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## Original research:

# Evaluation of intern's knowledge of dental trauma using mobile phone app: An institution-based study

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**Abstract**

**Aim:** The aim of this study was to evaluate dental interns' knowledge regarding the treatment of traumatic dental injuries.

**Materials and methods:** A total of 110 dental interns participated in the study.Quiz questions from the INJURED TOOTH mobile app were given to the interns of a dental college. They were asked to attempt the quiz at the beginning of their clinical posting in paediatric dentistry. A second quiz with the same questions was conducted after the completion of their clinical posting. The quiz was in English language and consisted of 37 questions based on crown fracture, crown root fracture, luxation injury, root fracture, avulsion, and others. The data available from filled forms were entered in Microsoft Excel. Quantitative analysis was done using IBM SPSS version 22.0 (IBM Corporation, Chicago, US), the p-value of less than 0.05 was considered significant.

**Results:** The knowledge of interns before their clinical postings were insufficient (65.47%). The knowledge was significantly improved after the completion of their clinical posting (76.13%). The mean score of knowledge on crown fracture among the participants before and after the clinical postings was 69.17% and 80.48% respectively. For crown root fracture- 82.17% and 84.33% , for luxation Injuries- 53.83% and 70%, for root fracture - 56.55% and 74.52%, for avulsion 67.71 and 75.21% and for other traumatic injuries - 64.17% and 71.67%.

**Conclusion:** The results of the current study demonstrate that dental interns lack the necessary knowledge to treat dental injuries. This highlights the need to introduce subjects relevant to dental trauma into the curriculum and use a variety of teaching strategies, such as problem-based learning, to increase the understanding of dental interns about dental trauma and its management.

**Keywords:** Traumatic dental injury, Interns, Injured Tooth App

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## Introduction

Traumatic dental injury TDI is defined as a lesion caused by forces acting on teeth as a result of an assault, a fall, a fight, a car accident, a collision with another object or person, or a para-function.[1] The prevalence of TDI has been reported to be 2.82 per 100 individuals worldwide, with the highest frequency being in children under the age of 12 (18.1%) [2,3]. According to a systematic review and meta-analysis by Tiwari N. et al [4] the overall prevalence of TDI in the Indian population is 13%, whereas the prevalence for age groups under 6 years is 15% (males, 15%; females, 16%), and for age groups over 6 years is 12% (males, 13%; females, 8%). TDIs can vary from minor tooth structure damage, such as a simple chip off of the enamel surface, to severe tooth structure damage, such as crown fractures, root fractures, and luxation injuries. [3] Early detection and diligent management of severe TDIs are essential to prevent cosmetic, functional, and psychological problems in young children. In order to ensure the best potential recovery of damaged oral tissues throughout the healing period, the patient needs urgent emergency intervention and treatment. [3]

To advance understanding of the assessment and treatment of a traumatised tooth, dental trauma education is crucial. In India, there has been no emphasis on teaching students how to assess and treat acute dental trauma. Most of the recently graduated dentists are undertrained and unprepared to handle dental trauma as a result of this lack of exposure. [5], [6] the time to develop more clinical skills is during the undergraduate degree's one-year internship. Studies have found that diverse professional groups, medical students, and dental students all lack appropriate understanding of dental injuries and related emergency treatment protocols. [7]

The International Association of Dental Traumatology IADT publishes dental trauma guidelines on its website and in dental traumatology periodicals and also has a mobile phone application Viz. The Dental Trauma app Apple iOS and Dental

Trauma First Aid app Android OS for TR information to professionals and patients [8] .Ignobilis Terrain LLP a subsidiary of Sri Ramachandra Innovation Incubation Centre sriher Chennai released an 'InjuredTooth' app https://play.google.com/store/apps/details?id=com.abh.injuredtoothapp which can be used to evaluate severe injury to the teeth and supporting structures. This software offers accurate injury diagnosis and evidence-based treatment planning. Both patients and dentists can benefit greatly from the follow-up notifications. The software assists in assessing knowledge by inbuilt quiz questions on Dental trauma. [9]Therefore, the goal of this study is to evaluate dental interns' knowledge regarding the treatment of traumatic dental injuries using quiz questions from the mobile app. The study also compares any change in their knowledge after the internship postings in the pediatric dentistry department

## Materials and methods

A cross-sectional study was conducted by the department of paediatric and preventive dentistry at Kannur Dental College, erala. Prior to the start of the study, approval from the Institutional Ethics Committee was obtained after clearance from the Scientific Review Board. KDC/ETH/22/ /SS12. The minimum sample size of 106 was calculated using the G Power software Universität Düsseldorf: Psychologie-HHU

Version 3.1.9.7 using 80% power and a 95% confidence interval. It was rounded off to 110. The study was completed in 15 months, from February 2022 to April 2023. The questions were taken from the INJURED TOOTH mobile app quiz (Figure 1). The test was in English and had 37 questions that were subdivided into six sections: Section I—crown fractures; Section II—crown root fractures; Section III—luxation injuries; Section IV—root fractures; Section V—avulsions; and Section VI—other dental injuries. The interns were instructed to gather in the department seminar hall prior to the postings and were given 30 minutes to finish the app quiz in the presence of at least two investigators. To prevent any discussion among the interns, they were told to approach the investigators if they had any clarifications. The answers of all the participants were noted in individual data sheets and transferred to MS Excel software.

