

Article

Determinants of Public Knowledge About Root Canal Treatment: A Cross-Sectional Survey of Croatian Adults

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Abstract

Aim: Root canal treatment preserves the natural tooth and avoids the consequences of extraction, yet its acceptance depends on public knowledge, attitudes, and perceptions. This cross-sectional online survey assessed the knowledge, attitudes, and experiences of Croatian adults recruited online via social media regarding root canal treatment and their association with sociodemographic characteristics. **Material and Methods:** A self-administered questionnaire (38 items, including an eight-item true/false knowledge scale) was distributed via social media between March and June 2025, and 1004 adults were included. Data were analyzed using the chi-square test or Fisher's exact test and logistic regression ($p < 0.05$). **Results:** The mean knowledge score was 5.60 ± 2.45 of 8. Participants with prior endodontic experience scored higher (6.36 vs. 5.15) and answered all knowledge items correctly more often ($p < 0.001$). In logistic regression, a higher level of knowledge was associated with female sex (OR = 1.78; 95% CI 1.34–2.36), older age, affiliation with a medical profession (OR = 3.16; 95% CI 2.32–4.32), prior endodontic experience (OR = 2.91; 95% CI 2.18–3.90), and considering the preservation of natural teeth important. Among treated participants, the level of knowledge did not differ significantly by the type of clinician who performed the treatment. Although fear and misconceptions (e.g., that the procedure is painful) were common, 88.3% of treated participants would recommend it. **Conclusions:** Overall knowledge was moderate rather than low. Targeted public education—delivered primarily through the dental office and reinforced by popular-science and social-media campaigns addressing treatment indications, the role of the endodontist, and misconceptions about pain—could reduce misconceptions and support the preservation of natural teeth.

Keywords: root canal treatment; endodontics; knowledge; attitudes; dental anxiety; patient perception; oral health; cross-sectional study



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1. Introduction

Endodontics is the branch of dental medicine concerned with the diagnosis, prevention, and treatment of diseases of the dental pulp and periapical tissues [1]. Its most common procedure, root canal treatment, removes the infected or necrotic pulp, cleans the canal system mechanically and chemically, and hermetically seals it to prevent reinfection, thereby enabling long-term retention of the natural tooth and avoiding the functional, esthetic, and financial burdens of extraction [1,2]. It is among the most frequently performed dental

procedures, with an estimated prevalence of 8.2% of teeth having undergone root canal treatment and more than half of the general population having at least one endodontically treated tooth [3]. This reflects a strong and ongoing global need for endodontic care, and the long-term prognosis is favourable: treated teeth show high survival, reaching 97% at 10 years and 68% at 37 years [4].

Despite this effectiveness, the decision to accept endodontic therapy depends largely on the knowledge, attitudes, and perceptions of the general population, and patient co-operation during treatment is closely linked to the factors that shaped that decision [5]. Misconceptions and fears that circulate in the public sphere strongly influence perception, fostering beliefs that the procedure is painful, lengthy, and costly; thus, extraction is often regarded as a faster and simpler solution [6,7]. Such perceptions translate into treatment delay, the development of complications, and ultimately more invasive therapeutic interventions [6–8].

Among the factors shaping the patient's relationship with endodontic treatment, dental anxiety holds a particular place. In studies of patient perception, endodontic procedures are consistently ranked among the treatments that provoke the highest levels of fear and anxiety, and this emotional state may lead a patient to refuse treatment and opt for extraction as a seemingly easier solution [9]. Notably, prior personal experience of treatment does not necessarily increase fear; its development is influenced far more by negative information from the surrounding environment and by others' experiences, so that individuals frequently develop pronounced fear of procedures they have never undergone themselves [10]. This fear is generally more pronounced in women and varies with age, and it can trigger a so-called vicious cycle of avoidance, in which postponing dental visits worsens oral health and subsequently necessitates more complex and invasive procedures, further reinforcing fear and avoidance [8,9].

The level of population knowledge regarding endodontic treatment has been generally assessed as inadequate, with many respondents failing to understand the purpose of the procedure or its advantages over extraction [11–13]. Affiliation with a health or medical profession has been associated with better knowledge of oral health, although even within this group, knowledge specific to endodontic treatment and tooth-preservation options may remain limited [14]. Previous experience of root canal treatment has also been shown to influence attitudes considerably: patients who have already undergone the procedure are more willing to accept it again, even given the associated costs, than those without such experience [13]. At the same time, sources of information—the dentist, family and friends, and increasingly the internet and social media—play an important role in shaping expectations and may contribute equally to accurate awareness and to the spread of misconceptions [12].

