horizonte, capital of Minas Gerais state (MG), Brazil, has a territory of 331,401 km², 2,375,151 inhabitants, and a Municipal Human Development Index of 0.810 [11]. It is divided into nine administrative regions for management and planning: Venda Nova, Pampulha, Noroeste, Oeste, Barreiro, Norte, Nordeste, Leste, Centro-Sul. It has 3 DSCs; the DSC Centro Sul, DSC Barreiro, and DSC Venda Nova [12].

In Belo Horizonte, patients who need specialized care are registered at the Regulation System (SISREG) - Oral Health. SISREG is an online program where appointments are scheduled by the Basic Health Unit (BHU) for the DSCs. The BHU performs procedures like removing decayed tissue, coronary access, intracoronary medication, and coronary sealing as an emergency treatment for teeth requiring endodontic treatment. After the emergency treatment, the patient is referred to specialized care at the DSC and waits for a vacancy. SISREG follows a classification of procedures per the situation of each case. The Municipal Health Secretary of Belo Horizonte defines priority criteria for the provision of the vacancy. Concerning the endodontics specialty, the need for treatment/retreatment of incisors, canines, and premolars and treatment/retreatment of molars is considered a high priority when there is no tooth loss in the arch in question to avoid the indication of a prosthesis. Molars that support an existing partial denture and are the last option to maintain the occlusion vertical dimension are medium priority. Molars that show extensive coronal destruction by caries or periodontal disease presenting mobility, third molars that do not support an existing prosthesis, and permanent first molars with incomplete rhizogenesis are contraindicated for endodontic treatment. Once the endodontic treatment is completed at the DSC, teeth that can be restored directly are referred for restoration to the BHU, and teeth requiring indirect restorations are referred for specialized treatment at the DSC [12].

Understanding the factors associated with pain in teeth that need endodontic treatment can outline strategies to improve the health service in addressing this problem. Thus, this study aimed to evaluate the

factors associated with the pain perception in patients needing endodontic treatment from their referral from PHC to specialized care at the DSC Centro Sul of Belo Horizonte, Minas Gerais, Brazil. Furthermore, this study hypothesized that pain perception before endodontic treatment leads patients to repeatedly seek emergency services in PHC.

Material and Methods

Ethical Clearance

This study was approved by the Research Ethics Committees of the Universidade Federal de Minas Gerais (UFMG) and the Municipal Health Secretary of Belo Horizonte (CAAE 54213816.1.3001.5140).

Study Design and Data Collection

This cross-sectional, quantitative study was conducted at the DSC of Centro Sul region of Belo Horizonte, MG, Brazil. This DSC was chosen because it is the largest and oldest of Belo Horizonte and facilitates data collection due to the concentration of data in a single location.

Participants in this study were patients referred for endodontic treatment at the DSC Centro Sul, aged 18 years or older, present on the SISREG list, and who agreed to participate in the study. The endodontists who attended the respective patients also participated. The population over 18 years old was chosen because, according to the last national oral health survey [13], adults (35-44 years old) were those who reported the highest prevalence of toothache in the last six months (27.5%), with 49.7% with pain classified as grades 4 and 5. Moreover, this population has 3.2 times more endodontic needs than adolescents (15-19 years) [13].

This was a convenience and not a probabilistic sample. The sample calculation guided an adequate number of cases for the study. Estimating proportions was used with a prevalence of endodontic treatment need of 50%, confidence level and precision of 5%, resulting in a minimum sample of 384 patients. Data were collected from May to November 2016.

All patients and endodontists who participated in the study were invited and clarified about the research objectives and guaranteed the preservation of their identities. Data were collected from patients by a self-applied questionnaire with questions about pain perception before endodontic treatment and the waiting time for endodontic treatment. The endodontists answered a questionnaire about the endodontic treatment performed. The dependent variable was the pain perception before the tooth being treated endodontically (yes or no).

The independent variables collected by the endodontists were: sex (female, male), type of tooth treated (anterior, posterior, and anterior and posterior), and date of referral for endodontic treatment by the PHC, per the referral guide. The independent variables collected in the patients' questionnaires were when felt pain (less than a month earlier or more than a month earlier), pain intensity (weak, moderate/severe), number of times required to go to the dentist because of painful symptoms (once, twice or more), and waiting time perception to start endodontic treatment after referral by the PHC (short, reasonable or long).

