



“Knowledge, Attitude, and Referral Patterns in Endodontic Practice Among General Dental Practitioners in Marathwada Region: A Cross-Sectional Study”

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ABSTRACT:

Background: Root canal treatment (RCT) is a fundamental procedure in general dental practice, yet knowledge, adherence to aseptic protocols, and referral practices vary among practitioners. Understanding these differences is essential to improve treatment outcomes and patient care.

Aim: To evaluate knowledge, attitude, clinical practices, and referral patterns in endodontics among general dental practitioners in Marathwada.

Materials and Methods: A descriptive cross-sectional survey was conducted among 486 practitioners, with 368 complete responses (75.7%). A 17-item validated questionnaire assessed demographics, endodontic knowledge, clinical practices, attitudes, and referrals. Data were analyzed using SPSS version 23, with $p < 0.05$ considered statistically significant.

Results: Most practitioners (79.3%) were confident performing RCT, while only 40.8% routinely treated molars. Adherence to irrigation protocols was high (88%), and 67.4% used apex locators, but consistent use of rubber dam isolation was low (12%). Referrals were mainly influenced by case complexity (56%). Around 64.1% of practitioners expressed interest in continuing dental education to enhance their skills.

Conclusion: General dental practitioners in Marathwada show satisfactory knowledge and positive attitude toward endodontics, but gaps exist in aseptic protocol adherence and structured referrals. Focused training and access to modern technologies are recommended to improve clinical practice.

KEYWORDS: Endodontics; Root Canal Treatment; General Dental Practitioners; Aseptic Protocols; Rubber Dam; Referral Patterns; Cross-Sectional Study.

I. INTRODUCTION

Endodontics is a specialized field of dentistry concerned with the diagnosis, prevention, and management of diseases affecting the dental pulp and periradicular tissues, with the primary aim of preserving natural dentition¹. The preservation of natural teeth is essential not only for functional efficiency but also for aesthetics and overall oral health. If left untreated, pulpal inflammation or infection may progress to irreversible damage, leading to pulp necrosis and the development of periapical pathology, ultimately resulting in tooth loss². Root canal treatment (RCT) remains the cornerstone of endodontic therapy and is considered a highly predictable procedure when performed with adequate knowledge of root canal anatomy, proper chemo mechanical preparation, effective disinfection, and three-dimensional obturation³.

In recent years, advancements in endodontic materials, instruments, and diagnostic modalities have significantly transformed clinical practice. The introduction of rotary nickel-titanium instruments has enhanced efficiency and reduced operator fatigue, while electronic apex locators have improved the accuracy of working length determination. Additionally, digital radiography and cone-beam computed tomography (CBCT) have enabled better visualization of root canal morphology and periapical tissues, thereby improving diagnostic precision and treatment planning⁴. Collectively, these innovations have contributed to improved treatment outcomes and higher success rates of endodontic procedures.

Despite these advancements, their integration into routine clinical practice among general dental practitioners (GDPs) remains inconsistent. Variations in knowledge, clinical experience, access to advanced equipment, and economic factors influence the adoption of modern



techniques, particularly in semi-urban and resource-limited settings⁵⁻⁷. Furthermore, adherence to standard endodontic protocols continues to be a concern. Previous studies have reported inadequate compliance with essential aseptic measures, especially the use of rubber dam isolation, which is critical for preventing contamination, ensuring patient safety, and enhancing treatment success^{7,8}.

The management of complex endodontic cases often requires advanced skills and specialized expertise. Referral to endodontic specialists is recommended in cases involving calcified canals, severely curved roots, retreatment, perforations, and instrument separation^{9,10}. Referral decisions are influenced by multiple factors, including practitioner confidence, clinical expertise, availability of advanced equipment, and access to specialist

II. MATERIAL AND METHODS

The present study was a descriptive, cross-sectional survey conducted among general dental practitioners in the Marathwada region to assess their knowledge, attitude, clinical practices, and referral patterns related to endodontics. Data collection was carried out over a period of three months, from June 2025 to September 2025.

A convenience sampling method was employed, targeting 486 dental practitioners. Participation was voluntary, and informed consent was obtained from all respondents prior to participation.

