VARIABLES AFFECTING PATIENT REFERRALS FROM GENERAL DENTAL PRACTITIONERS TO ENDODONTISTS

Original article

PROMĚNNÉ OVLIVŇUJÍCÍ ODESÍLÁNÍ PACIENTŮ PRAKTICKÝMI ZUBNÍMI LÉKAŘI K ENDODONTISTŮM

Původní práce

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SUMMARY

Introduction and aim: The aim of the survey was to identify the endodontic referral pattern among a group of Croatian dentists and to explore if the decision to refer a patient to an endodontist varies based on demographic variables of general dental practitioners and the features of their dental practice.

Methods: A questionnaire was designed that focused on demographics of the participants and their practice, the pattern of endodontic procedures they perform and the factors influencing their decision to refer. The survey was mailed to all licensed general practicing dentists with a work address in Rijeka, Croatia. Chi-square test was used at a significance level P<0.05 to analyze differences in the study sample.

Results: The majority of respondents (39 out of 94; 41.5%) were between 40 and 49 years old. Analysis revealed that the majority of respondents were female (64 out of 94; 68.1%). Significantly more male practitioners (10 out of 30) had postgraduate education compared to female practitioners (9 out of 64; 33.3% vs. 14.1%; P<0.001). Regarding the effect of demographic variables, only the number of dentists employed in a practice had a significant influence on the referral decisions of dentists (χ^2=7.006; P=0.030). Respondents who were the only employed dentists referred patients significantly more often than respondents who work in practices where three or more dentists are employed (72.4% vs. 20%; P<0.05).

Conclusion: Due to the aging European population, healthcare costs are increasing, and there is a need to monitor the overuse and underuse of specialized care to ensure appropriate treatment for each patient. Students and dentists should be encouraged to pursue postgraduate education, which enhances their professional competence.

Key words: dentists, endodontists, referral and consultation, root canal treatment

SOUHRN

Úvod a cíl: Cílem studie bylo zjistit, jakým způsobem se chorvatští zubní lékaři rozhodují o odesílání svých pacientů k endodontistům a zda se toto rozhodnutí liší v závislosti na demografických proměnných týkajících se praktických zubních lékařů a charakteru jejich stomatologické praxe.

Metodika: Byl sestaven dotazník zaměřený na demografické údaje týkající se účastníků studie a jejich praxe, typy prováděných endodontických zákroků a faktory ovlivňující jejich rozhodování o odeslání pacienta k endodontistovi. Dotazník byl rozeslán všem praktickým zubním lékařům s adresou ordinace v chorvatské Rijece. K analýze rozdílů ve zkoumaném vzorku byl použit χ^2 test na hladině významnosti p < 0,05.

Výsledky: Většina respondentů (39 z 94; 41,5 %) byla ve věku 40 až 49 let. Analýza ukázala, že většina respondentů byly ženy (64 z 94; 68,1 %). Významně více mužů (10 z 30) mělo postgraduální vzdělání ve srovnání se ženami (9 z 64; 33,3 % vs. 14,1 %; p < 0,001). Pokud jde o vliv demografických proměnných, měl významný vliv na rozhodování o odeslání pouze počet zubních lékařů zaměstnaných v ordinaci (χ^2 = 7,006; p = 0,030). Respondenti, kteří pracovali ve vlastní zubní ordinaci sami, odesílali pacienty významně častěji než respondenti pracující v ordinacích, kde jsou zaměstnáni tři a více zubních lékařů (72,4 % vs. 20 %; p < 0,05).

Závěr: V souvislosti se stárnutím evropské populace rostou náklady na zdravotní péči a je třeba sledovat nadužívání a nevyužívání specializované péče, aby byla pro každého pacienta zajištěna řádná léčba. Studenti a zubní lékaři by měli být podporováni v postgraduálním vzdělávání, které zvyšuje jejich odbornou způsobilost.

Klíčová slova: zubní lékaři, endodontisté, odesílání a konzultace, ošetření kořenových kanálků

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INTRODUCTION

The referral process involves the collaborative care and treatment of a patient by a referring general dental practitioner (GDP) and a specialist. Dental specialties vary from country to country, and the requirements for the number of specialists differ [1]. As in most European countries, access to secondary care in Croatia is largely influenced by the referral decisions of GDPs.

