

# Endodontic procedural errors and their reporting and referral among dental graduates working at dental institutes in Punjab: a cross-sectional study

Hammad Hassan<sup>1,2✉</sup>, Syed Moiz Ali<sup>3</sup>, Ahmed Amer Chaudhry<sup>3</sup>, Sidra Riaz<sup>4</sup>, Baneen Khawar<sup>3</sup>, Salman Aziz<sup>2</sup>

## ABSTRACT

**OBJECTIVE:** To find the frequency and type of endodontic procedural errors encountered by the dental graduates and their reporting and referral in cases of failure.

**METHODS:** This cross-sectional study was conducted from 1<sup>st</sup> January 2022 to 15<sup>th</sup> July 2022. Data was collected through online questionnaires using Google-forms distributed among dental graduates working in the operative department of four private and two public dental institutes in Punjab, Pakistan. Out of 269 graduates, 255 (94.7%) participated in the study. Data was analyzed by SPSS version-25.

**RESULTS:** Procedural errors were experienced by 222/255 (87.1%) respondents. Errors reported by male and female were 95% and 83.1% respectively. Most errors occurred during canal preparation (n=228; 89.4%), followed by access opening (n=208; 81.6%) and obturation (n=192; 75.3%) stage. Overall, most common errors were over- or under-extended obturation (n=192; 75.3%), ledge (n=161; 63.1%) and access cavity perforation (n=136 (53.3%). About 86.2% (n=220/255) of respondents tried to handle errors on their own. 19 (7.4%) and 48 (18.8%) rarely/never informed the department. In case of failure, 121 (47.4%) referred their case to their supervisor and 87 (34.1%) sought help from a colleague. Patients were not informed about the error in 29 (11.3%) cases.

**CONCLUSION:** Most errors occurred during canal preparation, access opening and obturation. Most common errors were over- or under-extended obturation & ledge. Majority of graduates prefer to handle the errors on their own. Help-seeking from supervisors and informing patients need to be improved. A system for reporting errors and a hierarchical management structure should be established.

**KEYWORDS:** Accidents (MeSH); Endodontists (MeSH); Malpractice (MeSH); Referral and Consultation (MeSH); Root Canal Therapy (MeSH); Endodontics (MeSH); Dental Pulp (MeSH); Root Canal Preparation (MeSH).

**THIS ARTICLE MAY BE CITED AS:** Hassan H, Ali SM, Chaudhry AA, Riaz S, Khawar B, Aziz S. Endodontic procedural errors and their reporting and referral among dental graduates working at dental institutes in Punjab: a cross-sectional study. *Khyber Med Univ J* 2023;15(2):96-100 <https://doi.org/10.35845/kmu.2023.23006>

## INTRODUCTION

Endodontic procedures have a relatively higher success rate when compared with other disciplines, but guaranteeing a perfect outcome is inadvisable even when the procedure has been done with the utmost care.<sup>1</sup> Despite advancements in instrumentation and strict clinical supervision, an endodontic procedural error cannot be avoided.<sup>2</sup>

A vast majority of clinicians believe that

endodontic procedural errors are the prime cause of treatment failure. However, procedural errors alone do not lead to an unfavorable outcome. They may complicate the procedure, but failure occurs due to poor judgment, operator skills, case difficulty, the quality of instruments, and the associated infection.<sup>3,4</sup> A procedural error during treatment is an occurrence that can happen to anyone.<sup>5</sup>

The success of the endodontic treatment

1. Science of Dental Materials, University College of Medicine and Dentistry, University of Lahore, Lahore, Pakistan
2. Science of Dental Materials, Institute of Dentistry, CMH Lahore Medical College, Lahore, National University of Medical Sciences (NUMS), Pakistan
3. Department of Operative Dentistry, Institute of Dentistry, CMH Lahore Medical College, Lahore, NUMS, Pakistan
4. Department of Operative Dentistry, de'Montmorency College of Dentistry, Lahore, Pakistan

Cell #: +92-314-7991624

Email✉: [hammadhassan@gmail.com](mailto:hammadhassan@gmail.com)

Date Submitted: July 27, 2022

Date Revised: February 02, 2023

Date Accepted: May 17, 2023

depends on meticulous three-dimensional cleaning and shaping of the root canal system, followed by a proper coronal and apical hermetic seal.<sup>6</sup> However, procedural errors may impede the success of the root canal treatment; hence, sound knowledge of the root canal anatomy is essential for the prevention of such mishaps.<sup>7</sup>

