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Assessment Of The Clinical Knowledge About The Endodontic Procedure Of A Non-Endodontist Compared To An Endodontist In Clinical Practice And Errors Commonly Made By Them- A Questionnaire-Based Study

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ABSTRACT

AIM:To assess the clinical knowledge about endodontic procedure of a non-endodontist compared to an endodontist in clinical practice and errors commonly done by them.

MATERIALS AND METHODS:The study was conducted among the UG students, PG students and Practitioners at I.T.S Dental college ,Greater Noida and Muradnagar. To perform this questionnaire-based study, a google form consisting total of twenty-five questions based on 11 Iatrogenic errors, was distributed anonymously. Statistical analysis was performed on the basis of answers obtained by the given questionnaire.

RESULT:According to the p value, there was statistically significant difference in all the groups, except in group 2 iatrogenic error, where there was no difference in the p value when the comparison of frequency and prevalence of iatrogenic errors were done between endodontist and non- endodontic practitioner.

CONCLUSION:The highest percentage of iatrogenic errors that were performed by non-endodontic practitioner were missed canal, missing of caries under crown and errors causing re-infection. Amongst endodontist and non- endodontist , it was seen that higher prevalence of iatrogenic errors were done by the non-endodontic practitioner

Keywords: *Dentistry, Endodontist, Endodontic Procedure, Iatrogenic Errors, Non- Endodontist*

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1. INTRODUCTION

Endodontics is a crucial specialty within dentistry that deals with the diagnosis, prevention, and management of diseases affecting the dental pulp and surrounding peri-radicular tissues. The cornerstone of endodontic practice is root canal therapy, a technically demanding procedure that requires precision, thorough anatomical knowledge, and the use of specialized instruments and techniques.[1-3] The ultimate goal is to preserve natural teeth by eliminating infection and preventing reinfection of the root canal system.

Despite advances in dental technology and procedural protocols, endodontic treatment remains prone to various iatrogenic errors—complications inadvertently caused by the clinician during the course of treatment.[4-6] These errors include, but are not limited to, ledge formation, instrument separation, root perforation, canal transportation, zipping, and under- or over-obturation of canals. Such complications may compromise the prognosis of the treated tooth, reduce patient satisfaction, and necessitate retreatment or even extraction in severe cases[7,8]

With the global rise in demand for root canal treatments, these procedures are increasingly performed not only by trained endodontists but also by general dentists or non-endodontists[9]. While endodontists receive advanced education and hands-on training in complex root canal cases, non-endodontists may not have access to the same level of specialized instruction or equipment, which can potentially increase the risk of procedural errors[10-12]

Understanding the prevalence and nature of iatrogenic errors across different provider groups is vital for improving treatment outcomes and guiding educational and referral practices. Previous studies have indicated that the incidence of such errors may be higher among non- specialist practitioners due to limitations in training, diagnostic acumen, and technical resources[13,14] However, data comparing clinical outcomes and error frequencies between endodontists and non-endodontists remain limited and are often region-specific[8,11,15].

This gap in the literature underscores the need for a comparative study to evaluate the types and frequency of iatrogenic errors made by both endodontists and non-endodontists in clinical practice. Such an investigation not only enhances our understanding of the clinical challenges faced by different practitioners but also identifies areas for continuing professional development, curriculum refinement, and quality assurance[16].

Moreover, recognizing which errors are most prevalent—and why—can aid in the formulation of standardized protocols and guidelines aimed at minimizing risk and improving overall

quality of care. It can also provide a framework for patient education and informed consent, particularly in high-risk or complex endodontic cases[17].

This study seeks to examine endodontic treatments performed in a clinical setting by both specialists and non-specialists. It will evaluate various types of iatrogenic errors such as canal perforation, missed canals, instrument separation, and over- or under-obturation. The study will also investigate the contributing factors behind these errors—such as experience level, use of technology (e.g., rotary instrumentation, apex locators, magnification)[18], and adherence to established endodontic protocols.

The findings are expected to provide:

Insight into the competency differences between endodontists and general practitioners in endodontic care.

Data that can inform dental education by highlighting gaps in clinical training.

Evidence to support the implementation of clearer referral guidelines for complex cases.

Recommendations to minimize iatrogenic complications and improve patient safety.

By addressing these issues, the study aims to contribute meaningfully to the body of knowledge in dental education, endodontic practice, and patient-centred care.

2. AIM AND OBJECTIVES

Aim:

To assess the clinical knowledge about endodontic procedure of a non-endodontist compared to an endodontist in clinical practice and errors commonly done by them.

Objectives:

To find out the most common iatrogenic errors done by the endodontist and non- endodontist.

To find frequency and prevalence of iatrogenic errors done by endodontist or non- endodontist.