Although understanding patients' baseline attitudes is essential for improving dentist–patient communication and delivering higher-quality, more humane care research examining the general population's perception of endodontic treatment remains relatively scarce. Most such studies have been conducted in African and Asian countries, they are rare in Europe [6,11,15–18], and to date none has been carried out in Croatia. Addressing this gap is important because misconceptions and unaddressed fears contribute to treatment delay, avoidable complications, and a preference for extraction over tooth preservation; identifying the knowledge gaps and attitudes present in the Croatian population can therefore provide a basis for targeted patient education and improved clinical communication. Accordingly, the aim of this study was to assess the level of knowledge, attitudes, and experiences of the adult general population of the Republic of Croatia regarding root canal treatment, and to examine their association with sociodemographic characteristics, including age, sex, level of education, and affiliation with a medical profession. The following

hypotheses were tested: (1) participants who had previously undergone an endodontic procedure would demonstrate a higher level of knowledge about root canal treatment than those without such experience; (2) participants working or studying in a medical profession would demonstrate a higher level of knowledge than those not affiliated with a medical field; (3) participants who consider the preservation of natural teeth important would demonstrate a higher level of knowledge than those who do not; and (4) the overall level of knowledge about root canal treatment in the sample would be low.

2. Materials and Methods

2.1. Study Design and Participants

This cross-sectional study was conducted at the Department of Restorative Dental Medicine and Endodontics, School of Medicine, University of Split, and data were collected through an online questionnaire from 1 March to 30 June 2025. The methodology and reporting of this study were structured in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [19].

The target population was the adult general population of the Republic of Croatia. The sampling frame consisted of individuals who had access to the link to the online questionnaire through social media (Facebook, WhatsApp, Instagram, Viber, TikTok). These platforms were selected because they are among the most widely used social-media and messaging applications in Croatia across a broad range of age groups, which was intended to maximise the reach and demographic breadth of the sampling frame. A convenience sample based on participant self-selection was used, combined with a snowball sampling technique: participants were asked to forward the questionnaire link to anyone they thought might be willing to complete it.

The inclusion criteria were adulthood (age ≥ 18 years), residence in the Republic of Croatia, and the ability to access and independently complete the online questionnaire. Individuals not residing in the Republic of Croatia, minors, individuals with incomplete data, and those unable to complete the questionnaire independently were excluded from the study. A total of 1004 participants who met the inclusion criteria were included.

The minimum sample size required for the study was 385 participants. The sample size was calculated using the Sample Size Calculator (Raosoft, Inc., Seattle, WA, USA) [20] based on the number of adults in the Republic of Croatia according to the most recent census of 2021 [21], with a 95% confidence interval and a 5% margin of error. The final sample ($n = 1004$) considerably exceeded the calculated minimum, ensuring sufficient statistical power.

2.2. Ethical Considerations, Informed Consent, and Data Protection

Ethical approval for research on human participants was granted by the Ethics Committee of the School of Medicine, University of Split (Class: 029-01/25-02/0001; Ref. No.: 2181-198-03-04-25-0029; Split, 3 April 2025). The study was conducted in accordance with applicable ethical guidelines and regulations and with the principles of the Declaration of Helsinki of the World Medical Association.

Participants' informed consent was presented on the first page of the questionnaire and was obtained by confirming a statement in which participants acknowledged that they understood the purpose of the study, that participation was voluntary and anonymous, and that they met the inclusion criteria. Before beginning the questionnaire, participants were informed about the purpose of the study, the identity of the investigators, the estimated time required to complete the survey, and the voluntary nature of participation. With regard to data protection, no IP or VPN addresses, links to social-media profiles, or other identifying information were captured.

2.3. Development, Validation, and Administration of the Online Questionnaire

Following a review of the scientific literature on related topics, ideas for the questionnaire were collected [5,6,11–13,15,17]. The questionnaire was jointly designed by the mentor, a university professor and specialist in endodontics and restorative dental medicine, and a sixth-year dental medicine student at the School of Medicine in Split. It was adapted from previous studies addressing the knowledge, experiences, and perceptions of the general population regarding endodontic treatment. The content, validity, and quality of the questionnaire were expertly assessed by a specialist in pediatric and preventive dental medicine. Before the start of the study, the questionnaire was pilot-tested on a sample of 20 participants who met the inclusion criteria. Pilot participants evaluated the clarity, comprehensibility, and technical functionality of the questionnaire, as well as the time required for completion. The estimated time required to complete the questionnaire was approximately 10 min.

The questionnaire was created on the Google Forms platform and was available to participants via a link distributed on the aforementioned social media in the period from 1 March to 30 June 2025. Google Forms is a neutral platform and contains no additional content that could influence participants' responses. The survey was of the open type, accessible to all visitors of the link without the need for registration or a password. Participation was voluntary, and no incentives for participation were offered. The questions were presented in a fixed order, without randomization. The first page of the questionnaire contained the informed consent, the inclusion criteria, and the purpose and aims of the study. All questions were mandatory, and the platform did not allow submission of an incomplete questionnaire. Participants were able to review and change their answers before final submission.