Endodontic treatment is demanding and requires a high technical standard, which is why the need for specialists in endodontology has been recognized [2]. Several studies have been conducted on referral patterns to endodontists [3–7] and to our knowledge, no such study has been conducted on a sample of Croatian dentists. The decision to refer a patient is influenced by numerous factors including clinical and non-clinical causes. Some of the most important clinical factors influencing the decision to refer include persistence of symptoms, canal obstruction, complicated tooth morphology, retreatment procedure, perforation, and the presence of a post in the root canal [4]. A survey of GDPs in Lithuania also identified difficult diagnosis, dental trauma, tooth resorption, size of periapical lesion, and apexification procedure as important reasons for referrals [8]. In endodontics, it is common for GDPs to attempt to treat a patient before referring to a specialist, which can make the further treatment procedure more challenging and unpredictable [7, 9]. To ensure continuity of appropriate treatment procedure, effective communication is a prerequisite [10]. Previous studies have identified several non-clinical factors that influence the referral decision. The most important were short waiting times, the proximity of the specialist´s dental practice, treatment costs, good communication, and the specialist's personality [4, 5].

The purpose of this study was to identify the need for endodontic referrals among a group of Croatian dentists and to explore, whether the decision to refer a patient to an endodontist varied based on the demographic variables of GDPs and the features of their dental practice. Furthermore, this study aimed to answer several empirical questions, such as: 1. What were the most frequent types of endodontic procedures performed in GDPs' practice? 2. Which criteria influenced the referral decision? 3. Which endodontic cases did GDPs handle themselves? 4. Which endodontic cases GDPs referred to a specialist endodontist?

MATERIALS AND METHODS

An Institutional Ethical Committee approved the study (approval number: 003-05/13-01/03). The questionnaire was designed as a short, one-page, double-sided survey with questions regarding the demographics of participants and their practice, the pattern of endodontic procedures they perform, and the factors influencing their decision to refer. The survey was conducted in an ethically correct manner and in compliance with the Declaration of Helsinki.

The introductory letter, questionnaire, and stamped return envelope were sent to GDPs throughout the city of Rijeka, Croatia, in spring 2019. Addresses of participants were drawn from a database containing all licensed dentists with a current work address in Rijeka who were classified as GDPs. The response deadline was set at two months following the questionnaire´s postmail. Return of the completed survey implied informed consent. To ensure anonymity, no attempt was made to contact the non-respondents. All participants who completed the survey remained anonymous. Each question was designed to allow one or more answers, depending on the type of question. Respondents were free to leave a blank answer, which was treated as a missing value. Calculations for each question were based on a different number of study participants due to some missing responses.

Data Analysis

The responses were coded by a single operator and entered into a spreadsheet (Microsoft Office Excel 2016, Microsoft Inc., Redmond, WA, USA). Data analysis was performed using statistical software (IBM SPSS Statistics 26, IBM, Armonk, NY, USA). Univariate analysis was used to describe the study sample in terms of respondents´ demographic characteristics, a description of their practice, the treatments they provided, and their referral patterns. Chi-square test was used to identify statistically significant differences, with a level of significance set at $P<0.05$.

RESULTS

Of the 255 questionnaires distributed, 94 were returned, resulting in a response rate of 36.8%. The demographic characteristics of the responding dentists and features of their dental practices are presented in **Table 1.** The ages of the respondents ranged from 26 to 68 years. The majority of the respondents (41.5%) were between 40 and 49 years old.

Tab. 1 Distribution of dentists and dental practice demographic variables and differences regarding the decision to refer patient to an endodontist.