3. MATERIAL AND METHODOLOGY

After obtaining ethical clearance from the IEC committee of I.T.S Dental college ,Greater Noida and Muradnagar, we proceeded with this cross-sectional study among UG students, PG students and Practitioners at I.T.S Dental college ,Greater Noida and Muradnagar. A self- administered Google Forms was used in study. On the basis of 11 selected iatrogenic errors, the set of 25 Questions were prepared for the survey .The survey form was then virtually distributed amongst them. They were told about the purpose of study. The inclusion criterion was willing UG, PG and Practitioners. The participants who were not willing was the only exclusion criterion. The questionnaire was distributed anonymously; they were instructed not to discuss the questions among themselves. The data obtained from these responses was collected back and inserted in Excel sheet for analysis.

4. RESULT

The present questionnaire-based study aimed to evaluate the prevalence and frequency of various iatrogenic errors during endodontic procedures between endodontists and non- endodontists, including UG students, PG students, and practitioners. Responses were collected and statistically analysed across 11 categories of common iatrogenic errors. Details given in Table 01.

A total of 11 iatrogenic errors were identified, with significant differences found in 10 categories between endodontists and non-endodontists. Only one category — "Treatment of the wrong tooth" — showed no reported incidence in either group, hence was statistically non-significant.

The most frequently reported iatrogenic error among non-endodontists was missing canals, with 81% of the total missed canal cases attributed to non-endodontists compared to only 19% by endodontists ($p < 0.001$). Similarly, missing of caries under the crown was reported in 85.7% of cases performed by non-endodontists versus 14.3% by endodontists ($p < 0.001$). This signifies a clear deficiency in diagnostic evaluation and case assessment among non-specialists.

In the category of errors causing reinfection, 71.5% of cases were attributed to non- endodontists, highlighting procedural lapses or poor aseptic protocol maintenance ($p = 0.009$). Ineffective anesthesia was also significantly higher in the non-endodontist group (91.7%), while endodontists reported only 8.3% of such instances ($p < 0.001$), indicating greater competency in pain management among specialists.

Perforations were notably more common in non-endodontists (84.6%) compared to 15.4% in endodontists ($p < 0.001$). File breakage occurred in 62.5% of non-endodontist procedures and 37.5% of those performed by endodontists ($p = 0.012$). These figures suggest deficiencies in mechanical instrumentation techniques among non-specialists.

Additional errors such as transportation (80%), flare-ups (77.8%), ledge formation (73.7%), and blocked canals (76.5%) were also predominantly observed in the non- endodontist group, all showing statistically significant p-values (< 0.001 or = 0.001), further reinforcing the gap in clinical proficiency. These values are given in Graph 01.

Collectively, the results show a significantly higher occurrence of iatrogenic errors in non- endodontic practitioners in almost all categories. As shown in Graph 02. The data underscores the need for specialized training, enhanced preclinical experience, and improved educational interventions to bridge this gap in clinical skillsets.

		Frequency (n)	Percentage (%)
1	Perforations	33	26
2	T/t of wrong tooth	0	0
3	Missed canal	41	42

4	Missing of caries under crown	41	42
5	Transportation	25	10
6	Breakage of file	28	16
7	Flare up	29	18
8	Ledge	39	38
9	Blocked canal	37	34
10	Errors causing Re-Infection	41	42
11	Ineffective anesthesia	32	24

Table 1: Iatrogenic Errors Frequency and Prevalence

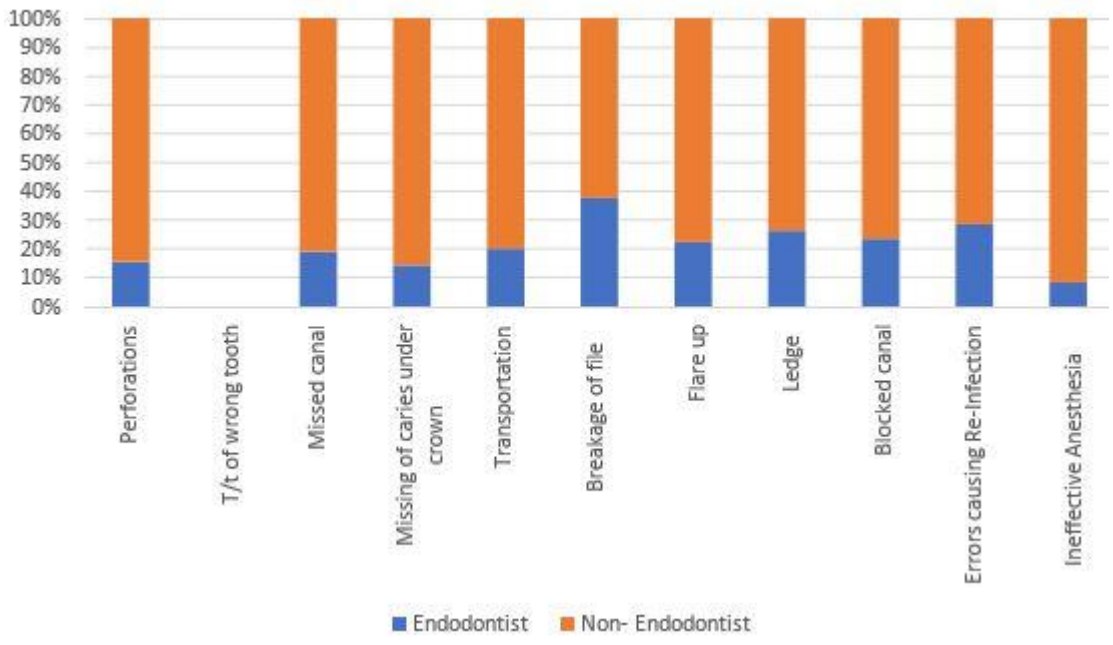
		Endodontist N (%)	**Non- Endodontist N (%)**	**P value**
1	Perforations (n=33)	5 (15.4)	28 (84.6)	$p< 0.001^{**}$
2	T/t of wrong tooth (n=0)	0 (0)	0 (0)	-------
3	Missed canal (n=41)	7 (19)	34 (81)	$p< 0.001^{**}$
4	Missing of caries under crown (n=41)	5 (14.3)	36 (85.7)	$p< 0.001^{**}$