The final questionnaire consisted of 38 questions divided into four sections: I. Sociodemographic data; II. Oral health and dental habits; III. Knowledge and attitudes related to endodontic treatment; and IV. Experience of endodontic treatment. Some questions contained several sub-questions or statements. The sociodemographic data (Q1–Q7) included sex, age, level of education, employment status, place of residence, family income, and affiliation with a medical profession. The second section (Q8–Q11) addressed participants' oral health and dental habits, comprising self-rated oral health, frequency of dental visits, the number of remaining teeth, and the importance attached to preserving the natural tooth. The third section (Q12–Q19) focused on knowledge of and attitudes toward endodontic treatment comprising eight true/false knowledge statements. The statements covered the indications for endodontic treatment, the causes of pulp infection, the symptoms of pulp damage, the role of the endodontist, the possibilities of preserving the natural tooth, the potential complications of untreated infection, tooth functionality after treatment, and the importance of oral hygiene. Correct answers were defined on the basis of current scientific guidelines and the professional endodontic literature. Each correct answer was worth one point, while an incorrect answer scored no points. The total knowledge score was obtained by summing the points across all statements and could range from 0 to 8. This score constituted an important basis of the study and was used in the subsequent analysis of the association between knowledge and sociodemographic characteristics and experience of endodontic treatment. The fourth section included eight attitude items (Q20–Q27) covering self-rated knowledge, the perception of pain and of tooth weakening, the role of antibiotics, fear and anxiety, concerns about treatment, sources of information, and the affordability of dental services. To access the final, fifth section of the questionnaire (Q29–Q38) (experience of endodontic treatment), an eliminating question (Q28) was posed: "Have you ever undergone an endodontic procedure (root canal treatment)?" In the case of a negative answer, the participant was thanked for their participation and the survey was

completed. For participants who answered affirmatively, the questionnaire continued. The questions in the final section focused on the participants' subjective experience during their encounter with endodontic treatment.

Because the survey was conducted via the Google Forms platform, it was not possible to precisely determine the number of unique visitors to the link, and therefore neither the view rate nor the participation rate could be calculated in the sense of the CHERRIES guidelines. Participants' IP addresses were neither collected nor stored; therefore, it was not possible to check for duplicates via IP address, nor were any other user-identification mechanisms used to prevent multiple entries. In accordance with these technical limitations, it was not possible to fully prevent multiple entries by the same participant; however, given the anonymity of the survey and the absence of any incentives for participation, the risk of intentional multiple completion was considered negligible. The collected data were used exclusively for the purpose of scientific research and were accessible only to the research team. As the platform did not allow submission of an incomplete questionnaire, only fully completed questionnaires were included in the analysis.

2.4. Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences, version 26.0 (SPSS; IBM Corp., Armonk, NY, USA). The threshold of statistical significance was set at $p < 0.05$. Categorical variables were presented as absolute numbers and percentages, while continuous variables were described as means and standard deviations, with the range of values where applicable. Categorical variables were compared using the chi-square test (the χ^2 statistic and degrees of freedom are available on request); Fisher's exact test was applied only when more than 20% of cells had an expected count below five. Continuous variables were compared between groups using the independent-samples Student's *t*-test, whereas ordinal variables and variables with non-normal distributions were compared using the Mann–Whitney U test. To assess the association of sociodemographic characteristics and participants' attitudes with the level of knowledge about endodontic treatment, a logistic regression analysis was additionally performed. The results of the regression analysis were presented as odds ratios (OR) with corresponding 95% confidence intervals (95% CI). For this analysis, the total knowledge score (range 0–8) was dichotomised at the sample median: participants who answered at least six of the eight items correctly were classified as having a higher level of knowledge, and those who answered five or fewer correctly as having a lower level of knowledge. All candidate variables (sex, age group, education, employment status, place of residence, family income, affiliation with a medical profession, previous experience of endodontic treatment, and the attitude toward retaining a natural tooth) were entered simultaneously into the multivariable model, without stepwise selection; both unadjusted and adjusted ORs are reported.

3. Results

Table 1 shows the participants' sociodemographic characteristics in relation to experience of endodontic treatment. Of 1004 participants, most were women ($n = 724$; 72.1%), with no significant sex difference in treatment experience ($p = 0.085$). The mean age was 30.83 ± 12.85 years; participants with prior experience were older (36.30 ± 14.02) than those without (27.55 ± 10.86), and age group was significantly associated with experience ($p < 0.001$). Significant associations were also found for level of education ($p = 0.001$), employment status ($p < 0.001$), and affiliation with a medical profession ($p < 0.001$), whereas place of residence ($p = 0.221$) and family income ($p = 0.237$) were not significant. Notably, participants with experience were less often affiliated with a medical profession (25.5% vs. 36.1%).

Table 1. Sociodemographic characteristics of participants in relation to experience of endodontic treatment.