Information was also collected regarding the patient's age, the reason for being at the DSC endodontic clinic (tooth treatment/retreatment, referral, financial issue, felt pain, others), the number of teeth treated endodontically (one, two, three, or more) and where the patient intends to restore the endodontically treated tooth (public service or private service).

Pilot Study

A pilot study was conducted with five endodontists from the DSC Centro-Sul to evaluate their understanding of the data to be collected. Doubtful questions were reformulated for the main study. These endodontists participated in the main study. Eleven patients participated in the pilot study to test the questionnaire and identify questions that were difficult to understand. Unclear questions were re-worded for the final study. These patients did not participate in the main study.

Data Analysis

The results were analyzed descriptively using the Statistical Package for Social Sciences – SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Quantitative data's normality was analyzed by the Kolmogorov-Smirnov test and data that did not present a normal distribution ($p<0.001$) were described by median and percentiles. Categorical data were analyzed through frequency. Associations were assessed by a bivariate analysis using Pearson's Chi-square test and Fisher's Exact test, with Bonferroni correction, with a 95% confidence level and, consequently, a 5% significance probability ($p\leq0.05$).

Results

A total of 387 questionnaires from patients of the DSC Centro Sul in Belo Horizonte were collected during the study by ten endodontists working in that service.

The median age of patients was 39 years (P25%=30, P75%=50), and most were female (71.1%). The main reason for being at the clinic was tooth treatment/retreatment (76.8%). Regarding the number of teeth treated, most patients had only one tooth treated (86.6%). Of the total number of teeth treated, 74.4% were exclusively posterior teeth. The pain was reported by 75.2% of the patients, occurring more than one month earlier in 63.6% of the cases, and in intensity considered moderate/severe by 66.9%. The patients interviewed revealed they searched for treatment more than once because of painful symptoms in the tooth to be treated (79.1%). The waiting time to start endodontic treatment was considered long by 46.0% of patients. Concerning restorative treatment after endodontic treatment, 98.7% reported that they would restore them at a public service (Table 1).

Table 1. Descriptive analysis of patients and teeth submitted to endodontic treatment at the DSC Centro Sul.

Variables	N	%
Sex		
Female	275	71.1
Male	112	28.9
Reason for being at the clinic*		
Tooth treatment/retreatment	295	76.8
Referral	49	12.8
Financial issue	19	4.9
Felt pain	10	2.6
Others[a]	11	2.9
Number of teeth treated		
One	335	86.6
Two	43	11.1
Three or more	9	2.3
Tooth type treated		
Anterior	86	22.2
Posterior	288	74.4
Anterior and posterior	13	3.4
Pain perception		

Yes	291	75.2
No	96	24.8
When felt pain**		
Less than a month earlier	55	18.3
More than a month earlier	246	63.6
Intensity***		
Weak	43	11.1
Moderate/severe	259	66.9
Number of times need to go to the dentist because of painful symptoms		
Once	81	20.9
Twice or more	306	79.1
Waiting time perception to start endodontic treatment after referral by the PHC		
Short	45	11.6
Reasonable	164	42.4
Long	178	46.0
Where the patient intends to restore the endodontically treated tooth		
Public service	382	98.7
Private service	4	1.0
Without information	1	0.3

*Data referring to the number of 384 patients who responded. [a]did not know the reason for being at the DSC (n=2; 0.5%), quality of care/treatment (n=4; 1.1%), accident (n=2; 0.5%), need/precision (n=3; 0.8%); **Data referring to the number of 301 patients responding; ***Data referring to the number of 302 patients responding.

The median waiting time for endodontic treatment, according to the patient perception, was 4.0 months (P25%=0, P75%=24) and 5.0 months (P25%=0, P75%=55) according to the PHC referral and treatment initiation at the DSC (data from endodontists' questionaries).

The pain was associated with sex, being more reported by women (p=0.008); the tooth treated type, patients who treated exclusively posterior teeth were the ones who most reported pain (p=0.002), intensity moderate to severe (p<0.001), and the number of times that patient needed to go to the dentist because of the tooth to be treated endodontically (twice or more; p=0.002) (Table 2).

Table 2. Analysis of the associations between the dependent and independent variables.

Variables	Test Value	p-value
Pain perception *versus* sex	7.032*	0.008
Pain perception *versus* type of treated tooth	9.916**	0.002
Pain perception *versus* when felt pain	3.270*	0.701
Pain perception *versus* pain intensity	19.898*	<0.001
Pain perception *versus* number of times needed to go to the dentist because of painful symptoms	9.958*	0.002
Pain perception *versus* waiting time perception to start endodontic treatment after referral by the PHC	5.151*	0.076

*Pearson's Chi-square; **Fisher's Exact Test.