The American Association of Endodontists has formulated a case difficulty assessment form to determine the degree of difficulty and associated risks before proceeding with the root canal treatment. Recognition of these factors prior to the initiation of treatment helps practitioners understand the complexities that may be involved in individual cases and prevents adverse outcomes due to avoidable procedural errors.<sup>8</sup>

Common endodontic errors reported in the literature are voids, gouging, overfilled canals, missed canals, instrument separation, and ledge formation. A few advancements in the field of endodontics that have helped reduce procedural errors include advanced cutting burs, dental microscopes, ultrasonics, and nickel-titanium rotary files with controlled torque and better bending strength.<sup>9-12</sup> Moreover, innovations like file retrieval

**Table I: Demographical distribution and comparison of procedural errors for different demographic variables (n=255)**

Demographics		Frequency (n=255)	Percentage	Procedural Errors (%)	$\chi^2$	P
Gender	Male	83	32.5	79 (95.2%)	7.2	0.07
	Female	172	67.5	143 (83.1%)		
Institute	Private	139	54.5	119 (85.6%)	0.56	0.45
	Public	116	45.5	103 (88.8%)		
Designation	House officers	122	47.8	113 (92.6%)	14.9	0.001
	Demonstrators	46	18.0	40 (86.9%)		
	Post-graduate Residents	87	34.2	69 (79.3%)		

$\chi^2$  = Chi-Square test (P-value  $\leq 0.05$  for statistical significance)

**Table II: Designation-wise comparison of procedural errors at various stages of endodontic treatment**

Stages	House Officers (n=122)	Postgraduate Trainees (n=87)	Demonstrators (n=46)	Total (n=255)	$\chi^2$	P
Canal Preparation	97 (42.5)	87 (38.2)	44 (19.3)	228 (89.4%)	24.8	<0.001
Access Opening	91 (43.8)	74 (35.5)	43 (20.7)	208 (81.6%)	8.9	0.01
Obturation	79 (41.1)	83 (43.3)	30 (15.6)	192 (75.3%)	26.3	<0.001
Post Space Formation	57 (50.4)	44 (38.9)	12 (10.6)	113 (15.6%)	2.2	0.328
Others	56 (55.4)	25 (24.8)	20 (19.8)	101 (34.9%)	2.8	0.24

$\chi^2$  = Chi-Square test (P-value  $\leq 0.05$  for statistical significance)

systems, instrument electrochemical dissolution, bioactive restorative materials for furcation repair, and microscope-assisted dental equipment have made corrections of complex procedural errors not only possible but a lot easier.<sup>13-15</sup>

There are fewer studies on the frequency of endodontic procedural errors, especially in Pakistan; additionally, there is very limited data that highlights the reporting and referral strategy of procedural errors in endodontic departments. The current study will assist us in identifying common endodontic errors, as well as their reporting and referral in endodontic clinics of dental institutes in Punjab, and will provide insight into recognizing common errors as well as developing a strategy for reporting and referring a mishap.

The aim of this study was to determine the frequency and type of endodontic procedural errors encountered by dental graduates working in dental institutes, as well as their reporting and referral in cases of failure.

## METHODS

This cross-sectional study was conducted after the approval from Institutional Review Board (IRB) of the Institute of Dentistry CMH Lahore Medical College, from 1<sup>st</sup> January 2022 to 15<sup>th</sup> July 2022

(Case#. 649/ERC/ CMH/LMC). Participation was voluntary and the statement of confidentiality and consent was mentioned in the beginning of the questionnaire link sent through email. The study was done following STROBE guidelines for cross-sectional studies. Data was collected using a survey questionnaire designed by the authors, which was later validated and went under several revisions before it was finalized. Furthermore, the survey questionnaire was validated by four faculty members using face and content validity before the final draft was selected, which underwent the pilot study. Online questionnaires were distributed among dental graduates working in the operative department of four private and two public dental institutes in Punjab, using Google-forms (Google Inc. Mountain View, CA, USA). Sample size was estimated using 95% confidence interval and 5% margin of error, using convenience sampling technique.

The questionnaire consisted of twelve close ended questions. The first part targeted demographics such as age, gender, institute, designation and year of study, whereas, the second part had questions regarding procedural errors, their type and their management and referral in case of failure.

IBM Statistical Package for Social Sciences (SPSS version 25, IBM corporation, USA,

New York, 2011) was used to examine descriptive statistics and frequencies. Cross tabulation and Chi-Square Test was employed to compare categorical variables i.e., gender and designations. P-value less than or equal to 0.05 was taken as significant.