Characteristic	Response	Total (n = 1004)	Experience—Yes (n = 376)	Experience—No (n = 628)	p-Value
Sex	Male	280 (27.9%)	93 (24.7%)	187 (29.8%)	0.085
	Female	724 (72.1%)	283 (75.3%)	441 (70.2%)	
Age group (years)	18–30	671 (66.8%)	178 (47.3%)	493 (78.5%)	<0.001
	31–45	154 (15.3%)	82 (21.8%)	72 (11.5%)	
	46–65	163 (16.2%)	106 (28.2%)	57 (9.1%)	
	>65	16 (1.6%)	10 (2.7%)	6 (1.0%)	
Education	Primary school	8 (0.8%)	7 (1.9%)	1 (0.2%)	0.001
	Secondary school	328 (32.7%)	104 (27.7%)	224 (35.7%)	
	University/college or higher	668 (66.5%)	265 (70.5%)	403 (64.2%)	
Employment	Student	510 (50.8%)	126 (33.5%)	384 (61.1%)	<0.001
	Employed	428 (42.6%)	220 (58.5%)	208 (33.1%)	
	Unemployed	37 (3.7%)	12 (3.2%)	25 (4.0%)	
	Retired	29 (2.9%)	18 (4.8%)	11 (1.8%)	
Place of residence	Rural	181 (18.0%)	75 (19.9%)	106 (16.9%)	0.221
	Urban	823 (82.0%)	301 (80.1%)	522 (83.1%)	
Family income	Below average	77 (7.7%)	29 (7.7%)	48 (7.6%)	0.237
	Average	671 (66.8%)	240 (63.8%)	431 (68.6%)	
	Above average	256 (25.5%)	107 (28.5%)	149 (23.7%)	
Medical profession	Yes	323 (32.2%)	96 (25.5%)	227 (36.1%)	<0.001
	No	681 (67.8%)	280 (74.5%)	401 (63.9%)	

Data are presented as number (percentage). Categorical variables were compared using the chi-square test and Fisher's exact test. A *p*-value < 0.05 was considered statistically significant.

Table 2 shows the proportion of correct answers to each of the eight knowledge statements by treatment experience. The mean knowledge score was 5.60 ± 2.45 (range 0–8). Participants with prior experience scored significantly higher (6.36 ± 1.92) than those without (5.15 ± 2.61). The highest proportions of correct answers concerned the benefit of oral hygiene after treatment (83.4%) and caries, cracks, or trauma as causes (80.5%), while the lowest concerned the indication for treatment when the pulp is inflamed or infected (48.6%). For all statements, participants with experience answered correctly significantly more often ($p < 0.001$).

Table 3 presents oral health and dental habits by treatment experience. Experience was significantly associated with self-rated oral health ($p = 0.001$), frequency of dental visits ($p = 0.003$), and self-reported number of remaining teeth ($p < 0.001$). Participants with experience rated their oral health slightly lower (mean 3.82 ± 0.85 vs. 4.04 ± 0.77) and less often reported having all their teeth (37.2% vs. 75.2%). The importance attributed to

retaining natural teeth did not differ significantly ($p = 0.835$); about 78% in both groups considered it important.

Table 2. Distribution of correct (“Yes”) answers to statements about endodontic treatment by experience of endodontic treatment.

Statement	Total (n = 1004)	Exp.—Yes	Exp.—No	p-Value
Endodontic treatment is needed when the dental pulp becomes inflamed or infected.	488 (48.6%)	226 (60.1%)	262 (41.7%)	<0.001
Caries, cracks, or trauma can lead to the need for root canal treatment.	808 (80.5%)	323 (85.9%)	485 (77.2%)	<0.001
Persistent sensitivity to heat/cold, tooth discoloration, or pus-filled sacs on the gums may indicate pulp damage.	732 (72.9%)	307 (81.6%)	425 (67.7%)	<0.001
An endodontist is a dentist specialized in root canal treatment.	601 (59.9%)	251 (66.8%)	350 (55.7%)	<0.001
Root canal treatment can save a natural tooth from extraction.	774 (77.1%)	338 (89.9%)	436 (69.4%)	<0.001
An untreated pulp infection can lead to swelling of the gums, face, and jaw.	773 (77.0%)	326 (86.7%)	447 (71.2%)	<0.001
A tooth treated endodontically can function like a normal tooth.	614 (61.2%)	287 (76.3%)	327 (52.1%)	<0.001
Good oral hygiene after root canal treatment helps prolong the lifespan of the treated tooth.	837 (83.4%)	333 (88.6%)	504 (80.3%)	<0.001

Values are presented as number and percentage. Chi-square or Fisher’s exact test, $p < 0.05$.

Table 3. Attitudes and self-rated oral health by experience of endodontic treatment.