Discussion

Most patients who participated in this study reported pain in the tooth to be treated endodontically. The hypothesis of the study that pain perception before endodontic treatment leads patients to seek emergency services in PHC repeatedly was confirmed. The sample was mainly composed of young adult and female patients. These results are similar to other studies evaluating the profile of users of public health services in the country [14-18].

The pain perception before endodontic treatment associated with females can be explained by cultural and biological issues. Women's greater demand for public services is primarily explained by the greater care with health and approach to health services through specific government programs for women, such as breast

cancer prevention, cervical cancer, and prenatal care [19]. The low demand of men for health services can be explained by cultural issues that hamper self-care practices, besides the fear of finding severe diseases. Also, health services cannot absorb the male demand, and public health campaigns do not approach this segment with the same intensity as the female public [20]. Pain perception is influenced by complex interactions between biological variables (hormonal, genetics, variations in the Central Nervous System) and psychosocial variables (depression, anxiety, culture, expectations of sex role, and importance given to pain) [21]. There are substantial differences in these variables between individuals and sexes. Pain is reported more among female patients [22,23]. This higher reporting of pain by females may be linked to non-reporting by male patients. Social and cultural issues linked to a hegemonic model of masculinity still exert much influence on how men deal with pain [20]. It is noteworthy that besides sex, other variables such as skin color, income, oral health conditions, and contextual factors have been associated with the report of toothache in the adult population [23].

It was observed that most patients knew what type of treatment they would undergo, indicating adequate guidance from the health professional or PHC management. However, many patients do not understand the nature of the endodontic treatment because it is performed using a rubber dam isolation device and is not visible to the patient's eyes. Therefore, they rely only on the professional's explanation of what is being done and how the treatment is conducted. Thus, adequate communication with the patient is fundamental for understanding the treatment [24].

Most patients had one tooth in need of endodontic treatment. However, 13.4% of patients had two or more teeth in need of endodontic treatment. Dental caries is the most prevalent oral health problem, and its evolution is the most common cause of pain with the consequent need for endodontic treatment or tooth extraction [25]. Its consequences can directly interfere with the quality of life of individuals [26,27]. The last epidemiological survey on oral health, conducted in 2010 in the Brazilian population [13], indicated only a slight reduction in the severity of dental caries among adults, maintaining regional and social inequalities, where the most vulnerable groups and in worse socioeconomic status had more caries and tooth loss.

Most endodontic treatments were performed in posterior teeth. The same results on the need for endodontic treatment in permanent teeth were also found in other studies [28,29]. Molars are exposed to a more significant cariogenic challenge by the dental arch's complex anatomy and posterior positioning, hindering these elements' hygiene. These results go against the SISREG priority criteria stipulated by the Municipal Health Department of Belo Horizonte, which considers as a high priority the endodontic treatment/retreatment of anterior teeth, premolars, and molars without tooth loss in the arch in which the tooth to be treated is located [12]. Protocols are essential, but the priorities in endodontics listed by SISREG violate the principle of care comprehensiveness and equity. Some studies show that DSCs were unable to meet the outpatient goals set by the Brazilian Ministry of Health, especially in the endodontics area [30-32], and point out the need to review these goals considering the particularities of each region, the existing demand and the epidemiological profile of the population [30,32]. Posterior teeth are fundamental in masticatory functions, even through reduced arches, and in the future, may serve to support prostheses [33].

Moreover, the fact that the patient has already lost one of the posterior teeth and does not fit the priority criteria [12] can cause the loss of one or more molars, going toward mutilation. Preserving the dental element, whenever possible, should be the choice of treatment. Tooth loss negatively impacts the individual's quality of life, functionally, emotionally, and socially [26,27]. Therefore, a re-evaluation of the SISREG

priority criteria in the specialty of endodontics should be done, considering the absolute need for endodontic treatment in this population to meet the SUS principles.

The reported pain by patients was not associated with the time of occurrence, although most reported having felt pain more than a month earlier but was associated with posterior teeth. A probable explanation for the higher prevalence of pain in posterior teeth would be that a partial pulpectomy is usually performed [7], with coronary access, removal of the coronary pulp, intracoronary medication, and sealing of the cavity in an emergency treatment performed in the PHC. In addition, the root canals are rarely manipulated with files in PHC, especially in posterior teeth, with highly curved and atresic canals, leaving inflamed or necrotic pulp tissue inside the root canals, which can cause posterior pain episodes.