Variable	Variable	n (%)	Referral Yes n (%)	Statistics
Age (N=94)	<29	3 (3.2)	1 (33.3)	χ^2=3.998 P=0.406
	30–39	15 (16.0)	8 (53.3)	
	40–49	39 (41.5)	27 (69.2)	
	50–59	29 (30.9)	22 (75.9)	
	>60	8 (8.5)	5 (62.5)	
Gender (N=94)	Male	30 (31.9)	16 (53.3)	χ^2=2.881 P=0.090
	Female	64 (68.1)	47 (73.4)	
Years in practice (N=94)	<10	11 (11.7)	6 (54.5)	χ^2=1.113 P=0.774
	10–20	29 (30.9)	19 (65.5)	
	21–30	43 (45.7)	30 (69.8)	
	>31	11 (11.7)	8 (72.7)	
Postgraduate education - Master, Ph.D, (N=94)	No	73 (77.7)	51 (69.9)	χ^2=0.688 P=0.407
	Yes	21 (22.3)	12 (57.1)	
Employment position (N=94)	Practice owner	73 (77.7)	48 (65.8)	χ^2=0.776 P=0.678
	Partner	6 (6.4)	5 (83.3)	
	Employee	15 (16.0)	10 (66.7)	
Provider of care covered by compulsory health insurance (N=94)	No	31 (33.0)	18 (58.1)	χ^2=1.129 P=0.288
	Yes	63 (67.0)	45 (71.4)	
Number of dentists employed in the practice (N=94)	One	76 (80.9)	55 (72.4)	χ^2=7.006 P=0.030*
	Two	13 (13.8)	7 (53.8)	
	Three or more	5 (5.3)	1 (20.0)	
Number of patients registered in dental practice (N=94)	<1500	76 (80.9)	22 (61.1)	χ^2=2.218 P=0.330
	1500–3000	13 (13.8)	38 (73.1)	
	>3000	(5 5.3)	3 (50.0)	

Chi-square test; *significant difference

Gender distribution analysis revealed that 64 of the respondents (68.1%) were female, while 30 (31.9%) were male. The largest group of respondents (43 out of 94; 45.7%) have practiced dentistry for 21 to 30 years. The respondents were mainly practice owners (73 out of 94; 77.7%), while 15 respondents described themselves as employees (16.0%), and 6 as partners (6.4%). Most respondents (73 out of 94; 77.7%) reported having no postgraduate dental education. However, when comparing genders, significantly more male practitioners (10 out of 30) had postgraduate education compared to female practitioners (9 out of 64; 33.3% vs. 14.1%; P<0.001).

Most of the respondents (63 out of 94; 67%) worked in a health facility providing care covered by the compulsory health insurance. The majority of respondents (76 out of 94; 80.9%) reported having up to 1,500 registered patients. Only five dentists (5.3%) reported having more than 3,000 patients. Regarding the number of employed dentists including themselves, the greatest percentage of respondents (76 out of 94; 80.9%) answered "one". Regarding the effect of dental practice features, only the number of dentists employed in the practice had significant influence on dentists' referral decisions (χ^2=7.006; P=0.030). Respondents who were the only employed dentists referred patients significantly more often than those who worked in practices where three or more dentists were employed (72.4% vs. 20%; P<0.05).

Apart from two subjects (2.2%), all respondents performed root canal treatment, and most of them also performed root canal retreatment (78 out of 93; 83.9%). Fifteen respondents (16.1%) reported performing surgical endodontic treatment. A significantly higher proportion of male respondents (12 out of 29; 42.9%) performed surgical endodontic treatment compared to female respondents (3 out of 64; 4.7%; χ^2=19.862; P<0.001; **Table 2**). No significant difference was found between respondents with and without postgraduate education regarding the types of endodontic procedures performed in their practice.