## RESULTS

In the present study, a total of 269 individuals were approached; out of them, 255 (94.7%) participants took part in the study, and the response rate was 94.7%. Out of these 255 participants, 172 (67.5%) were females and 83 (32.5%) were males. Majority of participants were house officers (n=122), followed by postgraduate trainees (n=87) and demonstrators (n=46) [Table I].

Out of 255 respondents, 222 (87.1%) experienced procedural errors. Frequency of procedural errors in females was 83.1% (n=143/172 and in males was 95% (n=79/83) [p=0.07].

Procedural errors at various stages of endodontic treatment revealed that majority of errors occurred during canal preparation (n=228; 89.4%), followed by access opening (n=208; 81.6%) and obturation (n=192; 75.3%) stage. There was a statistically significant difference in the frequency of procedural errors between house officers, demonstrators, and postgraduate trainees during access opening, canal preparation, and obturation (Table II).

Table III illustrates the gender-wise comparison and the frequencies of various endodontic procedural errors. The most frequent procedural error during access opening was access cavity perforation, reported by 136 (53.3%) respondents. Error in access cavity perforation was reported by males and females was 59% (n=49/83) and 50.5% (n=87/172) respectively. During canal preparation, ledge formation was the most frequent procedural error reported by 161 (63.1%) participants. Ledge formation was reported by 61 (73.4%) male and 100 (58.1%) female dental graduates. Over- or under-extended obturation was most frequently reported during obturation, encountered by 192 (75.3%) respondents, whereas, deviation during post-space formation was encountered by 73 (11%) respondents. There was a significant

**Table III: Gender-wise comparison of the frequency of various endodontic procedural errors**

Procedural Errors		Males (n=83)	Females (n=172)	Total (n=255)	$\chi^2$	P
Access opening	Access cavity perforation	49 (59%)	87 (50.5%)	136 (53.3%)	1.60	0.205
	Missed canals	50 (60.2%)	79 (45.9%)	129 (50.6%)	4.58	0.032
	Gouging	20 (24%)	28 (16.2%)	48 (18.8%)	2.23	0.135
	Treating the wrong tooth	14 (16.8%)	8 (4.6%)	22 (8.6%)	10.5	0.001
Canal Shaping and Cleaning	Ledge	61 (73.4%)	100 (58.1%)	161 (63.1%)	5.67	0.017
	Broken instrument	56 (67.4%)	64 (37.2%)	120 (47.1%)	20.57	0.001
	Obstruction	23 (27.7%)	42 (24.4%)	65 (25.5%)	0.31	0.572
	Root perforations	13 (15.6%)	15 (8.7%)	28 (11%)	2.76	0.097
Obturation	Over or under-extended Obturation	68 (81.9%)	124 (72.1%)	192 (75.3%)	2.91	0.088
Post space formation	Deviation from normal canal anatomy during post formation	32 (38.5%)	41 (23.8%)	73 (28.7%)	5.93	0.015
	Post space perforation	17 (20.4%)	23 (13.3%)	40 (15.7%)	2.14	0.144
Miscellaneous	Irrigant related error	22 (26.5%)	32 (18.6%)	54 (21.2%)	2.09	0.148
	Nerve paresthesia	9 (10.8%)	6 (3.4%)	15 (5.9%)	5.47	0.019
	Vertical root fractures	8 (9.6%)	8 (4.6%)	16 (6.3%)	2.36	0.124
	Instrument aspiration	6 (7.2%)	10 (5.8%)	16 (6.3%)	0.19	0.662

**Table IV: Comparison of procedural error reporting and referral between male and female dentists**

Statements		Males (n=83)	Females (n=172)	Total (n=255)	$\chi^2$	P
Reporting endodontic error to the department	Always	33 (39.7%)	98 (56.9%)	131 (51.4%)	12.95	0.005
	Sometimes	37 (44.5%)	53 (30.8%)	90 (35.2%)		
	Rarely	11 (13.2%)	9 (5.2%)	20 (7.8%)		
	Never	2 (2.4%)	12 (6.9%)	14 (5.4%)		
Informing the patient about the error	Always	41 (49.3%)	66 (38.3%)	107 (41.9%)	6.15	0.104
	Sometimes	32 (38.5%)	68 (39.5%)	100 (39.2%)		
	Rarely	2 (2.4%)	17 (9.8%)	19 (7.4%)		
	Never	8 (9.6%)	21 (12.2%)	29 (11.3%)		
Try to manage error by yourself	Yes	74 (89.1%)	146 (84.8%)	220 (86.2%)	0.86	0.353
	No	9 (10.8%)	26 (15.1%)	32 (13.7%)		
If unsuccessful in managing, where do you refer	Refer to Supervisor	48 (57.8%)	73 (42.4%)	121 (47.4%)	5.31	0.021
	Put Patient on follow-up	16 (19.2%)	18 (10.4%)	34 (13.3%)	3.76	0.05
	Refer to Surgery department	4 (4.8%)	8 (4.6%)	12 (4.7%)	0.004	0.95
	Seek help from a colleague	14 (16.8%)	73 (42.4%)	87 (34.1%)	16.2	0.001