Question	Response	Total (n = 1004)	Exp.—Yes	Exp.—No	p-Value
Self-rated oral health	Very poor	8 (0.8%)	6 (1.6%)	2 (0.3%)	0.001
	Poor	33 (3.3%)	16 (4.3%)	17 (2.7%)	
	Fair	199 (19.8%)	90 (23.9%)	109 (17.4%)	
	Good	517 (51.5%)	190 (50.5%)	327 (52.1%)	
	Very good	247 (24.6%)	74 (19.7%)	173 (27.5%)	
Frequency of dental visits	Never	28 (2.8%)	6 (1.6%)	22 (3.5%)	0.003
	Occasionally	663 (66.0%)	231 (61.4%)	432 (68.8%)	
	Every 6 months	313 (31.2%)	139 (37.0%)	174 (27.7%)	
Self-reported remaining teeth	≤20 teeth	59 (5.9%)	36 (9.6%)	23 (3.7%)	<0.001
	>20 teeth	333 (33.2%)	200 (53.2%)	133 (21.2%)	
	All teeth	612 (61.0%)	140 (37.2%)	472 (75.2%)	
Importance of retaining natural teeth	Not important	21 (2.1%)	8 (2.1%)	13 (2.1%)	0.835
	Somewhat	196 (19.5%)	77 (20.5%)	119 (19.0%)	
	Important	787 (78.4%)	291 (77.4%)	496 (79.0%)	

Values are presented as number and percentage. Chi-square or Fisher’s exact test, $p < 0.05$.

Table 4 shows perceptions, attitudes, and concerns by treatment experience. Participants with experience rated their own knowledge higher (median 3 (IQR 2–4) vs. median 2 (IQR 1–3); $p < 0.001$) and more often considered the procedure painful (49.2% vs. 33.0%;

$p < 0.001$) and tooth-weakening (28.5% vs. 15.1%; $p < 0.001$). Fear or anxiety did not differ by experience ($p = 0.937$). The dentist was by far the main source of information (82.7%); participants without experience relied more on friends or family ($p = 0.008$) and social media ($p = 0.010$). Those with experience more often considered dental services in Croatia affordable (59.6% vs. 46.5%; $p < 0.001$).

Table 4. Perceptions, attitudes, and concerns related to endodontic treatment.

Question	Response	Total (n = 1004)	Exp.—Yes	Exp.—No	p-Value
Self-rated knowledge of endodontic treatment (1–5)	median (IQR)	2 (1–3)	3 (2–4)	2 (1–3)	<0.001
Endodontic treatment is painful	Yes	392 (39.0%)	185 (49.2%)	207 (33.0%)	<0.001
Endodontic treatment weakens the tooth	Yes	202 (20.1%)	107 (28.5%)	95 (15.1%)	<0.001
Antibiotics eliminate dental infection without endodontic treatment	Yes	30 (3.0%)	7 (1.9%)	23 (3.7%)	0.073
Fear and anxiety about endodontic treatment	None	251 (25.0%)	94 (25.0%)	157 (25.0%)	0.937
	Mild	453 (45.1%)	172 (45.7%)	281 (44.7%)	
	Marked	300 (29.9%)	110 (29.3%)	190 (30.3%)	
Concerns related to endodontic treatment	None	588 (58.6%)	276 (73.4%)	312 (49.7%)	<0.001
	Pain	280 (27.9%)	76 (20.2%)	204 (32.5%)	0.145
	Long duration	501 (49.9%)	179 (47.6%)	322 (51.3%)	0.023
	Cost	254 (25.3%)	109 (29.0%)	145 (23.1%)	0.299
	Failure	186 (18.5%)	66 (17.6%)	120 (19.1%)	0.007
	Other	292 (29.1%)	127 (33.8%)	165 (26.3%)	0.535
Source of information about dental services	Dentist	830 (82.7%)	319 (84.8%)	511 (81.4%)	0.093
	Friend or family	206 (20.5%)	62 (16.5%)	144 (22.9%)	0.008
	Social media	138 (13.7%)	39 (10.4%)	99 (15.8%)	0.010
	Internet	232 (23.1%)	78 (20.7%)	154 (24.5%)	0.097
	Other	17 (1.7%)	3 (0.8%)	14 (2.2%)	0.069
Affordability of dental services in Croatia	Yes	516 (51.4%)	224 (59.6%)	292 (46.5%)	<0.001

Data are presented as a number (percentage) or as the median (interquartile range). Categorical variables were compared using the chi-square test (Fisher's exact test when expected counts were below five); the ordinal self-rated knowledge score was compared using the Mann–Whitney U test. A p -value < 0.05 was considered statistically significant.

Table 5 presents data only for participants who had undergone endodontic treatment ($n = 376$). The procedure was most often performed by a general dentist (74.2%) and by an endodontist in 18.6% of cases. Just over half (54.5%) felt adequately informed beforehand. Fear or anxiety was reported before (53.2%) and during (51.6%) the procedure, pain was reported during (46.8%) and after (43.4%), and complications such as swelling were reported in 16.5%. Despite this, 61.4% were fully satisfied with the outcome and 88.3% would recommend the procedure to friends or family.

Table 5. Experience of the procedure among participants who had undergone endodontic treatment.