The highest percentage of respondents (47 out of 89; 52.8%) referred fewer than

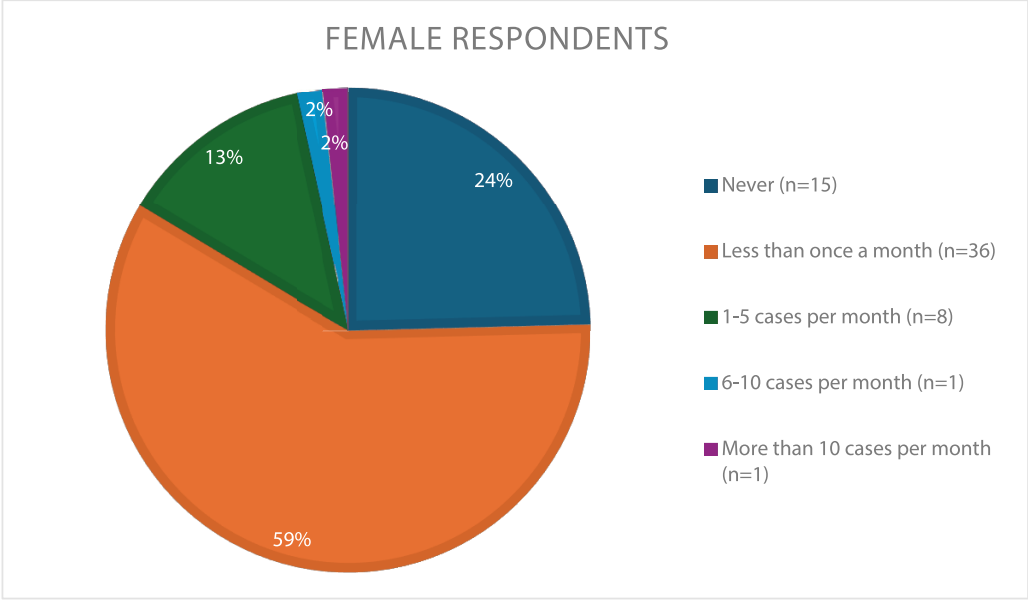
Tab. 2 Types of endodontic procedures performed in GDPs' practice.

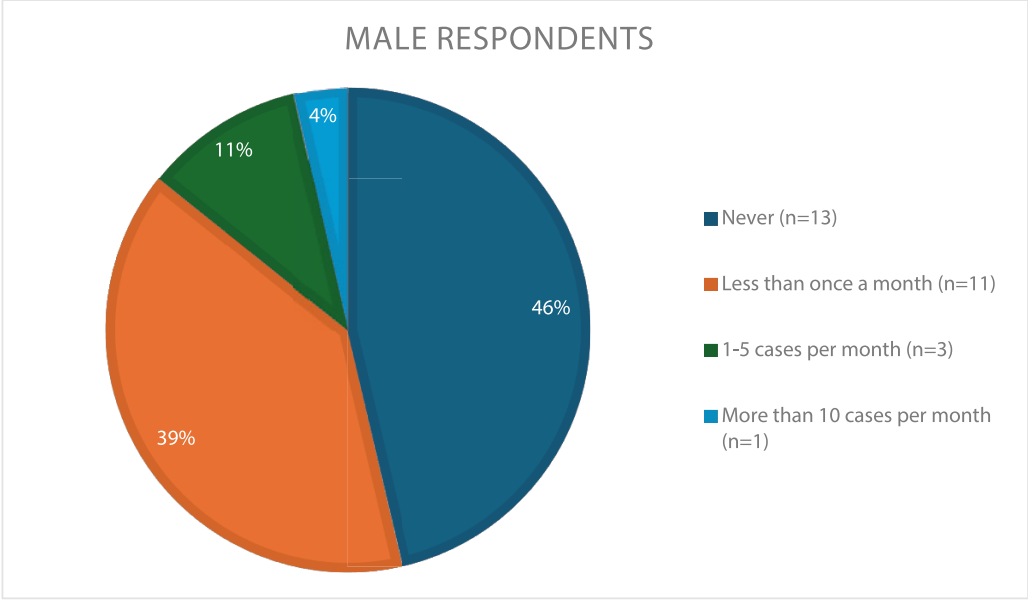
Treatment procedure	Total (N=93) n (%)	Female (N=64) n (%)	Male (N=29) n (%)	Statistics
Endodontic treatment	91 (97.8)	64 (100)	27 (96.4)	
Non-surgical retreatment	78 (83.9)	54 (84.4)	23 (82.1)	χ^2=0.071 P=0.790
Surgical endodontic treatment	15 (16.1)	3 (4.7)	12 (42.9)	χ^2=19.862 P < 0.001*
No endodontic treatment	2 (2.2)	0 (0)	2 (7.1)	

Chi-square test; *significant difference
Data are presented as percentages of the total number of respondents, categorized by gender.
Non-respondents: 1

one patient per month with an endodontic problem, while approximately a third (28 out of 89; 31.5%) of them never referred patients with endodontic etiology. Male respondents (13 out of 28) significantly more often stated that they never refer a patient when compared to female participants (15 out of 61; 46.4% vs. 24.6%; χ^2=4.245; P=0.039, **Graph 1**). Otherwise, no statistical difference was found in referral frequency with respect to gender.