$\chi^2$  = Chi-Square test (P-value  $\leq 0.05$  for statistical significance)

difference between males and females for errors like 'treating the wrong tooth', 'missed canals', 'ledge formation', 'broken instruments', 'deviation during post-space creation,' and 'nerve paresthesia'. Males more frequently experienced the above-mentioned procedural errors (Table III).

Male dental graduates were found to be reporting procedural errors more frequently to their departments. However, there was no significant difference when it came to informing patients about the error (Table IV). The majority (n=220; 86.2%) respondents,

reported that they try to manage procedural errors by themselves. When unable to manage, 121 (47.4%) respondents would report their case to their supervisor; a sizable number of these respondents were men. Around one-third (n=87; 34.1%) respondents, reported that they sought help from a colleague, and a significant proportion of these respondents were female. Those who put their patients on follow-up in cases of procedural error were 34 (13.3%), whereas only 12 (4.7%) referred their case to the surgery department (Table IV).

## DISCUSSION

Root canal therapy consists of a chain of technique-sensitive procedures that require a high level of training, knowledge, as well as cognitive and psychomotor skills. A break or compromise in this chain can lead to several procedural errors.<sup>16</sup> In the present survey, 87.1% of the participants admitted to having experienced a procedural error, which is relatively higher when compared to previous data. Previous data has shown wide variation of procedural error occurrence from 38-70%.<sup>9-11,17,18</sup>

In the literature, the most commonly reported errors were voids, under/over obturation, ledge formation, and transportation. These mistakes were more common among young graduates, particularly house officers.<sup>9,10,18</sup> These findings were congruent with the findings of this investigation; however, when the various stages of root canal therapy during which errors occurred were examined, the majority of errors occurred during cleaning and shaping. It could be because dentists become less vigilant after the access opening and achieving working length. Dentists should remain vigilant during the whole process of endodontic treatment; they should choose the right instruments and always consult their supervisor when facing difficulty.<sup>19</sup> Unlike global statistics, cavity perforation cases were higher in our study. Perforation usually occurs due to negligence or in search of missed canals.<sup>20</sup>

In the present study, a significant number of male dentists made procedural errors such as 'wrong tooth', 'missed canals', 'ledge formation', 'broken instruments', 'deviation during post space creation' and 'nerve paresthesia'; females were more vigilant. Other than that, there was no difference between male and female graduates regarding endodontic procedural errors. These results were consistent with a study done in Saudi Arabia.<sup>13</sup>

Following fundamental legal and ethical dental practices and principles is crucial in the event of an endodontic accident in order to develop a solid and safe patient relationship, where dental ethics must be the guiding principle. The patient and the dentist may experience less stress if they receive proper explanations before treatment. However, if an accident does

happen, the dentist has a duty to notify the patient so that they are informed regarding potential repercussions, available treatments, and prognosis and can be handled early.<sup>21</sup> The majority of the participants agreed that they report patient safety incidents to the department as well as to the patients. These results were in agreement with studies done by Obadan EM, et al,<sup>21</sup> Pemberton MN,<sup>22</sup> Enseldo-Carrasco E, et al<sup>23</sup> and Hiivala N et al.<sup>24</sup> However, male graduates in our study were keener when it came to reporting procedural errors to their department.