Data were collected using a 17-item, self-administered online questionnaire designed on Google Forms and distributed through WhatsApp

and email to ensure wider reach and convenience for the participants. The questionnaire included close-ended questions covering demographic details, knowledge and practice-related aspects, attitudes towards endodontic procedures, and referral patterns. The items were adapted from previously validated studies with minor modifications to suit the objectives of the current research. The collected data were compiled and analysed using SPSS version 23, with descriptive statistics summarizing responses and the Chi-square test applied to assess associations, considering a p-value of <0.05 as statistically significant.

care^{11,12}. Appropriate referral practices are essential to ensure optimal patient outcomes and to minimize the risk of treatment failure. Although several studies have assessed endodontic practices among GDPs in different regions, there is limited data regarding their knowledge, attitude, clinical practices, and referral patterns in the Marathwada region. Identifying these parameters is crucial for understanding existing gaps between knowledge and clinical application. Therefore, the present study was undertaken to evaluate the knowledge, attitude, and referral patterns related to endodontic practice among general dental practitioners in this region, with the aim of identifying areas for improvement and guiding future educational and clinical interventions.

Inclusion criteria comprised registered general dental practitioners actively involved in clinical practice within the Marathwada region. Specialists exclusively practicing endodontics and incomplete responses were excluded from the study.

III. QUESTIONNAIRE

Section	Domain	Variables Assessed
I	Demographic Details	Gender; Qualification; Years of clinical experience; Practice location; Practice type
II	Knowledge in Endodontics	Confidence in performing root canal treatment (RCT); Teeth routinely treated; Use of rubber dam isolation; Instrumentation technique (hand/rotary/both); Use of irrigation protocol; Use of apex locator for working length determination
III	Attitude Toward Endodontic Practice	Perception regarding specialist-only molar RCTs; Most challenging aspect in endodontics; Interest in attending continuing dental education (CDE) programs
IV	Referral Patterns	Frequency of referral to Endodontist; Types of cases referred (retreatment, calcified canals, curved roots, perforations, instrument separation, pediatric RCT); Factors influencing referral decision
V	Suggestions and Feedback	Open-ended suggestions to improve endodontic practice and training among general dental practitioners



IV. RESULTS

A total of 368 general dental practitioners (GDPs) participated in the study, yielding a response rate of 75.72%. The demographic distribution revealed a predominance of female practitioners (67%) compared to males (33%), with the difference being statistically significant. In terms of educational qualification, the majority of respondents were Bachelor of Dental Surgery (BDS) graduates (65.2%), followed by those with a Master of Dental Surgery (MDS) in other specialties (22.8%) and a smaller proportion specializing in endodontics (12%)(Table 2).

With respect to clinical experience, most practitioners (59.8%) had 1–5 years of experience, indicating that the study population largely consisted of early-career clinicians. A smaller proportion had less than one year (20.1%), while fewer participants had more extensive experience (6–10 years: 13.6%; >10 years: 6.5%). Practice settings were predominantly private clinics (60.3%), followed by consultancy-based practice (19%) and academic institutions (11.4%). Geographically, most practitioners were located in suburban (42.9%) and urban (37%) areas, with fewer practicing in rural regions (20.1%).

Regarding knowledge and clinical practice, a significant majority of practitioners (79.3%) reported confidence in performing root canal treatment (RCT), while a smaller proportion expressed partial or no confidence. A moderate proportion of practitioners (40.8%) reported routinely performing molar RCTs, indicating a tendency to undertake more complex procedures rather than limiting treatment to anterior or premolar teeth.

The adoption of modern endodontic techniques was evident among the participants. A large proportion (78.3%) utilized a combination of hand and rotary instrumentation, reflecting a transition toward advanced mechanical preparation techniques. Additionally, 88% of practitioners reported following a defined irrigation protocol, demonstrating awareness of the importance of canal disinfection in achieving successful treatment outcomes. The use of electronic apex locators was also relatively high, with 67.4% of practitioners consistently using them for working length determination, suggesting integration of

contemporary diagnostic aids into routine practice(Table3).