When asked about the criteria influencing their decision to refer a patient to a specialist, the most common factors for both male and female respondents were the nature of the





Graph 1
The frequency with which female and male respondents refer their patients to endodontists.

Tab. 3 Criteria influencing decision to refer a patient to a specialist endodontist.

Criteria	Total (N=75) n (%)	Female (N=55) n (%)	Male (N=20) n (%)	Statistics
Lack of time	14 (18.7)	10 (18.2)	4 (20.0)	χ^2=0.032 P=0.858
Lack of instruments	12 (16.0)	8 (14.5)	4 (20.0)	χ^2=0.325 P=0.569
Lack of skills	14 (18.7)	6 (10.9)	8 (40.0)	χ^2=8.175 P=0.004*
Lack of interest	6 (8.0)	1 (1.8)	5 (25.0)	χ^2=10.709 P=0.001*
Too many patients	11 (14.7)	6 (10.9)	5 (25.0)	χ^2=2.327 P=0.127
Nature of endodontic disease	49 (65.3)	35 (63.6)	14 (70.0)	χ^2=0.261 P=0.609
Patient's underlying disease	24 (32.0)	16 (29.1)	8 (40.0)	χ^2=0.802 P=0.370
Complex root anatomy	52 (69.33)	40 (72.7)	12 (60)	χ^2=1.117 P=0.290

Chi-square test; *significant difference
Data are presented as percentages of the total number of respondents, categorized by gender.
Non-respondents: 19

endodontic disease (49 out of 75; 65.3%), the patient's underlying disease (24 out of 75; 32.0%), and the complex anatomy of the affected tooth (52 out of 75; 69.3%). Less frequently, lack of time (14 out of 75; 18.7%), lack of instruments (12 out of 75; 16.0%), and lack of skill (14 out of 75; 18.7%) were cited as reasons for referral **(Table 3)**. However, male respondents significantly more often referred patients due to lack of skill (χ^2=8.175; P=0.004) and lack of interest (χ^2=10.709; P=0.001) than their female colleagues **(Table 3)**.

Endodontic cases that GDPs decide to perform themselves are displayed in **Table 4**, while **Table 5** presents cases for referral to an endodontist. The presence of inflammatory periapical changes and complicated tooth trauma were identified as the most important clinical factors influencing referral to an endodontist. Radiographically confirmed periapical inflammation was one of the main factors for endodontic referral, especially in the case of premolars and molars **(Table 5)**. A large majority of respondents (80 out of 89; 89.9%) indicated that they would treat a molar without periapical changes compared to only 56.2% of respondents (50 out of 89) who would treat a molar with periapical changes. A slightly smaller discrepancy was observed in the premolar group, where 93.3% of participants (83 out of 89) would treat

Tab. 4 Endodontic cases GDPs decided to perform the treatment themselves.

Procedure	Total (N=89) n (%)	Female (N=61) n (%)	Male (N=28) n (%)	Statistics
Anterior teeth without periapical change	86 (96.6)	60 (98.4)	26 (92.9)	χ^2=1.785 P=0.182
Premolars without periapical change	83 (93.3)	60 (98.4)	23 (82.1)	χ^2=1.785 P=0.182
Molars without periapical change	80 (89.9)	58 (95.1)	22 (78.6)	χ^2=5.755 P=0.016*
Anterior teeth with periapical change	70 (78.7)	48 (78.7)	22 (78.6)	χ^2=0.0002 P=0.990
Premolars with periapical change	60 (67.4)	41 (67.2)	19 (67.9)	χ^2=0.0036 P=0.952
Molars with periapical change	50 (56.2)	34 (55.7)	16 (57.1)	χ^2=0.0154 P=0.901
Complicated tooth trauma	28 (31.5)	18 (29.5)	10 (35.7)	χ^2=0.343 P=0.558

Chi-square test; *significant difference
Data are presented as percentages of the total number of respondents, categorized by gender.
Non-respondents: 5

Tab. 5 Endodontic cases GDPs would refer to an endodontist.

