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Management of endodontic emergencies - A questionnaire survey

Pratheebha C

Department of Conservative and Endodontics, Saveetha Dental College and hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 77, Tamil Nadu, India.

Email: 151901052.sdc@saveetha.com

Deepak. S

Senior Lecturer, Department of Conservative and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai-77, Tamil Nadu, India.

Email: deepaks.sdc@saveetha.com

Dr Adimulapu Hima Sandeep

Senior lecturer, Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences (SIMATS), Chennai, Tamilnadu, India.

Email: himas.sdc@saveetha.com

Abstract--Introduction: Endodontic emergencies are characterized by violent or disabling pain. The management of these emergencies requires a precise diagnosis and an emergency act with or without a prescription. Endodontic emergency treatment options have sparked a lot of debate. As a result, dentists must have sufficient experience and expertise about appropriate care procedures in order to effectively handle these cases. Aim: The main aim of the study is to assess the awareness level for managing the endodontic emergencies. Materials and Method: Based on knowledge, a self-administered questionnaire was developed. The questionnaire was distributed to the sample population through a Google Docs link. The participants were explained about the purpose of study in detail. Once after the results of the survey were obtained, pie charts with a frequency table were prepared. The statistics done using SPSS software, chi square test was done to check the association and a p value of 0.05 and lesser was said to be statistically significant. Results and discussion: 88 % of the population have handled endodontic emergency cases but the treatment options which were given by the participants are not the same as the standard procedures. The p value obtained was more than 0.05 (p=0.432) indicating it is insignificant. Level of knowledge of

dentists about indications of incision and drainage, intracanal-medicament, and antibiotic prescription was not enough. Conclusion: Level of knowledge of dentists about indications of incision and drainage, intracanal-medicament, and antibiotic prescription was not enough. These findings highlight the importance of refreshing courses for general dentists to improve their competency in the management of endodontic emergencies.

Keywords---endodontic emergency, antibiotic, intracanal medicament, treatment, innovative technique, eco friendly.

Introduction

Pressure or swelling caused by infection or irritation of the pulpal or periapical tissues needs an endodontic emergency treatment. The primary goal of emergency endodontic treatment is to alleviate discomfort and manage any irritation or infection that may be present. One of the most challenging aspects of clinical dentistry is to treat the endodontic emergencies (1). Nearly 90% of patients seeking emergency dental care have signs of pulpal or periapical disease, according to reports (2,3). Pulpotomy, pulpectomy with intracanal medicament, and prescription of systemic drugs are some of the strategies used to treat these disorders (4). The systemic antibiotic has gotten a lot of attention for treating infections caused by endodontic emergencies (5). If there is no bleeding and no essential pulp tissue, the procedure typically consists of full root canal instrumentation, keeping the instruments short of the radiographic apex, modifying the occlusion, and administering analgesics. If swelling is present, the tooth is opened, the occlusion is modified, analgesics and antibiotics are administered, and an incision is made if the swelling is fluctuant (6). It involves removing the patient's signs and symptoms while deferring permanent care.

The clinician must assess the best method of endodontic care based on the condition in the case of an endodontic emergency. Depending on the pulpal or periapical status, the severity and extent of pain, and whether or not there is diffuse or fluctuant swelling, treatment can differ. The treatment plan should never be forced on a patient without their consent. The informed course of treatment is made jointly between the patient and the clinician (7). As a result, dentists must have adequate expertise and awareness on proper care procedures in order to successfully handle dental emergencies (8).

In TDI, prompt and appropriate care will increase the prognosis and treatment success rate. As a result, general dental practitioners (GDPs) must be properly educated in this field (9). Hard tissue injuries, such as complex and uncomplicated crown fractures, crown/root fractures, and root fractures, are classified into two types. The other division covers injuries to the PDL and alveolar supposition. TDI management can be difficult for GDPs because it is intermittent and happens while dentists are not expecting it, so they are unprepared. Several experiments have been conducted around the world to assess GDPs' knowledge of how to treat and recognise various forms of dentoalveolar injuries; the majority of them have concluded that dentists'

knowledge is insufficient and that they are unable to successfully manage such cases in other studies (10). GDPs' understanding of the diagnosis and treatment of various dentoalveolar injuries has been assessed in a variety of ways. Our team has extensive knowledge and research experience that has translated into high quality publications (11-20),(21-24),(25-29),(30). The main aim of the study is to assess the awareness level for managing the endodontic emergencies.