During the one-month posting in the department of paediatric and preventive dentistry, a comprehensive, informative promotion lecture was delivered about dental tissues, types of dental traumatic injuries, emergency measures, and management of dental injuries to interns during their internship period.

Along with that, many dental camps were conducted to increase their exposure to trauma cases. A second quiz with the same questions was conducted after the completion of all clinical postings, and the answer data were collected.

Quantitative analysis was done using IBM SPSS version 22.0. (IBM Corporation, Chicago, US) Descriptive analysis was done using proportion, and percentages and analytics tests were done using the chi- square test. In the analytical tests, the Mann-Whitney test was done, and a p-value of less than 0.05 was assumed to be significant.


**Figure 1: Injured Tooth App**

## Results

Out of the 110 dental interns who took part in this study 92 were females and 18 were males. The knowledge of dental interns in various domains at the beginning of the internship postings was given in Table 1. The mean score of knowledge on crown fracture among the participants was 69.17%. Among the various domains, it was 82.17% for crown root fractures 53.83%, for luxation Injuries, 56.55%, for root fracture, 67.71% for avulsion, and 64.17%. for other traumatic injuries. The study also shows the average mean score for dental trauma across all domains is 65.47%. The comparison of knowledge of dental interns about dental trauma before and after completion of their clinical postings

| Question | Count (N) | Mean percentage of knowledge (%) | Standard Deviation | 95.0% CI for Mean | | Range | |
|---|---|---|---|---|---|---|---|
| Score percentage in crown fracture | 110 | 69.17 | 20.34 | 69.94 | 75.93 | .00 | 100% |
| Score percentage in crown root fracture | 110 | 82.17 | 19.96 | 79.95 | 85.82 | .00 | 100.00 |
| Score percentage in luxation injuries | 110 | 53.83 | 23.86 | 55.71 | 62.73 | 20.00 | 100.00 |
| Score percentage in root fracture | 110 | 56.55 | 24.68 | 58.91 | 66.17 | .00 | 100.00 |
| Score percentage in avulsion | 110 | 67.71 | 20.65 | 67.17 | 73.25 | 12.50 | 100.00 |
| Score percentage in others | 110 | 64.17 | 23.64 | 63.19 | 70.14 | 20.00 | 100.00 |
| Total score percentage | 110 | 65.47 | 13.23 | 67.08 | 70.97 | 29.73 | 100.00 |

**Table 1: Difference in knowledge across different domains**

| Question | Group | Mean % | Mean rank | Z | Effect size | Significance (p value) |
|---|---|---|---|---|---|---|
| Total score percentage | After posting | 76.13 | 120.13 | -3.289 | 0.25 | 0.001 |
| | Pre posting | 65.47 | 75.69 | | | |
| Score percentage in crownfracture | After posting | 80.48 | 108.05 | -3.289 | 0.25 | 0.001 |
| | Pre posting | 69.17 | 81.73 | | | |
| Score percentage in crownroot fracture | After posting | 84.33 | 93.43 | -0.575 | 0.043 | 0.565 |
| | Pre posting | 82.17 | 89.03 | | | |
| Score percentage in luxation injuries | After posting | 70 | 113.84 | -4.377 | 0.33 | <0.001 |
| | Pre posting | 53.83 | 78.83 | | | |
| Score percentage in root fracture | After posting | 74.52 | 114.81 | -4.487 | 0.33 | <0.001 |
| | Pre posting | 56.55 | 78.35 | | | |
| Score percentage in avulsion | After posting | 75.21 | 100.49 | -1.853 | 0.14 | 0.064 |
| | Pre posting | 67.71 | 85.50 | | | |
| Score percentage in others | After posting | 71.67 | 99.62 | -1.713 | 0.13 | 0.087 |
| | Pre posting | 64.17 | 85.94 | | | |