However, certain critical gaps in adherence to standard protocols were identified. The use of rubber dam isolation was notably limited, with only 12% of practitioners consistently implementing it, while a substantial proportion either used it occasionally or not at all(Figure2). This highlights a significant discrepancy between recommended guidelines and actual clinical practice, potentially impacting treatment quality and infection control.

In terms of attitudes, the majority of practitioners (64.1%) expressed a willingness to participate in continuing dental education (CDE) programs related to endodontics, indicating a positive approach toward professional development and skill enhancement. The most commonly reported challenges in endodontic practice were canal location and instrument separation, followed by difficulties in working length determination and patient cooperation. These findings underscore the technical complexity associated with endodontic procedures.

Referral patterns revealed that most GDPs preferred to manage endodontic cases independently, with referrals being made selectively. The majority reported rarely or occasionally referring cases, while only a small proportion consistently referred patients to specialists. The types of cases most commonly referred included instrument separation, retreatment cases, curved canals, and calcified canals, indicating that technically demanding and high-risk cases were more likely to be referred.

Case complexity emerged as the primary factor influencing referral decisions (56%), followed by other factors such as time constraints, lack of equipment, practitioner confidence, and patient-related considerations including affordability and preference.(Figure 3)

Overall, the findings indicate that while GDPs demonstrate good clinical confidence and a growing adoption of modern endodontic practices, there remain notable gaps in

adherence to standard protocols, particularly

in rubber dam usage. The results emphasize the need for targeted educational interventions and continuous professional training to bridge the gap between knowledge and clinical practice, ultimately improving the quality of endodontic care

TABLE 2.Demographic Characteristics (n = 368)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	246	67
	Male	122	33
Qualification	BDS	240	65.2
	MDS(Endodontists)	44	12
	MDS(other speciality)	84	22.8
Experience	1-5years	220	59.8
Practice Type	Private practice	222	60



TABLE 3: Endodontic Practice & Referral Patterns

Parameter	Frequency	Percentage
Confident in performing RCT	292	79.3
Perform molar RCT	150	40.8
Rubber dam (Always)	44	12
Rubber dam (Never)	172	46.7
Use of apex locator	248	67.4
Follow irrigation protocol	324	88
Referral based on complexity	206	56
Willing for CDE programs	236	64.1

Figure 1: Combined Graph of Key Endodontic Practice Indicators

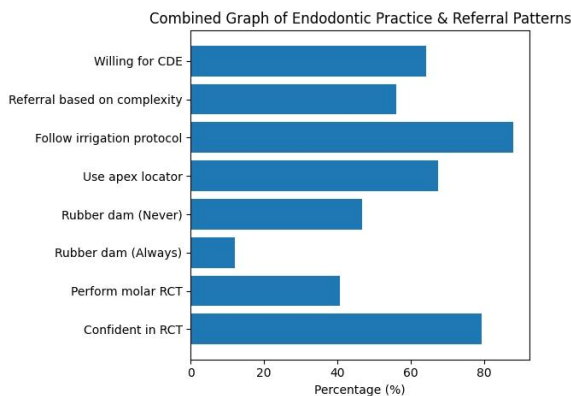


Figure 2: Frequency of Rubber dam Usage among Practitioners

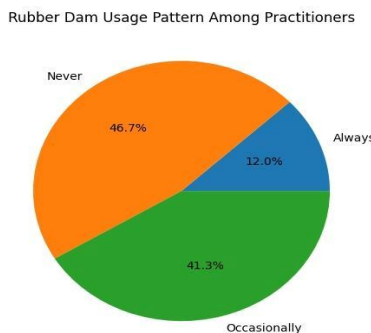
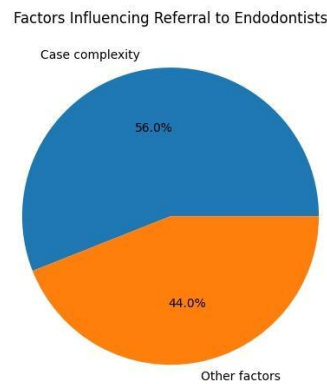


Figure 3: Referral Patterns in Endodontic Practice



V. DISCUSSION

The present cross-sectional study evaluated the knowledge, attitude, clinical practices, and referral patterns related to endodontic treatment among general dental practitioners (GDPs) in the Marathwada region. The findings suggest that although GDPs demonstrate satisfactory knowledge and confidence in performing root canal treatment (RCT), significant gaps persist in adherence to aseptic protocols and standardized referral practices.