5	Transportation (n=25)	4 (20)	21 (80)	p< 0.001**
6	Breakage of file (n=28)	9 (37.5)	19 (62.5)	p= 0.012*
7	Flare up (n=29)	7 (22.2)	22 (77.8)	p< 0.001**
8	Ledge (n=39)	10 (26.3)	29 (73.7)	p= 0.001*
9	Blocked canal (n=37)	9 (23.5)	28 (76.5)	p< 0.001**
10	Errors causing Re- Infection (n=41)	11 (28.5)	30 (71.5)	p= 0.009*
11	Ineffective anaesthesia (n=32)	3 (8.3)	29 (91.7)	p< 0.001**

*p< 0.05- significant difference **p< 0.001- highly significant difference

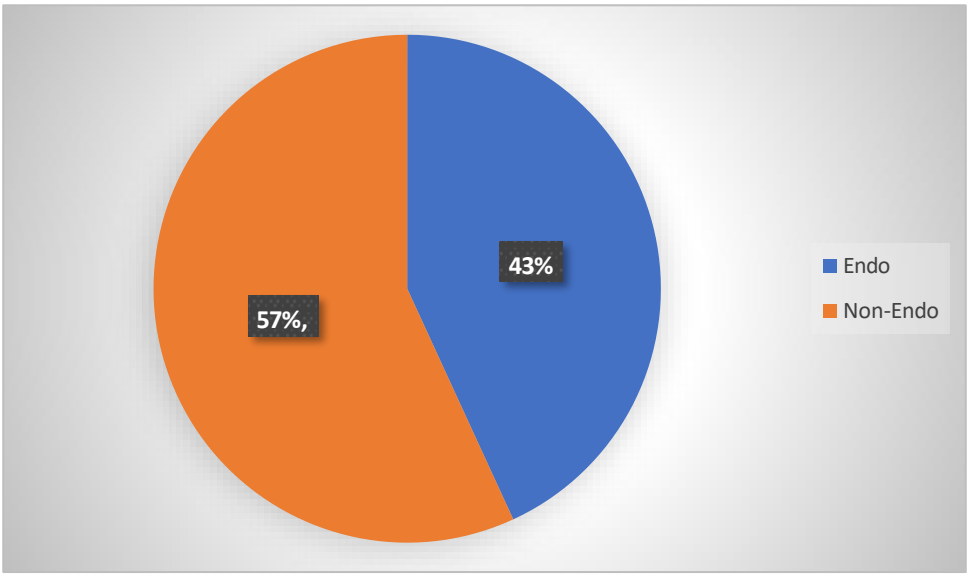
Table 2: Comparative Statistical Analysis of Iatrogenic Errors

(Frequency and Prevalence) Between Endodontist and Non-Endodontist



Graph 1: Comparative Statistical Analysis of Iatrogenic Errors

(Frequency and Prevalence) Between Endodontist and Non- Non-Endodontist



Graph 2: Overall Comparison of Iatrogenic Errors Between Endodontists and Non-Endodontists

5. STATISTICAL ANALYSIS

Data entries were done in Microsoft Office Excel 2010 and analyses of results were done using Statistical product and service solution (SPSS) version 21 software[19].

Descriptive statistics such as frequencies and percentage/proportion were calculated. Pearson Chi-square test was used to find out the difference between responses of study subjects and also to compare percentage of iatrogenic errors between endodontist and non-endodontist group. The p value was fixed at 0.05. Details given in Table 02.