Question	Response	Total (n = 376)
Dentist who performed the procedure	General dentist	279 (74.2%)
	Endodontist	70 (18.6%)
	Other	4 (1.1%)
	Don't know	23 (6.1%)
Informed before the procedure	Yes	205 (54.5%)
Fear or anxiety before the procedure	Yes	200 (53.2%)
Fear or anxiety during the procedure	Yes	194 (51.6%)
Pain during the procedure	Yes	176 (46.8%)
Pain after the procedure	Yes	163 (43.4%)
Swelling or other complications after the procedure	Yes	62 (16.5%)
Analgesic use after the procedure	Yes	144 (38.3%)
Antibiotic use after the procedure	Yes	78 (20.7%)
Satisfaction with the outcome	Fully	231 (61.4%)
	Partially	129 (34.3%)
	Not at all	16 (4.3%)

Data presented as number and percentage.

Table 6 shows the logistic regression analysis of factors associated with the level of knowledge about endodontic treatment. In the unadjusted analysis, higher odds of a higher level of knowledge were associated with female sex (OR = 1.78; 95% CI 1.34–2.36; $p < 0.001$), older age (46–65 years: OR = 1.96; 95% CI 1.34–2.88; $p < 0.001$; 31–45 years: OR = 1.46; $p = 0.046$), being retired (OR = 3.10; $p = 0.024$), affiliation with a medical profession (OR = 3.16; 95% CI 2.32–4.32; $p < 0.001$), and prior endodontic experience (OR = 2.91; 95% CI 2.18–3.90; $p < 0.001$). Participants who considered retaining a natural tooth only somewhat important (OR = 0.53; $p < 0.001$) or not important (OR = 0.20; $p < 0.001$) had significantly lower odds than those who considered it important, whereas education, place of residence, and family income were not significantly associated with knowledge. In the multivariable model, female sex (adjusted OR = 1.41; $p = 0.035$), age 46–65 years (aOR = 1.83; $p = 0.026$), affiliation with a medical profession (aOR = 4.49; $p < 0.001$), prior endodontic experience (aOR = 3.17; $p < 0.001$), and a lower valuation of tooth preservation (somewhat important: aOR = 0.54, $p < 0.001$; not important: aOR = 0.25, $p = 0.008$) remained independently associated with the level of knowledge.

Table 6. Factors associated with the level of knowledge about endodontic treatment—results of unadjusted and adjusted logistic regression analysis.

Characteristic	Response	Unadjusted OR (95% CI)	<i>p</i> -Value	Adjusted OR (95% CI)	<i>p</i> -Value
Sex	Male	1 (reference)		1 (reference)	
	Female	1.78 (1.34–2.36)	<0.001	1.41 (1.02–1.93)	0.035
Age	18–30	1 (reference)		1 (reference)	
	31–45	1.46 (1.01–2.12)	0.046	1.57 (0.94–2.64)	0.086
	46–65	1.96 (1.34–2.88)	<0.001	1.83 (1.08–3.11)	0.026
	>65	2.05 (0.65–6.41)	0.219	0.37 (0.03–4.37)	0.428

Table 6. Cont.

Characteristic	Response	Unadjusted OR (95% CI)	<i>p</i> -Value	Adjusted OR (95% CI)	<i>p</i> -Value
Education	Primary school	1 (reference)		1 (reference)	
	Secondary school	0.49 (0.10–2.46)	0.385	1.30 (0.18–9.28)	0.795
	University/college	0.63 (0.13–3.13)	0.569	1.60 (0.22–11.43)	0.638
Employment	Student	1 (reference)		1 (reference)	
	Employed	1.25 (0.95–1.63)	0.107	1.06 (0.70–1.60)	0.797
	Unemployed	0.85 (0.43–1.66)	0.629	1.04 (0.49–2.22)	0.918
	Retired	3.10 (1.16–8.25)	0.024	8.23 (0.92–73.96)	0.060
Place of residence	Urban	1 (reference)		1 (reference)	
	Rural	0.80 (0.58–1.11)	0.182	0.81 (0.56–1.17)	0.269
Family income	Below average	1 (reference)		1 (reference)	
	Average	0.90 (0.55–1.48)	0.687	0.84 (0.49–1.44)	0.522
	Above average	1.01 (0.59–1.73)	0.961	0.74 (0.41–1.34)	0.325
Medical profession	No	1 (reference)		1 (reference)	
	Yes	3.16 (2.32–4.32)	<0.001	4.49 (3.15–6.41)	<0.001
Experience of endodontic treatment	No	1 (reference)		1 (reference)	
	Yes	2.91 (2.18–3.90)	<0.001	3.17 (2.29–4.39)	<0.001
Retaining a natural tooth	Important	1 (reference)		1 (reference)	
	Somewhat	0.53 (0.39–0.73)	<0.001	0.54 (0.38–0.78)	<0.001
	Not important	0.20 (0.07–0.51)	<0.001	0.25 (0.09–0.69)	0.008
Dentist who performed the treatment ^a	Endodontist	1 (reference)		1 (reference)	
	General dentist	0.55 (0.27–1.13)	0.105	0.61 (0.29–1.31)	0.208
	Do not know	0.31 (0.11–0.93)	0.036	0.36 (0.11–1.14)	0.082
	Other	NE ^b		NE ^b	