*p<0.05 significance

**Table 2: Comparison of knowledge of dental interns in pre and post-postings**

were summarized in Table 2, Mann-Whitney test statistics demonstrate a significant difference in knowledge on crown fracture, luxation injuries, and root fracture between before and after clinical postings with p<0.001 respectively. There was no significant difference in knowledge on crown root fracture, avulsion, and other traumatic injuries before and after clinical postings i.e. p-value of 0.56, 0.064, and 0.087 respectively. The results also showed a significant difference in overall knowledge between before and after clinical postings with a p-value of 0.001. A comparative graphical representation of the higher mean score of knowledge on each domain among the dental interns before and after the postings was shown in Figure 2. The mean score of knowledge on crown fracture among the participants between before and after the clinical postings was 69.17% and 80.48% respectively. For crown root fracture- 82.17% and 84.33%, for luxation Injuries- 53.83% and 70%, for root fracture - 56.55% and 74.52%, for avulsion 67.71 and 75.21% and for other traumatic injuries - 64.17% and 71.67%. The study also shows the average mean score for dental trauma across all domains before and after clinical posting was 65.47% and 76.13% respectively.

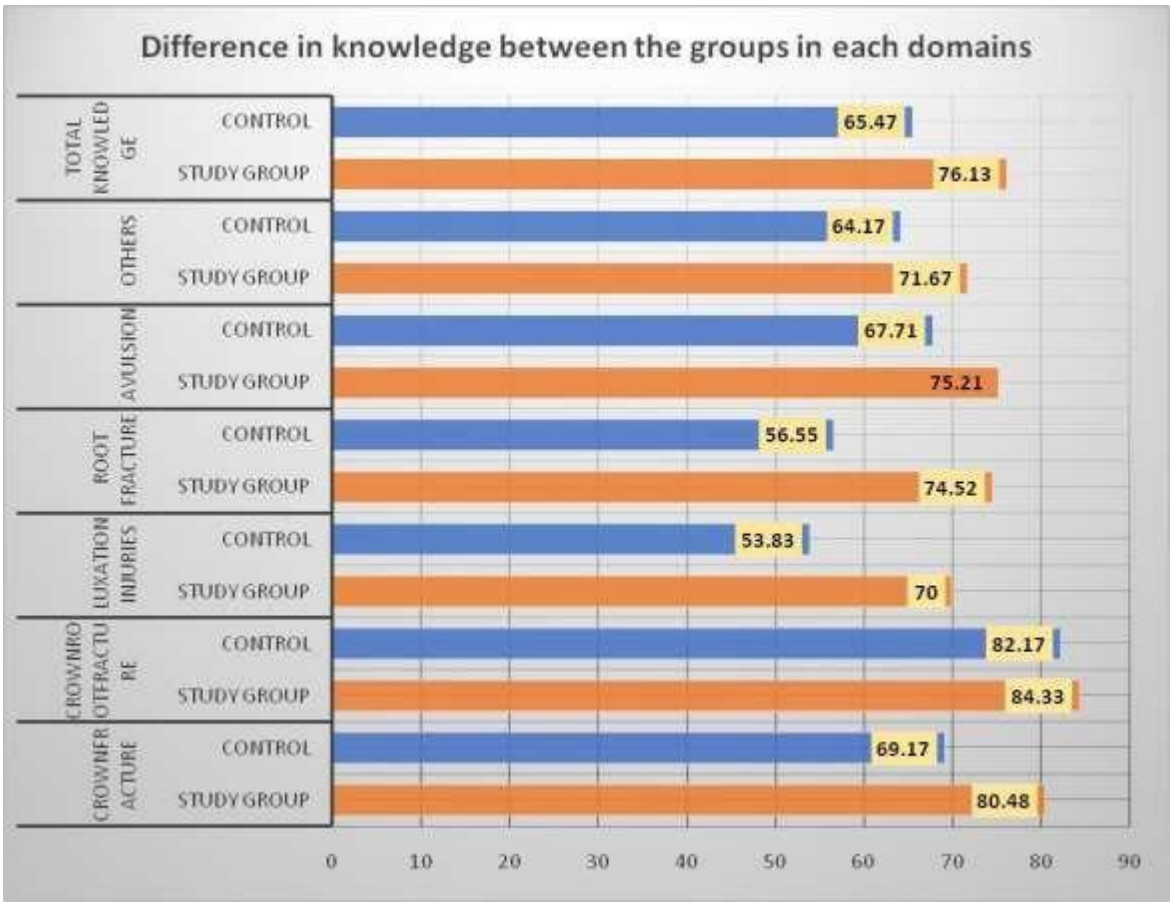


**Figure 2 -Difference in knowledge between the groups in each domain**

**Discussion**

Dental interns who have to deal with serious dental injuries should receive proper training. The effective application of therapeutic techniques improves both short- and long-term outcomes after a serious injury.[10, 11,12] The goal of this study is to evaluate dental interns' knowledge regarding the treatment of traumatic dental injuries Our study shows that the majority of our participantshad an insufficient understanding of dental trauma prior to their clinical postings. The study also shows that, upon completion of the clinical postings, the understanding has improved to a satisfactory level. The app-based questionnaire used in this study covered trauma types such as avulsion, root fracture, luxation injury, crown fracture, crown root fracture, and other types of traumatic injuries. In

the current study, the participants demonstrated a lack of understanding of root fractures, luxation injuries, and other injuries, including mandibular growth in condylar injuries, submerged primary molars, etc. The outcome is consistent with earlier research that used questionnaire-based data to assess the knowledge of dentists. [13, 14, 15].