The waiting time to start endodontic treatment was considered long by almost half of the patients, however, with no significant association with pain before the treatment being performed. A waiting time of several months to get care is considered long by the patient, especially in the presence of pain [24].

The pain was associated with an intensity of moderate/severe and a search for recurrent treatments more than once. Caries and their sequels continue to be the leading causes of dental emergencies, and among them, pain is the most prominent [25,34]. Patients who complain of pain tend to seek emergency care, especially in cases of severe pain, as found in this study. This search may be a reflection of the non-routine use of dental services in PHC [35]. Moreover, a large part of the returns that occur is associated with the non-solving characteristic of emergency services [7] because most of these appointments need continuity since they do not always result in definitive treatment, except in extraction cases [27]. A patient in pain associated with the need for endodontic treatment in PHC is submitted to pain relief intervention and will have to wait for a referral to a specialized DSC. Due to the long waiting time for specialized care, these patients tend to return to PHC with the initial need often accentuated and with accumulated treatment needs, starting a cycle of emergency care that negatively impacts their oral health and overloads the health services [7,9,36]. Moreover, structural, organizational, and service productivity factors affect the flow of care in health services. Therefore, an adequate number of professionals per specialty, the presence of oral health assistants and oral health technicians in Oral Health Teams, adequate infrastructure and presence of supplies, a good primary-secondary care interface, organizing the flow of users through reference and counter-reference, and regulations for access to the DSCs with the actual epidemiological demand of the population are essential to improve the quality of services offered, reducing the waiting time for specialized care [32].

Concerning the average waiting time, in months, for endodontic treatment, the patients' perception was below the time verified in the reference guides of PHC and initiation of endodontic treatment in the DSC. In this study, the results of waiting time to start endodontic treatment are higher than those found in other studies conducted in secondary care, considering the endodontics specialty, and that obtained an approximate time of 30 days from a referral from PHC to the start of endodontic treatment [37,38]. This difference may be due to methodological differences, where in these studies, the waiting time was estimated by users and health professionals, respectively, which may lead to a memory or information bias. The present study obtained the median waiting time on the referral forms from the PHC to the DSC. A 5-month waiting time for endodontic treatment has adverse consequences for the patient and the health care system. Besides the PHC overload due to the patient's frequent search for emergency treatment for pain relief [7,9,36], as previously discussed, there is also the risk of tooth fractures or patients abandoning the treatment, which may result in tooth extraction [36].

Patients must restore the tooth after the endodontic treatment. Endodontic treatment is an intermediate procedure, not having an end in itself. Teeth restoration restores the function, aesthetics, avoids fractures or even dental loss [36], and should be performed in the shortest time after endodontic treatment [39]. Almost all patients participating in the study stated that they would search the public service for restorative treatment after endodontic treatment, even reporting delays in care. Socioeconomic and demographic factors and the amount of treatment needed have been associated with the use of public dental services by the adult population instead of private dental services [16,18,40,41]. The financial resources were reported by some patients when asked why they were at the DSC clinic. However, some studies indicate patient satisfaction with the health services offered by SUS, which may indicate confidence in the care received or even patient dependence on the service [24,37]. Among the positive points highlighted by users who use Brazilian public dental services are the technical capacity of the professional, the physical structure of health services, and the treatment received [16]. The recurrent complaints are instead associated with poor service management, such as waiting lines, delays in care, reduced number of vacancies, and difficulty in the reference and counter-reference system [16,41,42]. These data reinforce the importance of universal and quality service because even reporting some dissatisfaction with the service, users mostly say they will use the public service again rather than the private service.

One of the limitations of this study is the possible information and memory bias by participants, which is the shortcoming of using questionnaires. Also, pain perception varies among people according to their experiences, needs, and pain threshold and is, therefore, subjective.

Conclusion

The report of pain perception before endodontic treatment was associated with sex, type of tooth, pain intensity, and the number of times that patient needed to search for dental treatment because of the tooth to be treated. Episodes of severe pain lead to the repeated search for emergency services, which may overload the primary care service, especially if the waiting time for endodontic treatment is long, which can compromise the efficiency and effectiveness of the health service. Proper management and flow of patients from primary to secondary care would reduce the number of emergency returns to primary health care, increase the resolution of users' needs, and allow greater access to other patients in the health system.

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

This study was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and Pró Reitoria de Pesquisa da Universidade Federal de Minas Gerais (PRPq/UFMG).

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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