Materials and Method

Study Design

A survey was conducted among the dental students to assess the awareness on managing the endodontic emergencies. The sampling method was a Non probability convenient sampling method. The current study was a pilot study involving 100 dental students. The participants completed the survey willingly and were not compensated in any way. Ethical approval and informed consent from the participants were obtained. The survey was conducted in the month of February 2021.

Survey instrument

The survey instrument which was a questionnaire was prepared after the extensive review of the existing literature. The questionnaire was reviewed and amendments were made to improve clarity of the questions to eliminate ambiguous responses. The questions consisted of a total of 16 questions. The questionnaire was shared to the participants using an online survey platform, google forms.

Data Analysis

Only completed surveys were taken for analysis and the incomplete surveys were eliminated. All the participants' responses were taken and its reliability was checked. Pie chart with a frequency table was prepared and analysed for each question. The statistics were done using SPSS software, a Chi square test was done to check the association and a p value of 0.05 was said to be statistically significant.

Results

The current study was a pilot study involving 100 dental students to assess the knowledge regarding the management of endodontic emergencies. 10% of the population have handled 1-5 endodontic cases, 28 % of the population have handled 11-15 endodontic cases, 56 % of the population have handled 6-10 endodontic cases and 6 % said 16 - 20 endodontic cases were handled by them [Fig 1]. For a condition with symptomatic irreversible pulpitis - symptomatic apical periodontitis, 5% of the people said that it requires the multiple RCT visit, 31% of the people said that it requires partial pulpotomy, 7% of the people said that it requires pulpectomy, 30% of the people said that it requires Root canal treatment and 17% of the people said that it requires Single RCT visit [Fig 2]. For a condition with necrotic pulp with fluctuant swelling and drainage through

canal, 4% said antibiotics, 37% said multiple visit RCT is required, 19% of the people has said that single RCT visit plus incision and drainage, 38% of the participants said that single visit RCT is required [Fig 3]. For a condition with severe inter appointment pain and swelling, 26% said analgesic, 8% said antibiotic, 37 % of the people have said that intracanal medicament, 29 % of the participants said occlusion reduction is required [Fig 4]. For a condition with severe pain and swelling after completion of RCT, 18% said analgesic, 10 % said antibiotic, 40% of the people have said that occlusion reduction, 32 % of the participants said retreatment is required. [Fig 5]. When asked how long the tooth was left open, 42 % said 1 -2 days, 9 % said 1-2 week [Fig 6]. 88% of the population have handled and 12 % have not handled endodontic emergencies [Fig 7]. For a condition with necrotic pulp with fluctuant swelling and drainage obtained through canal, 12% said antibiotics, 39% said multiple visit RCT is required , 26 % of the people has said that single RCT visit plus incision and drainage and 23 % of the participants said that single visit RCT is required [Fig 8].For the treatment options for failed RCT, 22% of the participants said analgesic, 5% participants suggested antibiotics, 34% of the people said apical surgery as the treatment option, 22% suggested for intracanal medicament and 17 % said for retreatment [Fig 9].

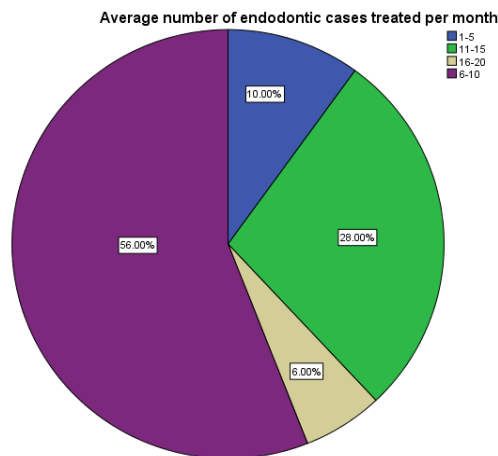


Figure 1: Represents the responses of participants, when asked for average number of endodontic cases treated per month, 10% said 1-5 and it is represented in blue and 28 % said 11-15 and it is represented in green, 6 % said 16-20 and it is represented in brown and 56 % of the population have handled 6-10 endodontic cases and it is represented in purple.