6. DISCUSSION

The present study highlights a critical disparity in the occurrence of iatrogenic errors between endodontists and non-endodontic practitioners. These findings align with existing literature and underscore the importance of specialization and continued education in dentistry.[20,21]

Missed canals were the most prevalent error among non-endodontists in this study (81%). Similar results were found by Hoen and Pink[22], who analyzed 1,100 endodontically treated teeth and reported a 42% rate of missed canals in failed root canal cases, attributing this to inadequate knowledge of canal morphology among general dentists. In contrast, endodontists undergo focused training in identifying complex anatomy, which likely explains the lower missed canal rate (19%) in the current study.

The high incidence of undetected caries under crowns among non-endodontists (85.7%) correlates with findings from a study by Dietschi et al.[23], which emphasized that improper pre-endodontic assessment, particularly in restorative cases, increases the likelihood of overlooking underlying caries. Endodontists, trained in diagnostic radiology and advanced caries detection techniques, are less prone to such oversights.

Reinfection in 71.5% of cases managed by non-endodontists in this study highlights issues in aseptic technique, temporary restorations, or incomplete obturation. A study by Nair[24] supports this, showing that microbial contamination due to improper disinfection is a leading cause of endodontic failure. Specialists were found to perform significantly better in maintaining sterile protocols.

In the current study, ineffective anesthesia was reported by 91.7% of non-endodontic practitioners. This indicates a gap in understanding local anesthetic techniques, particularly for inflamed pulp tissues. Malamed[25] emphasized the importance of supplemental injection techniques such as intraosseous or intraligamentary anesthesia — methods routinely used by specialists to manage challenging cases effectively.

The breakage of files (62.5%) and other mechanical errors like ledge formation (73.7%) and blocked canals (76.5%) were higher in non-endodontists. This is consistent with the findings of Siqueira[26], who noted a strong correlation between operator experience and incidence of file separation. Proper training in the use of rotary systems and file sequencing is crucial, yet often inadequately addressed in general practice.

Non-endodontists showed a higher frequency of perforations (84.6%) and transportation errors (80%). A study by Panitvisai et al.[27] noted that canal transportation and perforations often result from improper use of endodontic instruments and inadequate understanding of canal curvatures. These errors drastically reduce the prognosis of root canal therapy.

A significant number of non-specialists (77.8%) reported flare-ups, defined as acute exacerbations of periapical inflammation post-instrumentation. Walton and Fouad[28] reported similar trends, where improper debridement and over-instrumentation led to increased postoperative pain. Endodontists typically employ advanced irrigation protocols and medicaments to reduce such complications

In a comparative study by Eleftheriadis and Lambrianidis[29], the overall success rate of root canal treatment was found to be significantly higher among specialists. Similarly, the current study supports that specialists demonstrate lower incidence rates across all iatrogenic parameters, reaffirming the need for advanced training and specialty care.

A meta-analysis by Ng et al.[30] also supports that the technical quality of root fillings is a significant factor in treatment success, with specialists often outperforming general dentists. In the present study, lower rates of re-infection and blocked canals among endodontists further endorse this.

The findings of this study have major implications for curriculum development. Many non-endodontic errors stem from deficiencies in preclinical training, lack of familiarity with rotary instruments, and limited exposure to complex cases. Integrating more case- based learning and simulated practice in UG and PG programs may help bridge this gap.

Additionally, continuous professional development through workshops, webinars, and short-term training programs should be encouraged among general practitioners.

7. CONCLUSION

Non-endodontists showed a significantly higher incidence of iatrogenic errors in 10 out of 11 categories, with statistical significance in most cases ($p < 0.05$ or $p < 0.001$).

The most common errors among non-endodontists were missed canals, undiagnosed caries under crowns, and reinfection, indicating deficiencies in diagnostic and clinical protocols.

Mechanical errors such as file breakage, ledge formation, transportation, and perforations were more common among non-specialists, likely due to inadequate training in instrumentation.

Anesthesia-related failures were dramatically higher in non-endodontists, reinforcing the need for specialized pain management training.

Comparative studies support these findings, consistently showing better outcomes and fewer procedural errors among specialists.

The results indicate a critical need for enhanced endodontic education at undergraduate and postgraduate levels, with emphasis on case simulation, anatomy, and instrument handling.

There is a strong case for professional development programs targeting practicing general dentists to reduce iatrogenic errors and improve patient outcomes.

Ultimately, the study emphasizes that specialization and experience directly impact the success of endodontic treatments, highlighting the importance of referral to endodontists for complex cases.

This research underscores the pressing need for educational reform and skill-building initiatives to elevate the standard of endodontic care among general practitioners.

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10. CONFLICTS OF INTEREST

Nil.

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