Procedure	Total (N=64) n (%)	Female (N=46) n (%)	Male (N=18) n (%)	Statistics
Anterior teeth without periapical change	1 (1.6)	1 (2.2)	0 (0)	
Premolars without periapical change	1 (1.6)	1 (2.2)	0 (0)	
Molars without periapical change	4 (6.3)	3 (6.5)	1 (5.6)	χ^2=0.021 P=0.886
Anterior teeth with periapical change	21 (32.8)	17 (37.0)	4 (22.2)	χ^2=1.274 P=0.259
Premolars with periapical change	31 (48.4)	23 (50.0)	8 (44.4)	χ^2=0.160 P=0.689
Molars with periapical change	42 (65.6)	32 (69.6)	10 (55.6)	χ^2=1.1723 P=0.189
Complicated tooth trauma	32 (50.0)	24 (52.2)	8 (44.4)	χ^2=0.309 P=0.578

Chi-square test; *significant difference
Data are presented as percentages of the total number of respondents, categorized by gender.
Non-respondents: 31

a premolar without periapical changes, and 67.4% (60 out of 89) would treat a premolar with periapical changes. Thirty-two out of sixty-four (50.0%) respondents stated that they would refer a case of complicated tooth trauma to an endodontist.

DISCUSSION

Due to the aging European population, healthcare costs are increasing and there is a need for monitoring both the overuse and underuse of specialized care to ensure the appropriate treatment for each patient. Limited data are available regarding the variables influencing referral process within dentistry, particularly in the endodontic specialty. This survey in a sample of Croatian GDPs provided insight into the endodontic referral process, focusing on the factors that influenced their decision on when to refer.

The main goal of this study was to determine whether the decision to refer a patient to an endodontist varies based on the demographic characteristics of GDPs and features of their dental practices. The results indicated that only the number of dentists employed in practice had a significant influence on the dentists' referral decision. Respondents who were the only employed dentists referred patients more often than those who worked in larger group practices. These results are aligned with the finding that solo practitioners referred patients more frequently (72.4%) than those in larger practices (20%), likely due to the absence of an in-house endodontic specialist. It is reasonable to speculate that larger group practices may have a dentist who performs endodontic treatments, thus decreasing the need to refer a patient beyond the practice.

Although the majority of the sample consisted of respondents who graduated more than 20 years ago (57.4%), the present survey did not indicate any differences in referral patterns regarding the dentist's experience in practice. A study conducted by Abbott et al. found that less experienced dentists referred fewer patients to an endodontist than dentists with more than 10 years of practice experience (33.4% and 47.2%, respectively) [11].

When asked about the most frequent types of endodontic procedures performed in GDPs' practices, most respondents performed root canal treatment and retreatment. Differences between genders regarding the type of endodontic procedures and referral frequency were observed. Previous studies have reported a higher proportion of female practitioners referring to endodontists compared to male practitioners [5, 6, 7, 12], which was also confirmed in this study. A possible explanation for this phenomenon, which is also observed in other medical fields, could be the gender difference in risk-taking [13]. Females have been observed to display a lower risk acceptance and a tendency to avoid uncertain outcomes by opting for referral [14]. This behavior is also reflected in the significantly lower proportion of female respondents performing surgical endodontic treatment compared to male respondents in this study. As the proportion of female dentists increases, this referral behavior could have significant implications for both healthcare organizations and patients due to rising healthcare costs.

Until a few decades ago, the medical and dental communities were dominated by male

practitioners. However, this began to change, and an increasing number of female dentists were reported, affecting practice models, clinical procedures, specialist practice, and academia [15]. A study by McKay and Quiñonez reported that female subjects were less represented in leadership positions, academia, and specialties [16]. These findings were confirmed in the present study, with significantly fewer female respondents completing postgraduate education compared to male practitioners.