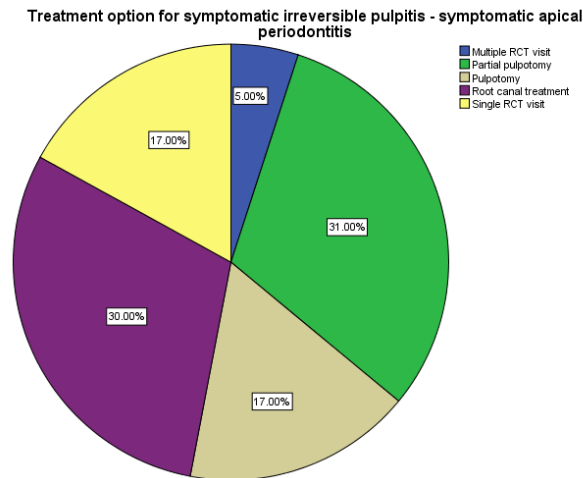


Figure 2: Represents the distribution of participants, when asked for the treatment option for symptomatic irreversible pulpitis - symptomatic apical periodontitis, 5% of the people said that it requires the multiple RCT visit and it is represented in blue , 31% of the people said that it requires partial pulpotomy and it is represented in green, 17% of the people said that it requires pulpectomy and it is represented in brown , and 30% of the people said that it requires Root canal treatment and it is represented in purple and 17% of the people said that it requires Single RCT visit and it is represented in yellow.

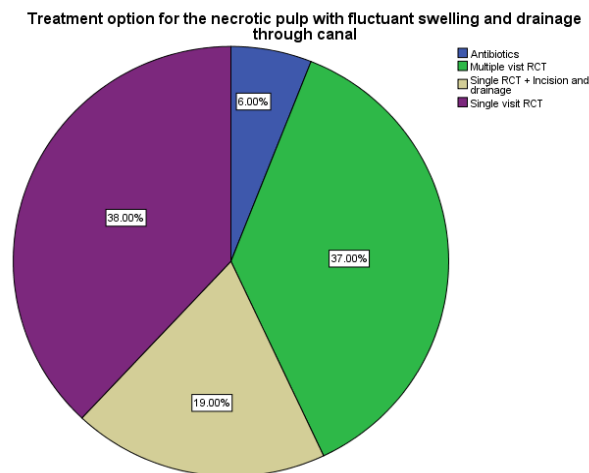


Figure 3: Represents the distribution of participants, when asked for the treatment option for necrotic pulp with fluctuant swelling and drainage through canal, 4% said antibiotics and it is represented in blue, 37% said multiple visit RCT is required and it is represented in green, 19% of the people has said that single RCT visit plus incision and drainage and it is represented in brown and and it is represented in brown and 38% of the participants said that single visit RCT is required and it is represented in purple.

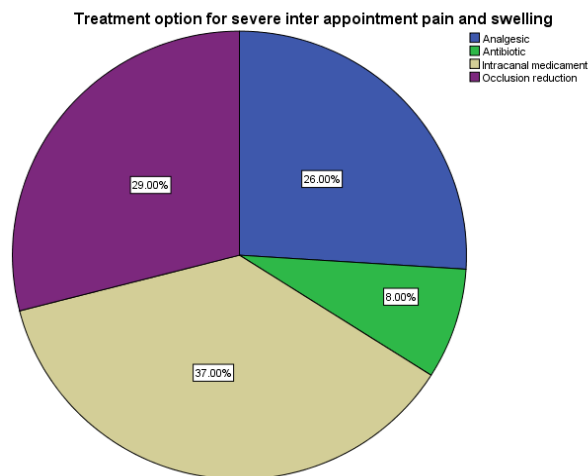


Figure 4: Represents the distribution of participants, when asked for the treatment option for severe inter appointment pain and swelling, 26% said analgesic and it is represented in blue, 8% said antibiotic and it is represented in green, 37 % of the people has said that intracanal medicament and it is represented in brown and and it is represented in brown.and 29 % of the participants said occlusion reduction is required and it is represented in purple.

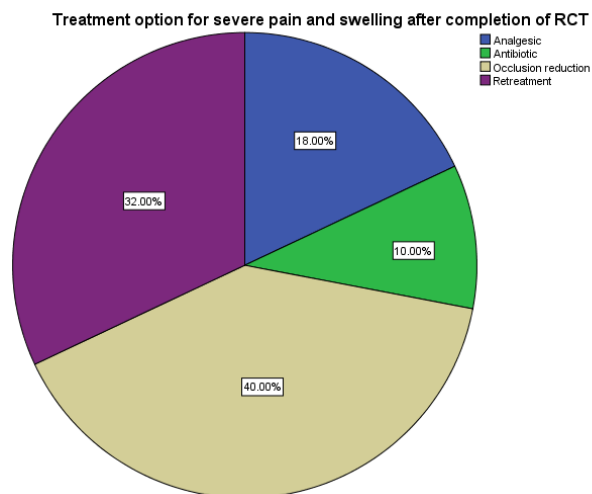


Figure 5: Represents the distribution of participants, when asked for the treatment option for severe pain and swelling after completion of RCT, 18% said analgesic and it is represented in blue, 10 % said antibiotic and it is represented in green, 40% of the people has said that occlusion reduction and it is represented in brown and and it is represented in brown and 32 % of the participants said retreatment is required and it is represented in purple.