The capacity to recognize when a case is beyond your expertise is another important risk management skill. It is preferable to refer a case if it is beyond your area of competence.<sup>25</sup> Referral to an endodontist (47.4%) was reported to be the most appropriate option for the majority of individuals in the current study, whereas, referring to the surgery department was the least preferred option. Modern endodontics, with the introduction of advanced equipment like ultrasonics, file retrieval systems, microscopes, and dissolution of files using electrochemical process, has made it possible to manage complex cases and procedural errors; therefore, surgery should be the last option.<sup>14,15</sup> The case difficulty assessment tool recommended by the American Association of Endodontists should be taught to dental students, and the supervisors should be vigilant when assigning cases to the younger dental graduates with limited experience.<sup>2</sup>

The present study provides information about the frequency of errors as well as their reporting and referral strategies. The few limitations of the current study are the lack of involvement of senior faculty, i.e., clinicians, as well as the lack of questions regarding the error reporting system in endodontic departments and the hierarchical order of management if an error occurs. Additionally, it lacks questions focusing on the criteria that determine when to refer a problematic case, and these questions may be added in future research.

## CONCLUSION

The majority of errors occurred during obturation, canal preparation, and access opening. The most common error was over- or under extended Obturation,

ledge, access cavity perforation and missed canals. House officers made most of the errors. However, females were more vigilant about procedural errors. Majority of graduates prefer to handle the errors on their own and either asked a colleague for assistance or referred their case to a senior endodontist after making a procedural error. Under-reporting to the department, lowered help-seeking from supervisors and informing patients about the errors are areas of concern. The complexity of the treatment must be evaluated beforehand, and both the department and the patient should be informed in case of a procedural error. An endodontic error reporting system and a hierarchical order of management should be established.

## REFERENCES

- Estrela C, Holland R, Estrela CR, Alencar AH, Sousa-Neto MD, Pécora JD. Characterization of successful root canal treatment. *Braz Dent J* 2014;25:3-11. <https://doi.org/10.1590/0103-6440201302356>
- Haug SR, Solfeld AF, Ranheim LE, Bårdsen A. Impact of case difficulty on endodontic mishaps in an undergraduate student clinic. *J Endod* 2018;44(7):1088-95. <https://doi.org/10.1016/j.joen.2018.03.012>
- Lin LM, Rosenberg PA, Lin J. Do procedural errors cause endodontic treatment failure? *J Am Dent Assoc* 2005;136(2):187-93. <https://doi.org/10.14219/jada.archive.2005.0140>
- Alrahabi M, Zafar MS, Adanir N. Aspects of clinical malpractice in endodontics. *Eur J Dent* 2019;13(03):450-8. <https://doi.org/10.1055/s-0039-1700767>
- Baaij A, Özok AR. Influence of method of teaching endodontics on the self-efficacy and self-perceived competence of undergraduate dental students. *Eur Endod J* 2018;3(1):31-7. <https://doi.org/10.5152/eej.2017.17048>
- Chybowski EA, Glickman GN, Patel Y, Fleury A, Solomon E, He J. Clinical outcome of non-surgical root canal treatment using a single-cone technique with EndoSequence bioceramic sealer: A retrospective analysis. *J Endod* 2018;44(6):941-5. <https://doi.org/10.1016/j.joen.2018.02.019>
- Siqueira Junior JF, Rôças I das N, Marceliano-Alves MF, Pérez AR, Ricucci D. Unprepared root canal surface areas: causes, clinical implications, and therapeutic strategies. *Braz Oral Res* 2018;32(suppl 1):e65. <https://doi.org/10.1590/1807-3107bor-2018.vol32.0065>
- Almohaimede AA, AlShehri BM, Alaiban AA, AlDakhil RA. Significance of endodontic Case Difficulty Assessment: A retrospective study. *Int Dent J* 2022;72(5):648-53. <https://doi.org/10.1016/j.identj.2022.01.001>
- Alghamdi NS, Algarni YA, Ain TS, Alfaifi HM, AlQarni AA, Mashyakhi JQ, et al. Endodontic mishaps during root canal treatment performed by undergraduate dental students: An observational study: An observational study. *Medicine (Baltimore)* 2021;100(47):e27757. <http://doi.org/10.1097/MD.00000000000027757>
- Mohammad N, Abd Fatah F, Ghazali N, Muhamad AZ, Hamir N. Endodontic root canal treatment performed by undergraduate dental students: Identification of technical standard and post-endodontic restorations. *Malays J Fundam Appl Sci* 2019;15(4):600-3. <https://doi.org/10.11113/mjfas.v15n4.1527>
- Yousuf W, Khan M, Mehdi H. Endodontic procedural errors: Frequency, type of error, and the most frequently treated tooth. *Int J Dent* 2015;2015:673914. <http://doi.org/10.1155/2015/673914>
- Ali SA, Hussain M, Shahzad M, Nafees H. Frequency of Procedural Errors during Root Canal Treatment Performed by House Officers in Private Teaching Dental Hospital. *J Liaquat Univ Med Health Sci* 2019;18(01):55-9. <http://doi.org/10.22442/jlumhs.191810601>
- Abdulrab S, Alaajam W, Al-Sabri F, Doumani M, Maleh K, Alshehri F, et al. Endodontic procedural errors by students in two Saudi dental schools. *Eur Endod J* 2018;3(3):186-91. <http://doi.org/10.14744/eej.2018.29491>
- Kowalczyk A, Silva Neto UX,