Data are presented as odds ratios (ORs) with 95% confidence intervals (CIs). The outcome was a higher level of knowledge, defined as a total score of at least 6 of 8 (i.e., at or above the sample median). The adjusted model included all variables listed in the table, entered simultaneously (no stepwise selection). OR, odds ratio; CI, confidence interval; a *p*-value < 0.05 was considered statistically significant. ^a Estimated only among the 376 participants who had undergone endodontic treatment, in a separate model with the endodontist as the reference category, adjusted for sex, age, and affiliation with a medical profession. ^b NE, not estimable: the “Other” group (*n* = 4) had a higher level of knowledge in every case, causing complete separation.

4. Discussion

This is, to the best of our knowledge, the first study to examine the knowledge, attitudes, and experiences of the general adult population of the Republic of Croatia regarding endodontic treatment, while comparable studies remain relatively rare worldwide. The overall level of knowledge proved to be moderate, which did not confirm the hypothesis of low knowledge, whereas prior experience of endodontic treatment, affiliation with a medical profession, and the attitude toward the importance of preserving the natural tooth emerged as factors significantly associated with better knowledge, thereby confirming the remaining three hypotheses. Beyond the pre-specified hypotheses, female sex and middle age (46–65 years) were also independently associated with a higher level of knowledge; the

former is consistent with the greater oral-health awareness and health-seeking behaviour frequently reported among women, and the latter may reflect greater cumulative exposure to dental care and health information with age.

The moderate level of knowledge is consistent with the findings of several similar survey studies in which the general population's knowledge of endodontic treatment was likewise rated as average [13,17,22]. In contrast, some authors have reported inadequate knowledge and concluded that acceptance of treatment would increase with better information [6]. Beyond the level of knowledge itself, the distribution of correct answers reveals that respondents are more familiar with general, intuitively understandable content—the role of oral hygiene, the causes leading to the need for treatment, and the consequences of untreated infection—than with technically specific aspects, such as the core indication for treatment and the role of the endodontist as a specialist. This pattern, in which the public understands the purpose and benefit of treatment well but its clinical basis less so, has been described in previous studies [11,12,15,22]. The low recognition of the endodontic specialty is clinically important because it may affect the timely referral of patients to a specialist and their expectations of the outcome [11].

The better knowledge among respondents with prior experience of treatment is expected, since personal experience entails having the procedure explained during conversation with the dentist and direct exposure to treatment; a similar favourable role of experience has been noted by other authors [13]. The higher level of knowledge in the medical profession can be attributed to better health literacy and daily exposure to professional content [14]. Interestingly, however, members of the medical profession less often had experience of the procedure itself; this finding should be interpreted with caution, as it probably reflects a larger proportion of younger respondents and students in this group rather than a preventive effect of medical education. The association between the attitude toward preserving the natural tooth and the level of knowledge was also confirmed, suggesting that better information stems from an interest in oral health; because this is a cross-sectional study, the direction of this association remains undetermined. This finding has preventive value, as it shows that education should be directed not only at facts about the procedure but also at raising awareness of the importance of preserving the natural dentition.

Respondents with experience of treatment, on average, rated their own oral health more poorly and had fewer preserved teeth, which is expected given that the need for endodontic treatment is itself a consequence of advanced dental disease, most often deep caries or trauma [1]; experience of treatment can therefore be regarded as an indicator of a greater burden of dental morbidity. This group was also characterised by more frequent dental visits, which may be interpreted in two ways—as a consequence of a greater need for care or as an expression of greater awareness of the importance of regular check-ups. Although regular dental attendance is associated in the literature with better oral health and less tooth loss [23], the fact that more frequent visits were recorded precisely here among those with poorer oral health suggests that they are at least partly driven by existing problems. In contrast, the importance respondents attached to preserving natural teeth did not differ according to experience of treatment, which is encouraging from a public-health perspective because it shows that a positive attitude toward tooth preservation exists regardless of personal experience and that the room for improvement lies not in motivation but in information.

The belief that endodontic treatment is painful proved, as in other populations, to be one of the most widespread perceptions [11,15]. In this sample it was more pronounced among those with experience, in whom it probably partly reflects actual experience, given that pain associated with root canal treatment is relatively common, especially before and during the procedure [24]. Patient education should therefore not deny pain but explain it

realistically and emphasise contemporary options for its relief. The level of fear, however, did not differ according to experience, confirming that it is shaped more by anticipation and others' experiences than by one's own [8–10], so that personal experience of treatment does not necessarily reduce the anxiety patients associate with it. This helps to reconcile an apparent tension with the widely reported role of anxiety as a driver of treatment avoidance and a preference for extraction: because dental anxiety is largely anticipatory, shaped by expectations and second-hand accounts before any treatment, undergoing the procedure neither necessarily creates nor relieves it. Consequently, interventions aimed at reducing avoidance should target anticipatory fear in the wider, treatment-naïve population rather than rely on personal experience to allay it.