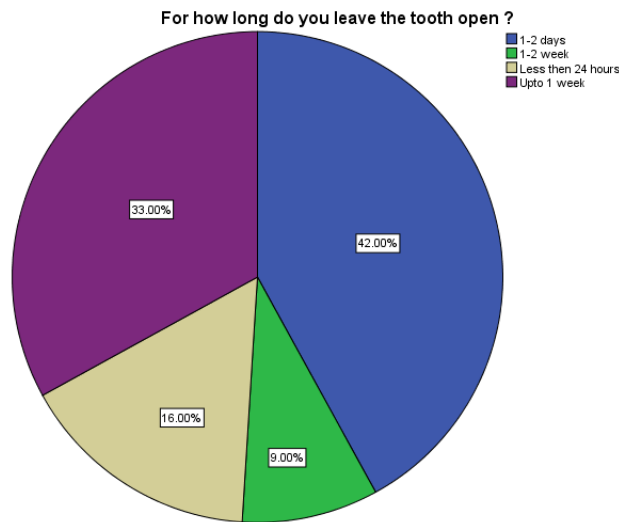


Figure 6: Represents the distribution of participants, when asked how long do you leave the tooth open, 42% said 1-2 days and it is represented in blue, 9 % said 1-2 weeks and it is represented in green, and 16 % said less than 24 hours and it is represented in brown and 33 % said up to 1 week and it is represented in purple.

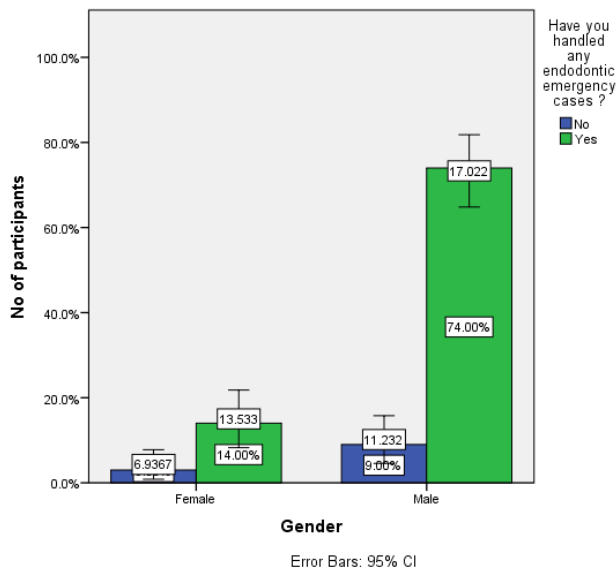


Figure 7: Bar graph depicts the association between the gender and have you handled any endodontic emergency cases. X axis represents the gender and Y axis represents the number of the participants. Dark blue represents the participants who have not handled endodontic emergency cases, Dark green represents those who have handled endodontic emergency cases. Most commonly the participants have handled endodontic emergency cases in both the genders. However, the majority of the males handled the endodontic emergency cases. This

difference was not statistically significant (Pearson ' s Chi square value : 0.619, df = 1 , P value = 0.432 (< 0.05)- not significant).