Crown fractures, which account for 18–22% of all TDIs, are frequent and primarily affect the anterior teeth. [3] When dental interns' understanding of the crown fracture was tested, many of the participants provided moderate answers. The study also shows that their knowledge increased significantly after the postings. Initially, the majority of dental interns were able to use the app's theory-based questions to their advantage, but they struggled with the clinical questions. This is the result of their lack of expertise and exposure to trauma cases during undergrad. Up to 5% of all traumatic injuries are crown-root fractures, which can involve pulp, dentine, or enamel. Due to their anterior and labial proximity to the mandibular incisors, the maxillary anterior teeth are most frequently damaged and are typically caused by direct trauma. [16] Both before and after their clinical placements, the knowledge level about crown root fracture was satisfactory. Poor responses were noted for the questions, which are statement-type. More exposure to clinical situations will improve their knowledge and understanding. Dental avulsion is one of the most severe dental trauma cases, and prompt treatment is crucial. [17] When dental interns' understanding of the avulsion was tested, many of the participants provided accurate answers. Most of the participants in the current study are aware that avulsions should be treated right away, within 20 minutes of damage. Many of the respondents had selected saliva as a good medium for storing avulsed teeth. Contrary to the fact that saliva is biological and easily available, saliva is not an ideal medium for avulsed teeth and should not be kept for more than 30 minutes due to the presence of enzymes and bacteria present in saliva that exert harmful effects on the PDL cells. [18] It was found that dental interns' knowledge about the types and duration of splinting was insufficient. Previous studies also show that knowledge about splinting is less common among general dentists [13, 19]. According to Zhao et al. [20], 49% of their respondents recommended a firm splint, 40.6% recommended splinting for 30 days, and 10.2% only recommended splinting for two weeks. Whereas, according to Westphalen et al. [21]73% of their respondents chose a flexible splint, and 64% of them said that the splint was worn for 15 days or longer. Our study shows that knowledge of root fractures and luxation injuries is insufficient. This might be because root fracture and luxation injury situations are complicated and have a range of potential treatments depending on the various factors influencing the prognosis and treatment. [13,22,23] In a cross-sectional survey, Abhilasha Gupta et al. [24] found that while 60% of the student population responded positively to questions about intrusive trauma, indicating a good theoretical understanding of the surgical aspect, only 11.5% of the population correctly answered questions about additional information regarding intrusion, which may have been influenced by a lack of clinical exposure. After completing all of their clinical posts, the dental interns in the current study performed better on the second section of the quiz, indicating that clinical exposure will considerably increase their understanding of TDI. Encourage them to take part in dentistry camps and other TDI-related courses, which can help them learn more about trauma cases and boost their confidence in handling them. [25] Al-Shamiri et al. [26] concluded that dental students lacked adequate knowledge of dental trauma management and suggested a number of instructional strategies, including problem-based learning and bolstering the curriculum on those subjects, to help them learn more. A study by Aboubakar et al.[27] found that Saudi and Egyptian dental interns had adequate levels of knowledge about the majority of topics related to managing tooth avulsions and that dental interns with experience of more than six months and prior knowledge of managing avulsed teeth performed better when answering questions. The current findings suggest that dental interns should be encouraged to participate in more educational programs about traumatic dental injuries. Lectures, seminars, continuing education courses, and the application of a formal protocol of treatment for dental injuries should all be included in the curriculum to assist dental students and interns in better managing traumatic injuries in children, improving their management skills, and increasing their knowledge of referral to specialised domains in need of further intervention. [24] Additionally, the IADT website (www.iadt-dentaltrauma.org) and mobile app should be used to inform interns about the accessibility of the IADT guidelines. [28]

There are certain limitations to the study. The study is based on students from a single dental college only. Another drawback of this study is that only 2022–23 internship batches were assessed. In order to present more generalised conclusions, further research should be done with a larger number of interns from various institutions and geographical regions.

## Conclusion

The results of the current study demonstrate that, to a certain extent, dental interns lack the necessary knowledge to treat dental injuries. More emphasis has to be given in the curriculum regarding dental trauma management. The study also shows that knowledge can be improved through more practically-oriented lectures and clinical exposures. This highlights the fact that there is a need to introduce a variety of teaching strategies, such as problem-based learning, seminars, and workshops, to increase dental students' understanding of dental trauma and its management.

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