Regarding criteria that influence the referral decision, the most common factors reported were the nature of endodontic disease, the complex anatomy of the affected tooth, and the patient's underlying disease. Furthermore, the present survey demonstrated that one of the main factors for endodontic referral was radiographically confirmed periapical inflammation. This was particularly pronounced in the molar and premolar teeth. This occurrence could be attributed to the complex morphology of lateral teeth, the treatment of which often requires visual assistance such as loupes or a dental microscope and profound knowledge of tooth morphology. A previously conducted study found that only 20% of general dentists are willing to perform root canal treatment on a complex tooth such as a molar [11], while another survey reported that approximately 75% of the endodontically treated teeth in a secondary endodontic facility in Brazil were premolars and molars [17]. Apical periodontitis (AP), a condition frequently leading to specialist referral, is common. An analysis conducted on a global scale identified the prevalence of AP in 52% at the individual level. The frequency of AP was higher in root-filled teeth in comparison to endodontically untreated teeth (39% and 3%, respectively) [18]. This study found that 65.6% of respondents referred molars with periapical changes to an endodontist, emphasizing the high referral rate for conditions associated with apical periodontitis.

Previous studies have shown that the location of the practice of both the general dentist and the endodontist to whom they refer may influence the referral pattern. In a study by Barnes et al. [6], proximity to an endodontist was identified as an important factor, as well as the issue of accessibility to a specialist service for patients in rural areas. A study investigating referral behavior of a group of Lithuanian dentists found that almost half of the respondents from rural areas never referred to an endodontist compared to one-third in urban areas [8]. In Croatia most of the endodontists are located near Faculties or Dental Clinics in urban areas. To avoid the influence of the location of the GDPs' practices on referral pattern, the present study focused only on GDPs practicing in urban areas.

Interestingly, the number of registered patients in a GDP's practice did not influence the frequency of the referral. Although there was no difference in the referral rate, this topic remains poorly investigated, since, to the best of our knowledge, there is no study that analyzes the relationship between the number of patients and referral frequency.

A study analyzing response rates in postal surveys of healthcare professionals found an average response of 57.5% among physicians [19]. Although the response rate of the present study was lower than anticipated, a similar range of responses has been observed in other studies [20, 21]. Because of the anonymity, no reminder letters could be sent to non-respondents, contributing to the lower response rate. This might have increased the risk of bias and could affect the validity of the study.

Besides the low response rate, the relatively small sample acquired from a single geographic location represents a limitation to the present study. To overcome this, future research should include a larger number of participants, preferably from multiple geographic locations to ensure broader applicability of the findings.

CONCLUSION

The present survey demonstrated that the number of dentists employed in a practice significantly influenced dentists' referral decisions. Respondents who were the only employed dentists referred patients more often than those who work in larger group practices. GDPs most frequently performed root-canal treatment and non-surgical retreatment. The nature of endodontic disease, the complex anatomy of the affected tooth, and the patient's underlying disease were the most reported criteria influencing the referral decision. The majority of respondents would treat teeth without periapical inflammatory lesions, while premolar and molar teeth with apical periodontitis were identified as the most frequent cases referred to an endodontist.

The data suggest that there is a significant need for endodontic treatment and

retreatment procedures. While no significant difference was found between respondents with and without postgraduate education in the types of endodontic procedures performed, the data suggest that pursuing postgraduate education may still enhance professional competence and better prepare dentists for handling complex cases. Further research is needed to fully understand the relationship between education and referral practices.

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Conflict of Interest

The authors declare no conflict of interest.

Author's Contribution to the Publication

Romana Peršić Bukmir designed the concept and methodology of the study, performed statistical analysis, data interpretation, and drafted the manuscript.

Ema Paljević performed interpretation of data, statistical analysis, and drafted the manuscript.

Elvis Božac, Jelena Vidas Hrstić, Ivana Vidović Zdrilić performed data acquisition and drafted the manuscript.

Ivana Brekalo Pršo co-designed the concept and methodology of the study and edited the manuscript.

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