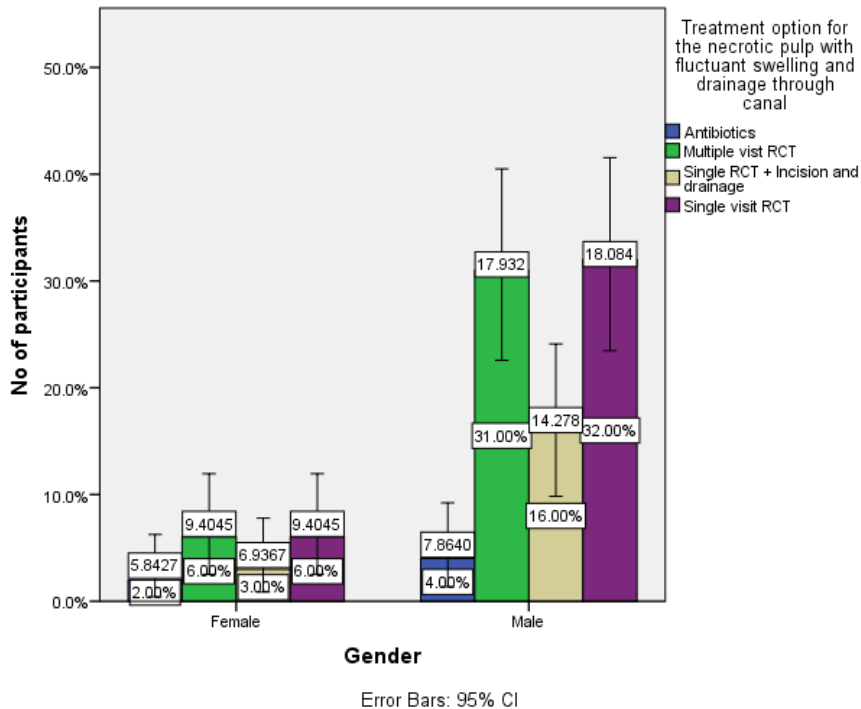


Figure 8: Bar graph depicts the association between the gender and treatment option for necrotic pulp with fluctuant swelling and drainage through the canal. X axis represents the gender and Y axis represents the number of the participants. Dark blue represents the participants who suggested antibiotics, Dark green represents the participants who suggested Multiple visit RCT, Brown represents the participants who have suggested Single RCT plus incision and drainage, Purple represents the participants who have suggested the single visit RCT. Most commonly the participants have suggested the multiple visit RCT in both genders. However, the majority of the males have suggested the multiple visit RCT when compared to females. This difference was statistically significant (Pearson ' s Chi square value : 1.210, df = 3 , P value = 0.751 (> 0.05) - significant).

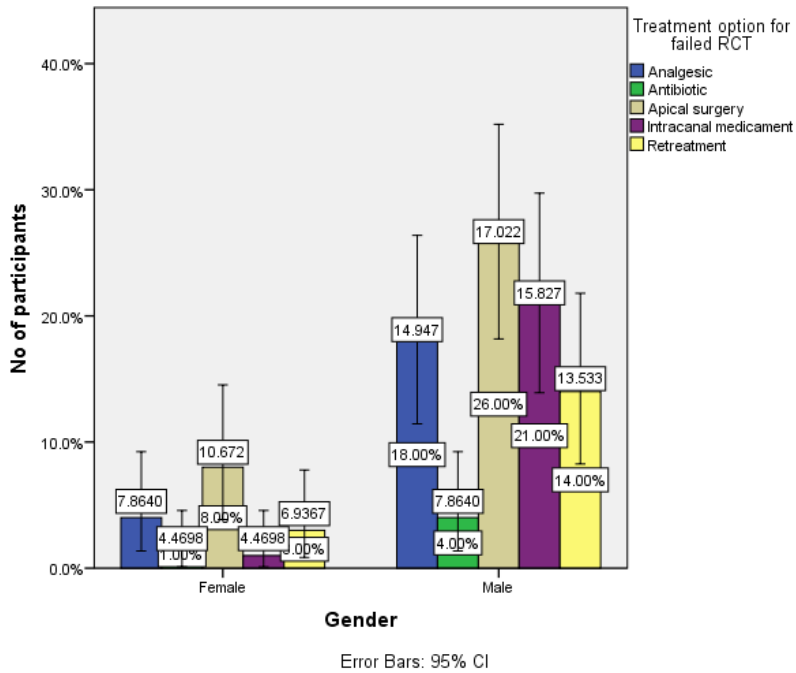


Figure 9: Bar graph depicts the association between the gender and treatment option for failed RCT. X axis represents the gender and Y axis represents the number of the participants. Dark blue represents the participants who suggested analgesics, Dark green represents the participants who suggested antibiotics, Brown represents the participants who have suggested apical surgery, Purple represents the participants who have suggested theIntracanal medicament, Yellow represents the participants who have suggested retreatment. Most commonly the participants have suggested apical surgery in both the genders. However, the majority of the males have suggested apical surgery when compared to females. This difference was not statistically significant (Pearson’s Chi square value:3.505, df = 4 , P value = 0.477 (< 0.05) - not significant).