The dentist proved by far the most frequent source of information about dental services, underscoring the dentist's key role in shaping patients' perceptions and knowledge, whereas respondents without experience relied more often on family, friends, and social media—sources that may convey inaccurate information and negative attitudes. Notably, in the study by Mohan et al. the most frequent sources of information were precisely family and friends, followed only later by the dentist [5], which differs from our finding and may reflect differences in health systems and care-seeking habits. Regardless of the source, existing evidence shows that information and high-quality communication are essential for reducing fear and increasing patient satisfaction [12,18].

Among respondents who had undergone treatment, most procedures were performed by a general dentist and only a smaller proportion by an endodontist, consistent with everyday practice in which more complex cases are referred to a specialist; an almost identical conclusion, with the assumption that most procedures are performed by less experienced clinicians, was reached by Aldawsari and Alamri, who highlighted the need for a clearer referral system [11]. In our sample, the type of clinician who had performed the treatment was not significantly associated with the level of knowledge. Relative to treatment by an endodontist, neither treatment by a general dentist nor being unaware of who had carried out the procedure was independently associated with knowledge, although knowledge tended to be highest among those treated by an endodontist and lowest among those who did not know who had treated them. Provider type was likewise unrelated to satisfaction with the outcome. Taken together, this suggests that a patient's level of knowledge reflects their own background and engagement with oral health rather than the specialty of the treating clinician, which may in part explain why those unaware of their provider were also the least informed. Only half of the respondents reported being adequately informed before the procedure, which is clinically important because insufficient knowledge increases fear and distrust, and communication between patient and clinician is key to reducing them [18]. Cost is regularly cited in the literature as an important factor in the decision to undergo treatment [13]. Despite the reported pain and fear, satisfaction with the outcome and willingness to recommend the procedure were very high, similar to the findings of other authors [5]; this discrepancy is consistent with the long-term success of endodontic treatment and the high survival rates of treated teeth [4], and shows that the procedure, once experienced, is generally evaluated positively.

Several clinical messages follow from these findings. In everyday practice, the dentist should adapt communication to the patient and explain the procedure more clearly before planning it, and in education the dentist should place particular emphasis on the fact that the purpose of endodontic treatment is to preserve the natural tooth and avoid its extraction. Since the dentist is the most frequent source of information, the dental office is a key site for education, but it is also worth developing easily understandable content accessible to the wider public.

The main strengths of this study are its large sample and the treatment of a topic not previously investigated in the adult Croatian population, together with a methodology aligned with recognised guidelines for reporting internet surveys [19]. Nevertheless, the results should be interpreted in light of several limitations. Because of the convenience sample based on self-selection and distribution via social media, the generalisability of the results to the entire population is limited; the sample was dominated by women, younger and highly educated individuals, and members of the medical profession, while groups without internet access were probably under-represented, which may have raised the recorded level of knowledge. Because the survey was administered exclusively online and the number of unique visitors to the link could not be determined, this participation bias should not be underestimated, and the under-representation of individuals without internet access probably contributed to some overestimation of the true level of knowledge; findings from online surveys should therefore be compared with caution against those of offline, chairside studies, and future work would benefit from large population-based sampling frameworks such as national health and nutrition surveys to broaden demographic coverage [25]. The data are based on self-assessment and are therefore subject to recall bias and the giving of socially desirable answers, and the cross-sectional design does not allow causal relationships to be established. Because IP addresses were not recorded, multiple entries by the same respondent are theoretically possible, although this risk is considered negligible owing to the anonymity of the survey and the absence of incentives.

Future research should include a more representative sample of the Croatian population, with a more balanced distribution by sex, age, and education, preferably using probability sampling or statistical weighting and a combination of online and paper questionnaires to reach under-represented groups. A longitudinal design would help clarify the direction of the association between knowledge and attitudes and show whether patients' perceptions change after treatment. Finally, since misconceptions and fear most often spread outside the dental office, it would be worthwhile to develop and test the effectiveness of targeted educational interventions focused on the indications for treatment, thus dispelling misconceptions about pain and tooth weakening, and the role of the endodontist.

5. Conclusions

In this first study of Croatian adults, knowledge of root canal treatment was moderate rather than low and was independently associated with prior endodontic experience, affiliation with a medical profession, valuing the preservation of natural teeth, female sex, and middle age (46–65 years), whereas education, place of residence, and family income were not. These findings highlight the need for targeted public education—particularly on the indications for treatment and the role of the endodontist—delivered primarily through the dental office in order to reduce misconceptions and support the preservation of natural teeth.

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