- Fariniuk LF, Westphalen VP, Laurindo CA, Carneiro E. Electrochemical dissolution of fractured nickel–titanium instruments in human extracted teeth. *Int Endod J* 2017;50(6):578-85. <http://doi.org/10.1111/iej.12654>
15. Shah PK, Zhang Q, Chong BS. Get Smart—technological innovations in endodontics part 2: case-difficulty assessment and future perspectives. *Dent Update* 2021;48(7):556-62. <https://doi.org/10.12968/denu.2021.48.7.556>
16. Das D, Barai S, Kumar R, Bhattacharyya S, Maity AB, Shankarappa P. Comparative evaluation of incidence of dentinal defects after root canal preparation using hand, rotary, and reciprocating files: An ex vivo study. *J Int Oral Health* 2022;14(1):78. [http://doi.org/10.4103/JIOH.JIOH\\_136\\_21](http://doi.org/10.4103/JIOH.JIOH_136_21)
17. Ibhawoh LO, Enyinnaya NS, Enabulele JE. Radiographic assessment of endodontic accidents at a Nigerian tertiary health institution: A one-year retrospective study. *Ibom Med J* 2020;13(3):206-13.
18. Grayli E, Peyvandi A, Mallahi M, Naeemi S, Afshari E. Radiographic Evaluation of Iatrogenic Errors of Root Canal Treatments Performed in an Undergraduate Dental Clinic. *J Dent Mater Tech* 2021;10(1):16-21. <http://doi.org/10.22038/JDMT.2021.17655>
19. Miccoli G, Seracchiani M, Zanza A, Del Giudice A, Testarelli L. Possible complications of endodontic treatments. *J Contemp Dent Pract* 2020;21(5):473-4. <http://doi.org/10.5005/jp-journals-10024-2811>
20. da Cunha LZ, Solda C, Padoin K, Rigo L. Endodontic procedural errors: Analysis of images from cone beam computed tomography. *Forensic Imaging* 2022;28:200493. <https://doi.org/10.1016/j.fri.2022.200493>
21. Obadan EM, Ramoni RB, Kalenderian E. Lessons learned from dental patient safety case reports. *J Am Dent Assoc* 2015;146(5):318-26. <http://doi.org/10.1016/j.adaj.2015.01.003>
22. Pemberton MN. Developing patient safety in dentistry. *Br Dent J* 2014;217(7):335-7. <http://doi.org/10.1038/sj.bdj.2014.856>
23. Enseldo-Carrasco E, Sheikh A, Cresswell K, Bedi R, Carson-Stevens A, Sheikh A. Patient safety incidents in primary care dentistry in England and Wales: a mixed-methods study. *J Patient Saf* 2021;17(8):1383-93. <http://doi.org/10.1097/PTS.0000000000000530>
24. Hiivala N, Mussalo-Rauhamaa H, Murtomaa H. Patient safety incident prevention and management among Finnish dentists. *Acta Odontol Scand* 2013;71:1663-70. <http://doi.org/10.3109/00016357.2013.797103>
25. Ramugade MM, Sagale AA. A review of medicolegal considerations of endodontic practice for general dental practitioners. *J Int Soc Prevent Communit Dent* 2018;8(4):283. [http://10.4103/jispcd.JISPCD\\_206\\_18](http://10.4103/jispcd.JISPCD_206_18)

## AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

**HH:** Concept and study design, acquisition of data, drafting the manuscript, approval of the final version to be published

**SMA, AAC & BK:** Acquisition of data, drafting the manuscript, approval of the final version to be published

**SR & SA:** Concept and study design, analysis and interpretation of data, critical review, approval of the final version to be published

*Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.*

## CONFLICT OF INTEREST

Authors declared no conflict of interest

## GRANT SUPPORT AND FINANCIAL DISCLOSURE

Authors declared no specific grant for this research from any funding agency in the public, commercial or non-profit sectors

## DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request



This is an Open Access article distributed under the terms of the Creative Commons Attribution-Non Commercial 2.0 Generic License.