Table 1
Descriptive statistics of responses received

Questions	Number of responses	Percentage of responses
Treatment option for symptomatic irreversible pulpitis- with normal apical		
a) Partial pulpotomy	44	44%
b) Pulpotomy	17	17%
c) Root canal treatment	35	35%
d) Single RCT visit with occlusion reduction	4	4%
Treatment option for necrotic pulp with symptomatic apical; periodontitis no swelling		
a) Analgesic	20	20%
b) Complete instrumentation	3	3%
c) Multiple visit for RCT	44	44%
d) Single visit RCT	33	33%
Treatment option for necrotic pulp with fluctuat swelling and no drainage		
a) Antibiotics	11	11%
b) Multiple Visit RCT	38	38%
c) Single visit RCT with incision and drainage.	31	31%
d) Single visit RCT	20	20%
Treatment option for severe interappointment pain		
a) Analgesic	26	26%
b) Antibiotics	3	3%
c) Intracanal medicament	49	49%
d) Occlusion reduction	22	22%
Treatment option for severe pain after the completion of RCT		
a) Analgesic	22	22%
b) Antibiotics	7	7%
c) Occlusion reduction	42	42%
d) Retreatment	29	29%
Have you ever left a tooth in open drainage		
a) No	15	15%
b) Yes	85	85%5

Discussion

The study was carried out for 3rd, 4th, CRRRI and PGs students were chosen because of the theoretical and clinical training of students on the management of endodontic emergencies. The purpose of the research was to see how well these students learned how to treat multiple endodontic emergencies using a specific procedure. Studies on the management of endodontic emergencies are rare, and there is a real controversy in treatment modalities found in the endodontic literature. In the previous study by Hargreaves, et al (31), the emergency management for symptomatic irreversible pulpitis without apical periodontitis, 57.3% of the students suggested complete instrumentation, whereas 40.3% chose partial pulpectomy and 81.9% pulpotomy. But in our study we got a different result, where people suggested a different treatment option for symptomatic irreversible pulpitis that the majority of the study population have suggested for partial pulpotomy. Natkin's work has shown that complete instrumentation allows a significant decrease of symptomatic irreversible pulpitis pain (32).

Full instrumentation, occlusal removal, analgesic medications, and intracanal medicaments are the most popular and normal emergency procedures for necrotic teeth without swelling (6). But in our study, the treatment option for necrotic teeth without swelling for 28% of the participants said analgesic, 3% said that complete instrumentation is required and the remaining 44% of the people said that multiple visits for RCT. In the previous study done by Gatewood et al (33). In the previous research done by Khaley, et al the majority study participants of his study suggested complete instrumentation then chose 59.1% incision and drainage, and 73.1% analgesic and 53.2% intracanal drugs for necrotic pulp with fluctuant swelling. But in our study the majority of the people suggested multiple visits to RCT, then 11% said antibiotics and 31% of the people said that single RCT visit plus incision and drainage. Incision and drainage are another recovery choice for this emergency. Indeed, some scholars believe that multiple abscesses are likely at times. One is attached to the apex, and the other resides in the vestibule. Since they are not associated, drainage through the tooth is insufficient, and incision is also needed. For this reason, Matthews *et al.* have suggested that incision and drainage should be considered as a standard option in this emergency situation, as it would reduce pain and swelling (34). Analgesic prescription was also recommended in all emergencies. As Alamoudi noted in her study, students can prescribe anything from nonnarcotic medications for mild-to-moderate pain to narcotic medications for severe pain (34).

Effective management of endodontic pain represents a continuing challenge. Currently, educators are interested in planning educational activities based on the identified needs of the target audience. In fact, assessing the learning protocol and its additional requirements is a fundamental step in ensuring the relevance of educational activities to a target audience. This will help the educators in curriculum planning to achieve learning goals and to bring about efficient physicians. The limitation of this survey would be that the population size is less, could have expanded the population size and questionnaire error should have been avoided. The future scope of this study would be suggesting the correct treatment protocol to be followed in endodontic emergency cases as in our study

many participants suggested a wrong treatment protocol for the endodontic emergencies.

Conclusion

The results of this study revealed that there are significant differences between treatment plans offered by dentists and endodontists in cases of endodontic emergencies. Level of knowledge of dentists about indications of incision and drainage, intracanal medicament and antibiotic prescription was not enough. This emphasizes the importance of refreshing courses for general dentists to improve their competency in the management of endodontic emergencies.

Author contribution

Pratheebha C carried out the literature search, Questionnaire preparation, data collection, data analysis and manuscript writing. Dr. Deepak conceived the study, participated in its design and coordinated and provided guidance to draft the manuscript. All the authors have equally contributed in developing the manuscript.

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Conflict of interest

The author declares that there was no conflict of interest in the present study.