A notable observation in this study was the predominance of female practitioners (67%), reflecting the increasing feminization of the dental workforce, consistent with previous national and international reports^{13,14}. The majority of respondents were BDS graduates, indicating that endodontic procedures are predominantly performed by general practitioners rather than specialists in this region. This observation aligns with earlier Indian studies, where GDPs constitute the primary providers of endodontic care^{5,11}.

The high level of self-reported confidence in performing RCT (79.3%) observed in this study is comparable with findings reported in previous literature⁵. Furthermore, 40.8% of practitioners reported performing molar RCTs, suggesting a growing inclination toward managing more complex cases. This percentage is relatively higher than that reported in some international studies, where GDPs tend to refer posterior teeth more frequently⁶. However, it is important to note that self-reported confidence may not necessarily reflect actual clinical competence, thereby emphasizing the need for objective skill evaluation and continuous professional development.

Despite satisfactory knowledge and adoption of certain modern techniques—such as adherence to irrigation protocols (88%) and use of



electronic apex locators (67.4%)—the use of rubber dam isolation was markedly low, with only 12% of practitioners reporting consistent usage. This finding is consistent with previous Indian studies that have highlighted poor compliance with rubber dam application^{7,8}. Considering that rubber dam isolation is regarded as the gold standard for maintaining asepsis, preventing microbial contamination, and improving treatment outcomes³, its limited use represents a significant concern. Potential barriers may include lack of training, perceived increase in treatment time, financial constraints, and issues related to patient acceptance.

Referral patterns in this study were primarily influenced by case complexity (56%), which is in agreement with global literature emphasizing the importance of recognizing clinical limitations and referring complex cases appropriately^{9,10}. Common indications for referral included retreatment cases, calcified canals, severe root curvatures, and procedural complications. However, the relatively low referral rates observed may be attributed to increased self-reliance among GDPs, limited accessibility to endodontic specialists, and economic considerations in semi-urban settings¹². These findings highlight the need for structured referral protocols and improved collaboration between general practitioners and specialists.

An encouraging finding of this study was the positive attitude toward continuing dental education (CDE), with 64.1% of practitioners expressing willingness to participate. This indicates a strong potential for improving clinical standards through targeted educational programs focusing on aseptic techniques, advanced instrumentation, and evidence-based decision-making.

The strengths of the present study include a relatively large sample size (n=368) and a high response rate (75.7%), enhancing the reliability and generalizability of the findings within the regional context. However, certain limitations must be acknowledged. The study relied on self-reported data, which may be subject to reporting bias. Additionally, the cross-sectional design precludes the establishment of causal relationships and temporal changes.

Overall, the findings of this study highlight a critical gap between knowledge and clinical implementation, particularly in infection control practices. Addressing these gaps through structured training programs, improved access to modern endodontic equipment, and the development of efficient referral systems is essential for enhancing the quality and predictability of endodontic care.

VI. Limitations and clinical implications

The study is limited by its reliance on self-reported data and cross-sectional design, which may introduce bias and limit causal interpretation. Additionally, the findings are region-specific and may not be generalizable.

Despite these limitations, the study highlights the need for improved adherence to aseptic protocols, particularly rubber dam usage, and emphasizes the importance of continuing dental education and structured referral systems to enhance endodontic practice.

VII. CONCLUSION

General dental practitioners demonstrated good knowledge, confidence in performing routine root canal treatments, and a positive attitude toward endodontic practice. Most practitioners adopted modern techniques and managed cases independently, referring complex cases appropriately.

However, gaps such as limited rubber dam usage and procedural challenges highlight the need for improved adherence to standard protocols. Strengthening continuing dental education and promoting evidence-based practices can enhance the quality and outcomes of endodontic care.

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