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Reference

1. Shqair AQ, Gomes GB, Oliveira A, Goettens ML, Romano AR, Schardozim LR, et al. Dental emergencies in a university pediatric dentistry clinic: a retrospective study. *Braz Oral Res.* 2012 Jan;26(1):50–6.
2. Hasler JF, Mitchell DF. Analysis of 1628 cases of odontalgia: A corroborative study. *J Indianap Dist Dent Soc.* 1963;17:23–5.
3. Kumar A, Brennan MT. Differential Diagnosis of Orofacial Pain and Temporomandibular Disorder [Internet]. Vol. 57, *Dental Clinics of North America.* 2013. p. 419–28. Available from: <http://dx.doi.org/10.1016/j.cden.2013.04.003>
4. Raouf M, Vakilian A, Kakoei S, Manocherifar H, Mohammadalizadeh S. Should medical students be educated about dental trauma emergency management? A study of physicians and dentists in Kerman Province, Iran. *J Dent Educ.* 2013 Apr;77(4):494–501.
5. Nagle D, Reader A, Beck M, Weaver J. Effect of systemic penicillin on pain in untreated irreversible pulpitis. *Oral Surg Oral Med Oral Pathol Oral Radiol*

- Endod. 2000 Nov;90(5):636–40.
6. Dorn SO, Moodnik RM, Feldman MJ, Borden BG. Treatment of the endodontic emergency: a report based on a questionnaire—part I. *J Endod.* 1977 Mar 1;3(3):94–100.
 7. Dorn SO, Cheung GS-P. Management of endodontic emergencies. *management.* 2016;8(30):48–91.
 8. Torabinejad M, Fouad A, Walton RE, Lévy G. *Endodontie: principes et pratique.* Elsevier Masson; 2016.
 9. Westphalen VPD, Martins WD, Deonizio MDA, da Silva Neto UX, da Cunha CB, Fariniuk LF. Knowledge of general practitioners dentists about the emergency management of dental avulsion in Curitiba, Brazil. *Dent Traumatol.* 2007 Feb;23(1):6–8.
 10. Emerich K, Kaczmarek J. First aid for dental trauma caused by sports activities: state of knowledge, treatment and prevention. *Sports Med.* 2010 May 1;40(5):361–6.
 11. Muthukrishnan L. Imminent antimicrobial bioink deploying cellulose, alginate, EPS and synthetic polymers for 3D bioprinting of tissue constructs. *Carbohydr Polym.* 2021 May 15;260:117774.
 12. PradeepKumar AR, Shemesh H, Nivedhitha MS, Hashir MMJ, Arockiam S, Uma Maheswari TN, et al. Diagnosis of Vertical Root Fractures by Cone-beam Computed Tomography in Root-filled Teeth with Confirmation by Direct Visualization: A Systematic Review and Meta-Analysis. *J Endod.* 2021 Aug;47(8):1198–214.
 13. Chakraborty T, Jamal RF, Battineni G, Teja KV, Marto CM, Spagnuolo G. A Review of Prolonged Post-COVID-19 Symptoms and Their Implications on Dental Management. *Int J Environ Res Public Health* [Internet]. 2021 May 12;18(10). Available from: <http://dx.doi.org/10.3390/ijerph18105131>
 14. Muthukrishnan L. Nanotechnology for cleaner leather production: a review. *Environ Chem Lett.* 2021 Jun 1;19(3):2527–49.
 15. Teja KV, Ramesh S. Is a filled lateral canal - A sign of superiority? *J Dent Sci.* 2020 Dec;15(4):562–3.
 16. Narendran K, Jayalakshmi, Ms N, Sarvanan A, Ganesan S A, Sukumar E. Synthesis, characterization, free radical scavenging and cytotoxic activities of phenylvilangin, a substituted dimer of embelin. *ijps* [Internet]. 2020;82(5). Available from: <https://www.ijpsonline.com/articles/synthesis-characterization-free-radical-scavenging-and-cytotoxic-activities-of-phenylvilangin-a-substituted-dimer-of-embelin-4041.html>
 17. Reddy P, Krithikadatta J, Srinivasan V, Raghu S, Velumurugan N. Dental Caries Profile and Associated Risk Factors Among Adolescent School Children in an Urban South-Indian City. *Oral Health Prev Dent.* 2020 Apr 1;18(1):379–86.
 18. Sawant K, Pawar AM, Banga KS, Machado R, Karobari MI, Marya A, et al. Dentinal Microcracks after Root Canal Instrumentation Using Instruments Manufactured with Different NiTi Alloys and the SAF System: A Systematic Review. *NATO Adv Sci Inst Ser E Appl Sci.* 2021 May 28;11(11):4984.
 19. Bhavikatti SK, Karobari MI, Zainuddin SLA, Marya A, Nadaf SJ, Sawant VJ, et al. Investigating the Antioxidant and Cytocompatibility of Mimulus elengi Linn Extract over Human Gingival Fibroblast Cells. *Int J Environ Res Public Health* [Internet]. 2021 Jul 4;18(13). Available from: <http://dx.doi.org/10.3390/ijerph18137162>

20. Karobari MI, Basheer SN, Sayed FR, Shaikh S, Agwan MAS, Marya A, et al. An In Vitro Stereomicroscopic Evaluation of Bioactivity between Neo MTA Plus, Pro Root MTA, BIODENTINE & Glass Ionomer Cement Using Dye Penetration Method. *Materials* [Internet]. 2021 Jun 8;14(12). Available from: <http://dx.doi.org/10.3390/ma14123159>
21. Rohit Singh T, Ezhilarasan D. Ethanolic Extract of *Lagerstroemia Speciosa* (L.) Pers., Induces Apoptosis and Cell Cycle Arrest in HepG2 Cells. *Nutr Cancer*. 2020;72(1):146–56.
22. Ezhilarasan D. MicroRNA interplay between hepatic stellate cell quiescence and activation. *Eur J Pharmacol*. 2020 Oct 15;885:173507.
23. Romera A, Peredpaya S, Shparyk Y, Bondarenko I, Mendonça Bariani G, Abdalla KC, et al. Bevacizumab biosimilar BEVZ92 versus reference bevacizumab in combination with FOLFOX or FOLFIRI as first-line treatment for metastatic colorectal cancer: a multicentre, open-label, randomised controlled trial. *Lancet Gastroenterol Hepatol*. 2018 Dec;3(12):845–55.
24. Raj R K, D E, S R. β -Sitosterol-assisted silver nanoparticles activates Nrf2 and triggers mitochondrial apoptosis via oxidative stress in human hepatocellular cancer cell line. *J Biomed Mater Res A*. 2020 Sep;108(9):1899–908.
25. Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol*. 2019 Dec;90(12):1441–8.
26. Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species [Internet]. Vol. 94, *Archives of Oral Biology*. 2018. p. 93–8. Available from: <http://dx.doi.org/10.1016/j.archoralbio.2018.07.001>
27. Uma Maheswari TN, Nivedhitha MS, Ramani P. Expression profile of salivary micro RNA-21 and 31 in oral potentially malignant disorders. *Braz Oral Res*. 2020 Feb 10;34:e002.
28. Gudipani RK, Alam MK, Patil SR, Karobari MI. Measurement of the Maximum Occlusal Bite Force and its Relation to the Caries Spectrum of First Permanent Molars in Early Permanent Dentition. *J Clin Pediatr Dent*. 2020 Dec 1;44(6):423–8.
29. Chaturvedula BB, Muthukrishnan A, Bhuvanaraghan A, Sandler J, Thiruvenkatachari B. Dens invaginatus: a review and orthodontic implications. *Br Dent J*. 2021 Mar;230(6):345–50.
30. Kanniah P, Radhamani J, Chelliah P, Muthusamy N, Joshua Jebasingh Sathiya Balasingh E, Reeta Thangapandi J, et al. Green synthesis of multifaceted silver nanoparticles using the flower extract of *Aerva lanata* and evaluation of its biological and environmental applications. *ChemistrySelect*. 2020 Feb 21;5(7):2322–31.
31. Hargreaves KM, Cohen S, Berman LH. Preface [Internet]. *Cohen's Pathways of the Pulp*. 2011. p. ix. Available from: <http://dx.doi.org/10.1016/b978-0-323-06489-7.00034-5>
32. Alamoudi RA. Assessment of dental interns' knowledge toward managing endodontic emergency: A Survey of three dental schools in Jeddah city. *Saudi Endodontic Journal*. 2019 May 1;9(2):126.
33. Gatewood RS, Himel VT, Dorn SO. Treatment of the endodontic emergency: a decade later. *J Endod*. 1990 Jun;16(6):284–91.

34. Matthews DC, Sutherland S, Basrani B. Emergency management of acute apical abscesses in the permanent dentition: a systematic review of the literature. *J Can Dent Assoc.* 2003 Nov;69(10):660.